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Exploring the Impact of a Sensory Integration Strategy within a classroom learning literacy task in Autism Education

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Abstract

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that affects one in 36 children globally, with an estimated 1.6% prevalence amongst children in Aotearoa, New Zealand (James, 2025). Many children experience sensory processing challenges that significantly impact their ability to engage and interact with conventional and traditional learning tasks presented by teachers (APA, 2013). Within the Aotearoa, New Zealand context, although inclusive education is encouraged and widely promoted, there still lacks classroom-based research. There is even less research which explores how the implementation of tailored sensory strategies being embedded into everyday learning tasks can impact learning for autistic children. Therefore, this study addresses the research gap to explore the differences in student engagement between traditional literacy tasks and sensory integrated methods. Two versions of a literacy task were evaluated in the classroom of a specialist school: one version which integrates sensory stimuli (tactile, proprioceptive, auditory, and vestibular), and the other with no sensory elements. Observational data of students' responses and interaction with the activities was collected, alongside semi-structured interviews with the classroom teacher. The focus of the interview was to discuss feasibility, effectiveness, as well as the observed differences in behaviour between both the conditions. Findings revealed that when students were presented with the sensory integrated task, there were higher levels of engagement, sustained attention, emotional regulation as well as task participation as opposed to the traditional non-sensory task. The implementation of sensory stimuli supported greater ownership and independence, increased willingness to initiate learning and decreased the need for prompting and re-direction from the teacher. Furthermore, teacher feedback also highlights the practicality and feasibility of the sensory integrated approach to literacy learning, whilst also acknowledging the challenges associated with limited training and resources, as well as time constraint and workload. Overall, this

study serves to provide valuable and insightful real-world evidence supporting the integration of sensory based strategies within literacy learning for autistic students, contributing deeply to the movement of inclusive education and neuro-affirming approaches in Aotearoa, New Zealand.

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Glossary

To ensure clarity and understanding as well as consistency throughout this research study, it is important to define and address several key terms that may be used often as a foundation of this research.

Autism Spectrum Disorder (ASD) refers to a neurodevelopment condition which is commonly characterised by the challenges and deficits in communication, social interaction, repetitive or restricted behaviour, as well as the accompaniment of there being a present difference in sensory processing abilities (Autism Spectrum Disorder, n.d.). These sensory difficulties often persist as either the representation of hypersensitivity or hyposensitivity to stimuli such as sound, smell, touch or movement (Sensory issues, n.d.).

Hypersensitivity is reflected as sensory over-responsiveness where an autistic child may be overly sensitive to specific sensory input leading to the feeling of being overwhelmed, distracted or frustrated (Sensory issues, n.d.).

Hyposensitivity reflects the representation of under-responsiveness where a child may have a reduced sense of response to sensory input, often making such situations with sensory stimuli unnoticeable or with a sense of unawareness (Sensory issues, n.d.).

The basis and foundation of this research is rooted in the implementation of *Sensory Integration*, which is the neurological process in which the brain organises and interprets any form of information presented to the senses, and within the specific context, it refers to the classroom strategies and techniques that incorporate sensory input – such as tactile, proprioceptive, or vestibular stimuli to enhance and support children's engagement, attention, emotion regulation, and overall learning (Ayres, 1972).

Autistic children commonly present *Sensory Processing Difficulties* which describe the disruption in how sensory information is received and responded to, which can lead to behavioural or emotional dysregulation for autistic children (What are sensory processing

difficulties, n..d). In relation to sensory processing dysfunction, there is *proprioception input* (the sense that gives awareness of the body's position and movement) as well as *vestibular input* (balance and spatial orientation sense) (Lotr, 2022). Both inputs are frequently focused on when presented with a sensory-based activity as it supports regulation, attention and focus. *Tactile input* is another sensory domain that involves the sense of touch, which is often engaged using textured material or any form of hands-on interaction (Güçlü et al., 2007; Staff & Staff, 2024). Lastly, *auditory input* also serves as a regulatory tool, as it refers to the way in which the brain interprets and responds to sound-based information (Hitoglou et al., 2010).

Within this specific study, the term *"engagement"* refers to the observable behaviours that indicate and highlight each child's active focus, as well as participation and engagement during the presented learning task, measured through analysing attention span, task persistence, as well as interaction with the material that they are offered in the task.

This presented *learning task* is defined as a structured classroom activity which is specifically designed to teach a particular skill or concept with the appropriate consideration of sensory stimuli. These tasks that are presented are both a sensory integrated task as well as a non-sensory task to allow for accurate comparisons of student's engagement and performance between both conditions.

By defining and elaborating on these specific terminologies and core concepts, the study maintains a consistent conceptual framework that supports its methodological and analytical processes.

Chapter 1: Introduction

1.1 What is Autism?

Autism Spectrum Disorder (ASD)[1] is a neurodevelopmental condition that effects one in 36 children globally, with research indicating the increasing prevalence of the diagnosis to continue increasing over the years (Harstad et al., 2023; James, 2025). The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR) defines ASD as a complex neurodevelopmental disorder which is categorised by a persistence in two core areas (American Psychiatric Association [APA], 2022). These include persistent deficits in social communication and interaction and restricted and repetitive patterns of behaviour (APA, 2022). Symptoms can range from mild to severe, and can also be linked to additional disorders, commonly attributed to ADHD and anxiety disorders (APA, 2022; ASD levels of severity, n.d.).

Specifically, autism is characterised by an array of characteristics, whether it be differences in sensory, social, or communicative processing, largely affecting the way that children interact and engage with learning tasks (APA, 2022). As described by the DSM-5-TR) the characteristics of ASD are defined by deficits in social communication, including the inability to read non-verbal cues such as eye contact, body posture, and expressions. This can also be revealed through a lack of shared enjoyment as well as interests with one's peers (APA, 2022). This often results in autistic children wanting to do things on their own, without being able to perform tasks with those around them. This communicative deficit also results in a lack of social or emotional reciprocity as well as the inability to engage and communicate in a manner that results in back-and-forth conversations (APA, 2022; Communication problems in children, 2023). As a result, many autistic children are shown to have a lack of

[1] When I am referring to autism from a mental health professional perspective I use ASD however, in other places in the thesis I use autism which is more in line with current lived experience guidelines

developmental and cognitive functionality to engage with spoken language (APA, 2022; Communication problems in children, 2020). Not only this, but autism is also attributed to and characterised by the presence of restricted and repeated behaviours, commonly reflected through children presenting hand flapping and/or presenting persistent and continual preoccupation with parts of an object (APA, 2022).

Autistic children also experience limited functioning because of their symptoms, but the impact of this can vary (APA, 2013). Historically autism related diagnoses were classed and separated into distinct categories such as Autistic disorder, Aspergers Disorder, and Pervasive Developmental disorders not otherwise specified (APA, 2013). These categories had then been consolidated into a single diagnosis within the DSM-5-T-R which retained the three severity levels and specifiers to reflect the differing levels of support required for daily functioning to occur (APA, 2022).

Firstly, children in level one are those that require support. Without such support in place, deficits and challenges with social communication occur which have the potential to cause impairments (ASD levels of severity, n.d.; The three levels of autism, 2025). A child at level one may have trouble having to initiate social interactions with peers or may show a decreased interest in engaging in any form of social interaction (APA, 2022; ASD levels of severity, n.d.). Another key symptom at level one is children presenting inflexibility with their behaviours, often causing interruption when functioning in one or more areas/contexts. At level two, the severity increases meaning they present challenges with verbal as well as nonverbal communication skills despite having the right and appropriate support (APA, 2022). This stage is also reflective of inflexibility in behaviour, making it difficult to deal with change. Additionally, it also signals more frequent repetitive as well as restricted behaviour (ASD levels of severity, n.d.; The three levels of autism, 2025). Lastly, in the third level children require substantial support (APA, 2022). At this level, there are typically

severe deficits associated with verbal and non-verbal communication skills with very minimal initiation or any form of response with social interactions (ASD levels of severity, n.d. Children are also significantly inflexible when needing to change or adapt their repetitive and restrictive behaviour patterns (APA, 2022; ASD levels of severity, n.d.). Research has reflected a graded pattern, where children rated at level one showed relatively higher adaptive functioning as well as lower autism severity scores than those at level three (Gardner et al., 2018). This suggests that overall, level one is associated with better functional outcomes and may also reflect profiles in which support is particularly effective.

When identifying the cause of autism, research reveals that both genetics and environment play a crucial factor (Bhandari et al., 2020). Researchers have identified and examined genetic coding as well as irregular segments of genes amongst autistic children (National Autistic Society, n.d.). It has been common for autistic children to have underlying genetic patterns within their families, reflecting the genetic nature of the disorder itself (UCLA, 2023). As technological advancements increase, researchers are now investigating any possibility of interference in the way children's brain develops that may result in ASD (Qin et al., 2024). Many researchers have also begun to identify the differences in shape and density of children's brain and the structure between neurotypical (an individual whose brain is able to process information, behave, as well as develop in a way that is deemed as typical within society) and neurodivergent (where the brain processes, information, behaviour and learning abilities are different to that of what is typical for society) children (Askham, 2024). When reflecting on environmental factors, toxins in the air, chemicals, viral infections, as well as exposure to chemicals can all be a potential cause of autism (Yenkoyan et al., 2024). While there is no single cause to ASD, there is ongoing research to investigate both genetic and environmental influences that can provide substantial information for early detection and diagnosis of ASD (Kuodza et al., 2024).

Other disorders and diagnosis have also been identified as more common and prevalent within the autistic community, most predominately with Attention Deficit Hyperactivity Disorder (ADHD) (Hours et al., 2022). Research states that around 50-70% of those that are diagnosed with ASD also present comorbid symptoms and diagnoses of ADHD (Hours et al., 2022). Diagnosis of ADHD means that autistic children will find it challenging to focus and attend to tasks, control frustration, and perform tasks that may be out of their norm or not rewarding (Miller, 2025). Many symptoms of ADHD and ASD interlink, resulting in many having a diagnosis of ASD complimentary with ADHD (APA, 2022). Autistic children also show signs of comorbidity with intellectual impairment, which means that children experience limitations with their intellectual functioning and their adaptive behaviour skills despite these skills being crucial in everyday life and functioning processes (APA, 2013; Srivastava et al., 2014). Having such a comorbid condition can make it overly challenging for children to engage in social interactions, as well as independence in day-to-day tasks performed (Hours et al., 2022).

The diagnosis of autism is usually recognisable within a child's early ages of life, typically before the age of three, however in some cases, can be diagnosed at a later stage when symptoms become more prominent or concerning (Rogers, 2000). A specific challenge outlined by the APA (2013) is how children with ASD often experience sensory processing challenges that impact their ability to engage with tasks in a manner that fulfils their sensory needs and supports their development. When looking at an educational scope, such differences can result in challenges in students' engagement, participation, and ability to complete a task, especially when tasks are delivered in a traditional, non-individualised manner (Webster, 2025).

Notably when children with autism experience difficulties and challenges with social communication and interaction, these can manifest in varying ways. This could include

difficulty in understanding verbal or non-verbal cues such as voice, facial expression, and even body language (APA, 2022). Children also present repetitive and restricted patterns of behaviour. However, it is important to note that such behaviours are not just random reactions but rather serve as a coping mechanism to self-regulate or to cope with overwhelming situations. Autistic children also commonly present sensory processing differences, which may result in experiencing hypersensitivity (over responsivity), or hyposensitivity (under-responsiveness) regarding sounds, lights, textures, tastes and even smells (Dunn, 1997). This often leads to children experiencing challenges in the ability to make friends, high sensitivity to sounds and sights, or the inability to perform tasks which are outside of their specific routine (ASD levels of severity, n.d.; Sensory issues, n.d.).

Although many autistic children require a varying amount of support within their day to day lives depending on intellectual disability and level of autism, it is also important to note the level of independency that many can acquire and possess through their unique strengths, most commonly in areas of detail-focused processing, memory, attention to details, as well as the ability of pattern recognition (Crespi, 2021). Therefore, there is no one size that fits all approach to the diagnosis, treatment or support, as symptoms, conditions, and occurrence can all differ and vary across ages. Autism is a rather multifaceted and diverse condition that is deeply individual and cannot be concluded as the same for everyone (Alsawadi et al., 2024). Due to the varying differences that this diagnosis entails, it is crucial for children with autism to be reciprocated with empathy, openness, and support, to succeed and grow as neurodivergent individuals leading a self-directed lifestyle (Autism, A, 2024b). Instead of focusing on the deficits, it is important to prioritise embracing and understanding the strengths of autistic children, their potential, and the cruciality of inclusion to allow societies to recognise the need for more equitable and compassionate futures where all ways of being are acknowledged and valued.

1.2 Autism in Aotearoa New Zealand

Within the context of Aotearoa, New Zealand, autism is a significant component of neurodiversity, currently affecting around 1 in 54 children with an estimated prevalence of 1.6% amongst children (Autism A, 2024; James, 2025). This figure may be higher due to the commonality of their being underdiagnosis most often amongst Māori, Pacifica, and immigrant populations (Bowden et al., 2020). Specifically for Māori and Pacifica families, autism amongst children have a prevalence of 27.9% and is marked to increase over the years (Autism A, 2024). With the diverse population of Aotearoa, New Zealand, the cruciality of ethical and culturally accepting services is also integral to ensure that the cultural needs of individuals and families are considered and valued. To provide culturally appropriate support for this demographic, services such as Altogether Autism provide a holistic understanding of the self through a prominent cultural focus on whanau (family), whakapapa (ancestry), as well as Wairua (spiritual wellbeing) (Altogether Autism, 2025; Autism resources in NZ, 2023). Despite such aid, many have also shared untimely waiting periods for children's admission into special schools, or for gaining access to assessments and therapies, making the navigation of the system rather overwhelming and daunting for many families (RNZ, 2019).

Once diagnosed, children and their families may receive support through the Ministry of Education or through support of local community services and providers in Aotearoa, New Zealand (Ministry of Education, 2016). For example, Autism New Zealand and Altogether Autism are both prominent organisations that play a crucial role in guiding families through the challenging and often diverse journey by engaging them with workshops, resources, as well as emotional and mental support (Altogether Autism, 2025; James, 2024). Furthermore, the New Zealand autism guideline is an essential and guiding tool created by the Ministry of Disabled People in partnership with the Ministry of Education (Aotearoa New Zealand Autism Guideline [ANZAG], 2024). The latest Aotearoa New Zealand Autism Guideline

[ANZAG] (2024), third edition, published in 2022, considers and acknowledges autism (takiwātanga) across the entirety of one's life – starting from early childhood up till adulthood. This guideline consists of 300 evidence-based recommendations for ways to support autistic individuals, all of which have been developed by clinicians, educators, as well as researchers and those with lived experience. The guideline elaborates on assessments and diagnosis, specific supports in place for families, navigating education, mental health, and overall wellbeing (ANZAG, 2024). It also further provides insight into living in the community, and professional development opportunities, Māori perspectives, and perspectives of Pacific Peoples (Aotearoa New Zealand Autism Guideline, 2024).

Research raises the awareness and importance of acknowledging the necessity of equitable outcomes and a holistic understanding to provide the diverse population of Aotearoa, New Zealand with the appropriate care and support (Ministry of Education, 2023). When provided with the right support, through culturally grounded services and detailed guidelines being central to diagnosis, meaningful differences are created where autistic children feel comfortable, accepted, and empowered (ANZAG, 2024). This research adds to this by focusing on the classroom setting.

1.3 The current situation of Autistic children in classrooms in Aotearoa, New Zealand

When specifically looking at the classroom context for autistic children in Aotearoa, New Zealand, the experience is often in relation to school resource availability, teacher training, as well as the overall attitude towards inclusivity within the classroom (Education Review Office [ERO], 2022). The current policies promote inclusive education where all children have the right to learn alongside their peers at local schools (Thapaliya, 2023). It is for this reason that many Autistic children attend mainstream schools; however, doing so requires educators to ensure that the learning environment for autistic children is one that is

adapted to their specific needs (Thapaliya, 2023). For this reason, whether children are in mainstream classes, or within a special school setting, it is crucial for educators to gain specific training and expertise as well as tools to ensure that autistic children are supported in their learning environment (Goodall, 2014).

In New Zealand, the Ongoing Resourcing Scheme (ORS) as well as the Learning Support Delivery Model, aim to allocate the appropriate support that children and families require for high needs students (Ministry of Education, 2020; Overview of the ongoing resourcing scheme, n.d.). Those who may not fall within the category of ORS funding or may not qualify but still require a substantial amount of support have reflected the process as one that is lengthy and dauting (Stuff, n.d.). This has made it challenging for those who may not have severe needs but still require substantial support as they are turned away and unable to receive timely support and care (Stuff, n.d.). Families have reported the feeling of exclusion when making decisions, as well as the need to strongly advocate to secure the appropriate educational support that they require such as school placements (Brede et al., 2017). This has created a gap within the New Zealand education sector for Autistic students, whilst also adding pressure to teachers, parents, as well as students. Not only this, but schools are also required to apply for support through bureaucratic processes which are rather daunting and complicated, often delaying children's admissions and intervention, resulting in autistic children having to begin school at a delayed age (Altogether Autism, 2025).

Currently in New Zealand, efforts are underway to improve inclusivity within classrooms, by having the Education Review Office (ERO) offer professional development opportunities as well as inclusive education guidelines to educators (ERO, 2022). Additionally, organisations such as Autism New Zealand, also provide school-based workshops and training to best support educators (Programmes Archive, n.d.). Many schools have begun to adopt the structured teaching models of TEACCH (Treatment and Education

of Autistic and Communication-Handicapped Children) (TEACCH, 2025). The approach aims to provide children with structured teaching that entails visual information processing and targets supporting children with difficulties in social communication, attention, and executive functioning (TEACCH, 2025; Virues-Ortega et al., 2013). This approach also includes the use of visual schedules and sensory tools within classroom settings to support children and their learning (Hood, 2023; Lal et al., 2011).

1.4 What is sensory integration?

Sensory integration refers to the neurological process where the brain organises and interprets sensory information that is received from the body and environment (Smith, 2019). When sensory integration functions, the brain filters, prioritises, and synthesises these inputs in a way where individuals can perform each of these developmental processes successfully to allow tasks such as walking, eating, concentrating, or playing to occur (Elbasan et al., 2012). This function allows individuals to respond to the presented stimuli. Ayres (2005) describes this process of sensory integration dysfunction in the 1970s, where he had coined the term ‘sensory integration’.

Sensory processing difficulties are common in autism, in particular extreme sensitivity or insensitivity (Koziol et al., 2011; Randell et al., 2022). For autistic children, sensory integration processes may not occur efficiently, leading to difficulties in regulating responses to sensory stimuli (Crasta et al., 2020). These difficulties can result in either hypersensitivity (over-responsiveness), hyposensitivity (under-responsiveness), or sensory-seeking behaviours (Dunn, 1997; Sensory issues, n.d.). This can often make it challenging for autistic children to learn and develop a set of new skills, to comfortably engage with others, and socially interact.

There is a profound acknowledgement of the importance of understanding sensory

processing through the vestibular, proprioceptive, tactile, and auditory systems when implementing sensory integration interventions (Camarata et al., 2020; Dunn 1997). Here, sensory processing reflects the way in which the brain processes the input from the environment to exhibit a specific or appropriate motor or behavioural reaction and response (Dunn 1997; Sensory processing, n.d.).

Firstly, the vestibular system plays a key role in ensuring balance as well as spatial orientation (Choudhery & Ansarii, 2020). This in turn supports children's postural control as well as their focus which are functions that are essential for autistic children especially to engage with classroom activities and meaningfully participate (Chisari et al., 2024). This vestibular sense specifically revolves around the inner ear or the semi-circular canals and provides the body with information about what the body may be doing, head positions, as well as detection of movement and speed (Professional, 2025). Children who present an under-responsive vestibular system often are perceived as being rather inattentive or lethargic, whereas those who are presenting as over-responsive are often considered as consistently on the go, or may be avoiding any form of movement altogether (Choudhery & Ansarii, 2020; Swc, 2024).

On the other hand, the proprioceptive system informs the body about specific positions as well as movement, to help aid coordination, motor planning, as well as self-regulation abilities (Blanche et al., 2012; Middletown Autism, n.d.). This system specifically deals with the information our body receives from the receptors of the muscles and joints (What is proprioception, 2024). Griffin OT (2025) explains how it allows children to determine how hard or soft something may be whilst also helping children use their fine motor skills such as using a pencil. In this manner, the brain will receive a signal of how to move a body part, or which body part to move when our body is in a state of stretching or bending for example (Middletown Autism, n.d.). Research within this field, reveals that those

activities which activate the proprioceptive system, such as engaging with tasks that involve lifting, pushing, or even squeezing and pressure, have the potential to improve and promote a sense of calmness, in turn supporting individuals to increase their attention (Patil et al., 2023; Taggart, 2019).

Next, the tactile system, the largest sensory system which develops first, is heavily focused on processes and input received from the skin (Jones et al., 2014). The tactile system is connected to the regions of the brain that are interconnected and related to the process of arousal, emotion, and control of reflexive and automatic functions (Tactile system, 2023). This system is foundational when children are engaging with sensory exploration and in making sense of the world around them (Asmika et al., 2018). Applying the tactile system and implementing tactile activities allows autistic children to gain better hand and finger awareness, attention, and fine motor planning skills (Staff & Staff, 2024). When working correctly, this system is integral as it allows the body to regulate its posture, balance, muscle tone, and movement of one's eye (Your 8 senses, n.d.). It is through this system that autistic children can understand the world around them and feel secure when exploring their environment (Otr, 2021).

Lastly, the auditory system is a tool that is essential for communication abilities and one that supports classroom functionality (Hitoglou et al., 2010). Children who present with auditory sensitives may result in feeling overwhelmed when they are in an overly noisy environment, or they may struggle to interpret and understand verbal instructions (GriffinOT, 2024; Tharpe et al., 2006). Although most autistic children will gradually present some form of language, even if it is minimal, still around 30% of autistic children remain non-verbal or only minimally verbal past their early childhood years (Tager et al., 2013). Therefore, it is important for there to be an understanding of auditory stimuli to support children's growth and enable them to receive information in a way that is best suited for their needs.

By understanding the importance of these systems, the incorporation of sensory stimuli and input through different senses can be tailored in a way that supports these systems, as well autistic children's needs, through the implementation of sensory integration methods and interventions (Weiner & Grenier, 2020). This allows autistic children to learn in a manner that is more receptive for themselves, and where traditional learning demands are not placed to make them feel overwhelmed or distressed, but rather to feel supported and have the ability to self-regulate which is crucial for effective and meaningful engagement in learning tasks (Camarata et al., 2020; Goncalves & Monteiro., 2023; Schoen et al., 2019).

Ayres (2005) work and theory has influenced and inspired the implementation of many sensory based therapies on a global level, to treat a wide range of symptoms that autistic children have presented, as it provides vestibular (which contributes to balance and spatial orientation), proprioceptive (which helps us perceive body position and movement), auditory (helps to hear and engage with sound and speech), and tactile (ability to receive, interpret and respond to touch) development (Ayres, 1972; Hellier, 2016; Ziming et al., 2024). The method and approach of sensory integration is one that incorporates sensory material, to change conventional learning into one that is more interactive, engaging, as well as one that is not overwhelming (Schoen et al., 2019). Autistic children process sight, sound, touch, and movement differently in comparison to neurotypical children, hence the incorporation of sensory material can provide comfort, predictability, and be a fun way for children to engage with and explore the world around them (Vives-Vilarroig et al., 2022).

Sensory integration within the classroom specifically refers to how students process the sensory information they receive, and the effect that this has on their ability to learn, participate, and engage with classroom learning (Abraham, 2002). For neurotypical children, the process of having the brain filter and manage such sensations happens automatically, ultimately giving them the ability to have a prolonged attention span, to sit still, read, and

appropriately interact with peers (Howley-Rouse, 2024; Piccardi & Gliga, 2022). For autistic children, their sensory processing differences result in such environments being experienced as overwhelming, confusing, or dysregulating (Sensory issues, n.d.; Tomchek & Dunn, 2007). A child that is hypersensitive may find the classroom setting overly loud and too visually stimulating, resulting in them covering their ears or wanting to leave the setting (Sensory issues, n.d.; Gomes et al., 2008). On the other hand, a child that is hyposensitive may find it challenging to sit still and engage as they are seeking to have a form of deep pressure or require movement (Sensory issues, n.d.; Canete et al., 2023).

Within the Aotearoa, New Zealand context, classroom teachers are more commonly and frequently encountering neurodivergent students whose challenges are in relation to sensory needs and requirements (Ministry of Education, 2018). Such awareness of sensory integration within a classroom setting is essential to not misinterpret such behaviours as fidgeting, refusal, or a lack of engagement as defiance, but as a form of potential sensory overload (Sensory issues, n.d.). Sensory-friendly classroom strategies are being implemented within classrooms in Aotearoa, New Zealand, specifically within special schools and inclusive education settings (Ministry of Education, 2023). Occupational therapists may recommend to allied classroom teachers to assess each individual student's sensory profile and methods for specific environmental adaptations that allow students to engage with unique patterns and methods of learning and development (Bodison et al., 2018; Çorakcı & Bumin, 2025). For example, tactile input such as playdough when sitting has proved to be beneficial for neurodivergent students to feel less overwhelmed when a new activity is being conducted (Laurie, 2022). Teachers have also been encouraged to adopt body-based learning as well as multi-sensory teaching methods to allow all sensory systems to engage with the learning process (Spielmann & Miller., 2020; Structural Learning 2023).

When referring to the implementation of sensory integration, there is an increasing

awareness and use of the Universal Design for Learning (UDL) in Aotearoa, New Zealand which supports the inclusive approach that many schools seek to take on (Ministry of Education, 2016; View of Promoting inclusive practice for Autistic learners, n.d.). This model encourages and advocates for the design of classroom environments to accommodate the diverse sensory needs that children have from the outset, instead of retrofitting such changes once the issues have begun or arise (View of Promoting inclusive practice for Autistic learners, n.d.). This may include giving all students the opportunity to choose how they complete a specific task (e.g. drawing instead of writing).

1.4.1 Why is sensory integration needed?

The need for sensory integration within the classroom context for neurodivergent students is not only beneficial but also transformative as it directly affects the way in which students behave, engage, learn, and experience the learning environment that they are within (Ashburner et al., 2008). With the absence of sensory integration, many children experience dysregulation and find it difficult to participate and engage within the classroom, negatively impacting a child's learning as well as their own self-esteem (Sung et al., 2024). Such behaviours commonly get attributed as being problematic rather than recognizing the underlying reaction as one that may be a coping mechanism or stress response (Mills & Chapparo, 2018).

When sensory integration can be acknowledged, educators and organisations can provide the appropriate strategies to help and support students to effectively engage with learning. The use of sensory material such as fidget tools, wobble cushions or weighted pillows for example are all different methods and sensory tools that provide comfort to help autistic students feel less overwhelmed to participate in learning activities (Biel, 2017). Having the presence of sensory stimuli and having children's sensory needs met through

calming or alerting input such as deep pressure, movement, or even tactile material, means that the nervous system is able to stay balanced, and within the green brain (represents the state of the prefrontal cortex, specifically in a place where the logical and thinking part of the brain is able to respond and in control) where they are more open to and able to focus, learn, and complete tasks in an effective manner (Falloon et al., n.d.; Grandin, 1992; Laurie, 2022; Ricker, 2025).

Therefore, the implementation of sensory integration consists of the use of a structured form of sensory input whether it be in the form of tactile, auditory, visual, proprioceptive, or vestibular stimuli (Smith, 2019). The structured use of sensory input assists autistic children in engaging in a way that is catered to their specific sensory needs, helping them regulate their emotions, focus better, and respond in an appropriate manner to the learning cues and demands (Howley-Rouse, 2023). With sensory experiences varying widely for autistic children as compared to those who may be neurotypical, sensory integration techniques offer an opportunity for learners to thrive in a setting that isn't overwhelming, but rather foster more meaningful engagement (Ayres, 2005; Griffin OT, 2024; Moyes, 2010).

As well as engagement and improved interaction, sensory integration can also promote emotional regulation which can support social interactions and effective learning (Guardado & Sergent, 2020; How sensory integration can help, n.d.). Specifically, our sensory systems are directly linked to the key regions of the brain which regulate emotions, particularly the limbic system as well as the autonomic nervous system (How your brain works, n.d.). Hence, when sensory input is organised and balanced, the nervous system is supported to return to a calm and regulated state. For example, deep pressure or proprioceptive input helps in activating the parasympathetic nervous system which supports the reduction of anxiety (Bestbier &Williams, 2017).

1.5 Purpose of the study

There are many organisations and special schools within Aotearoa, New Zealand that cater their learning to fulfil the sensory requirements of autistic children (Specialist schools, n.d.). As the researcher of this study and as one who has drawn personal experience as a teacher aide within this environment and school setting, I have been able to observe first-hand how traditional learning styles and educational approaches often fail to keep children engaged and interacted due to sensory processing difficulties that impact attention, participation, and overall learning. With a vast number of sensory integrated research being conducted in clinical or controlled settings, the purpose of this study is to address this critical gap that limits the attention and awareness of sensory integration not just in classroom environments, but also as integral in learning tasks and activities (Randell et al., 2022; Schaaf et al., 2014).

Through the design and comparison of two literacy-based learning tasks (one which has sensory elements integrated, and another with no sensory integration), the research task sought to examine the observable differences that can be reported in students' levels of engagement, participation, emotional regulation, as well as overall task performance. The activity is carefully constructed in a manner that provides multisensory input through tactile, proprioceptive, auditory, and vestibular elements to engage children in a learning experience that does not seem overwhelming or daunting, but one that is comfortable and aligns with their neurodevelopmental needs (Dionne-Dostie et al., 2015; Smith, 2019). Having this strategy and task integrated in an authentic manner within the existing classroom routine allows for a clear picture of children's potential and capabilities when they are supported in the right manner to achieve their learning outcomes and goals.

1.5.1 Research question

The central guiding question of this study is to explore how sensory integration

strategies can be implemented within classroom learning tasks for autistic children, and the impact this has on children's learning. The research question is therefore: *How does the use of a sensory integration strategy influence student's engagement, participation, and emotional regulation during a literacy task in an Autism education class?* This research also seeks to understand the feasibility of implementing sensory integration within learning tasks through gaining the perspective and experience of teachers.

1.6 Assumptions of the study and positionality

This research study is grounded in several key assumptions which ultimately shape the design as well as its interpretative lens. Firstly, a key assumption of this research study is that autistic children experience diverse sensory processing challenges, which plays a significant role in children's engagement and interaction when presented with a traditional learning task (Case Smith et al., 2015; Kojovic et al., 2019). Another key assumption of this study is that the use of traditional classroom approaches and learning methods may not fully support and assist the unique learning styles that autistic children require to thrive and progress, necessitating the need for alternative approaches and methods such as the use of sensory integration (Anderson, 2023; Brooks, 2010). This supports the assumption that implementation of sensory integration within learning tasks can enhance and support engagement, participation, emotional regulation and task participation (Barros et al., 2023; Bodison et al., 2018).

I position myself in this research as a neurotypical adult who works in a specialist school as a teacher aid. I am committed to working with neurodivergent children and communities in ways that are neuroaffirmative, ethical, and grounded as much as possible in the views of the community.

Chapter 2: Literature Review

2.1 Introduction

The purpose of this literature review is to map and depict the current state of knowledge that exists within the given field of sensory integration, and identify established findings, limitations, and gaps, as well as the justification for a new approach to the field of sensory integration. The focus is on literature on education for autistic children, and more specifically the implementation of sensory integration strategies within classroom learning tasks. Although this body of research and literature has grown substantially over the years, there remains a dominating focus on clinical and therapeutic contexts, with naturalistic settings like a classroom remaining unexplored despite its day-to-day commonality (Camarata et al., 2020 Case-Smith et al., 2015; Randell et al., 2022; Schaaf et al., 2014). This study therefore aims to address this gap by implementing sensory integration strategies directly into a classroom learning task and evaluating the implications and practical impact that this has within the educational context.

Presenting this literature review highlights the need for sensory integration research specifically within a classroom-based setting to better understand the impact of such interventions not just when the environment is sensory adapted, but when learning tasks are as well. This literature review aims to explore three core areas:

- *Theoretical foundations of sensory integration in autism*
- *Empirical research on sensory integration strategies within an educational context*
- *Gaps in the Literature and the need for classroom-based case studies*

By reviewing these themes, this literature review establishes the importance of sensory integration within autism education, and the unique contribution that this thesis aims to achieve. With a shift from a generic approach of sensory environments to a more specific task based sensory integration strategy within the classroom, this research aims to provide

practical and insightful knowledge that can inform and lead ongoing inclusive education practices.

2.2 Conceptual and theoretical frameworks theories of sensory integration

This research project is deeply grounded in a conceptual and theoretical framework which integrates the principles of sensory integration theory, elements of information processing, as well as the philosophical foundation of a critical realist approach. These core frameworks and ideologies inform the design of this research, its implementation, as well as the interpretations of the study. Having this theoretical position enables a deeper understanding of the influence that sensory-based interventions has towards learning outcomes, engagement, as well as behaviour amongst autistic children.

At the center of this study lies the principles of sensory integration theory, first developed in 1972, by an occupational therapist named A. Jean Ayres (Ayres, 1972). This theory's foundation lies on the premises that the brain's ability to organise and process specific sensory information that is received is crucial for meaningful behaviour, learning, as well as social participation to occur (Ayres, 1972). Hence the approach of sensory integration encompasses not only dysfunction and intervention, but also their role in learning efficiency (Camino-Alarcon et al., 2024). Additionally, Ayre's (1972) insight and research propose the idea that when children experience sensory processing difficulties, specifically for autistic children, it is often hard to interpret the sensory input that allows them to behave and engage effectively with their surroundings. In this situation, children find it challenging to process sensory information, and experience difficulties associated with emotional regulation, motor planning, task completion, and attention (Schoen et al., 2019). Sensory processing is similar to sensory integration when referring to the central nervous system, but the terms are not interchangeable. Sensory processing includes the ways in which the central nervous system

organises, receives, as well as responds to sensory input. In contrast, sensory integration can refer to both a neurological process and therapeutic approach (Camino-Alarcon et al., 2024).

Ayres (1972) describes that sensory integration as where the information the brain receives from the senses (touch, movement, vision, hearing etc.), is organised in a manner to produce the appropriate responses. Building on this theoretical framework, sensory integration theory can inform therapeutic approaches with an aim to support those who experience difficulties with sensory processing and integration. Therefore, although sensory processing elaborates on the broader neurological processes that are involved in responding to sensory information, sensory integration describes the ways in which this sensory information is both interpreted as well as organised within the brain. In a therapeutic context, this is what informs specific intervention designs which address difficulties experienced with these processes and for those who face sensory processing difficulties.

For autistic children there is often the challenge of regulating sensory input, which can lead to either hypersensitivity or hyposensitivity (Arky, 2025). This in turn affects functioning processes making it difficult to engage with motor skills (e.g., coordination), self-regulation (meltdowns), play, social participation, attention, and learning (Arky, 2025; Shaheen, 2014). This specific sensory integration dysfunction is referred to by Ayres (1972) as a hidden difficulty because the neurological challenges are not obvious to others or easy to pick up on, but still hugely impacts the everyday functioning of children with autism. That is why sensory integrated methods such as child-led activities for example are encouraged by Ayres (1972) as they aim to improve the ability to process sensory input and enable the occurrence of more adaptive responses which result in appropriate behaviours towards sensory input.

This foundational and seminal work presented by Ayres (1972) highlights the importance and cruciality of providing autistic children with sensory experiences which are

not overwhelming or overexerting, but instead ones that help children make sense of their environment and allow them to develop adaptive responses. Furthermore, the sensory processing theory found by Winnie Dunn (1997), categorises children's sensory processing patterns into four quadrants, all based on their interaction that occurs between their neurological threshold as well as self-regulation strategies (summarised in figure 1). These four quadrants are noted to be low registration, sensory seeking, sensory sensitivity, as well as sensory avoidance (Dunn, 1997).

Figure 1: *Four Quadrants of Sensory Patterns Based on Dunn (1997)*

Neurological thresholds	Self-regulation strategies/behavioural responses	Sensory Pattern
High threshold	Passive	Low Registration
High threshold	Active	Sensation Seeking
Low threshold	Passive	Sensory Sensitivity
Low threshold	Active	Sensation Avoiding

Note. Adapted from Dunn (1997).

When looking at this model and seminal work through the lens of sensory integration research and the implications of such methods on learning activities, Dunn's (1997) model deems to be particularly significant as it helps researchers, educators, as well as occupational therapists identify and understand how students will perceive, respond to, as well as manage the sensory input that they receive within a dynamic learning environment. By acknowledging these patterns, teachers within classrooms can create more individualised and inclusive interventions that are tailored to specific children's needs to further enhance engagement and reduce any possibility of sensory-related disruptions (Dunn, 1997). Thus, the seminal work of Dunn's (1997) sensory processing framework provides both a theoretical foundation as well as a practical tool for ensuring that children are provided with tailored

sensory strategies that meet their diverse needs within an educational setting.

Incorporating these theories within this research is relevant in understanding the role sensory input plays in information processing (Ayres 1972; Dunn 1997). For example, a child who presents hypersensitivity to auditory stimuli may find it challenging to process verbal instructions, whereas a child who presents hyposensitivity may seek additional stimulation in a way that is seen as disruptive or distracting behaviour. Such processing differences can act as a hurdle in learning, where instructions are given in a generic traditional and conventional format that do not accommodate individual sensory needs and cognitive processing styles of autistic learners (Dawson et al., 2008). Therefore, the implementation of integrating sensory elements within learning tasks can serve to reduce cognitive load, promote engagement, participation, and emotional regulation, to enhance attentional control and promote deeper processing that aligns instructions with the child's preferred sensory modalities (Unwin et al., 2022). This theoretical lens therefore guides the research to gain a deeper understanding and exploration of sensory integrated learning tasks that can support effective and meaningful information coding and retrieval for autistic children.

The broader philosophical foundation of this research is also informed by a critical realism approach, a metatheoretical framework introduced by Roy Bhaskar (1975) and later adapted for educational research purposes by scholars such as Fleetwood (2014). The approach of critical realism distinguished between the real (the underlying structures and mechanisms that exist independently of our perception), the actual (the events generated by those structures), and the empirical (our experience of those events) (Mingers, 2004; Rutzou, n.d). Integrating this approach within the study is particularly relevant to the field of educational research as it allows for there to be an understanding of the objective realities such as the neurological differences that are associated with autism, as well as the socially constructed nature of how these specific realities are understood and interpreted, responded

to, as well as managed and handled within a larger school system (Kourti, 2021; Luke, 2009; Scott, 2005).

When looking particularly at the context of this study, adopting a critical realism approach supports a dual focus (Rutzou, n.d). This approach enables the researcher to investigate and explore observable data and classroom behaviour (e.g., task management, attention) of each student and their specific outcomes, whilst also exploring and focusing on the underlying causal mechanism (reduced sensory overload, increased proprioceptive input) that may result in these specific behaviours. Presenting and adopting this layered approach aligns greatly with the study's purpose of not just providing theoretical contributions, but to also providing practical insights for classroom teaching. This approach also supports methodological pluralism, allowing for there to be an integration of structured observational data with more interpretive insights that align with critical realist perspectives through combining multiple sources such as teacher's feedback and interviews (Van Bouwel, 2003).

Lastly this research uses embodied cognition as a theoretical lens which argues that cognitive processes are deeply intwined and rooted in the way our bodies interact with the physical world (Foglia & Wilson, 2013; Wilson, 2002). Adopting this lens into this study is practical and relevant especially when considering sensory integration as it diverges away from perceiving learning as purely just mental or abstract, but instead viewing how sensory input such as movement, touch, or spatial awareness can shape understanding and meaning making (Dunn, 1997; Mueller & Tronick, 2020). For autistic children, having a form of tactile and kinaesthetic engagement can be beneficial allowing students to engage with academic content which might otherwise seem overwhelming (Ashburner et al., 2008). This approach therefore views sensory experiences not as auxiliary, but as an integral component for learning amongst autistic children.

The combined approach of sensory integration theory, sensory processing theory,

critical realism, and embodied cognition, allows this research to take on a robust and multidimensional framework which informs the design of the interventions, its specific methods of data collection, and the interpretation of findings through data analysis. The research extends from identifying whether sensory integration methods "work" in a classroom setting for autistic children, to instead seeing "how" and "why" it facilitates and supports learning, regulation, as well as overall participation. The theoretical underpinning of sensory processing challenges explores how sensory differences have led to an inference for autistic children's learning, and to better understand how integration of sensory input into learning tasks can aid neurological development as well behavioural outcomes (Jones et al., 2020; Pfeiffer et al., 2011).

2.3 Sensory integration and autism: Interventions

For autistic children, learning occurs through a lens deeply shaped by individual understanding and experiences of their sensory world, making typical and traditional classroom tasks difficult to engage, emotionally regulate, and participate with learning tasks as it remains under-responsive to their specific needs (Admin, 2024; Tutt et al., 2006). The implementation of sensory integration strategies aims to provide autistic children with a more structured and meaningful interaction and sensory experience with tasks which help the nervous system better manage and integrate input from a wide array of sensory modalities (Ayres, 1972; Pfeiffer et al., 2011). With repetition, such implementations can support autistic children's regulation abilities, engagement, as well as functional participation in everyday activities including their academic learning and development (Case-Smith et al., 2015; Preis et al., 2014).

Building on the core idea of Ayres (1972) theory of sensory integration, recent research has offered empirical validation for the implementation of sensory integration

methods. A prominent example of this is Schaaf et al.'s research (2014) who had previously demonstrated the significant impacts of structured sensory integration methods on sensory processing and social participation for autistic children. Through adopting the measuring technique of Goal Attainment Scaling (GAS), and through standardised processing assessments, their findings revealed that there were significant improvements seen in children's goal attainment, sensory processing, and social participation (Schaaf et al., 2014). Their findings also suggested that providing autistic children with structured sensory activities have the potential to improve participation, engagement and adaptive behaviours, which in turn support emotional regulation (Schaaf et al., 2014). This research can be viewed as a significant study in the field of sensory integration through its findings providing a practical model for evidence-based interventions that can be adopted within educational contexts. However, although Schaaf et al (2014) provides compelling evidence in the field of sensory integration interventions, it is important to note that the interventions' structure and resource intensive nature may pose limitations in its feasibility within educational settings who may have very little funding.

Research conducted by Pfeiffer et al. (2011) explored how sensory based interventions improved attention and engagement for autistic children, as compared to those who had received standard care. This pilot study randomly assigned 20 children from ages six to twelve to either a sensory integration intervention group or a fine motor control group. The sensory integrated task consisted of structured, play based sessions which had been deeply grounded in the principles of Ayres (1972) sensory integration theory that targeted vestibular, proprioceptive, and tactile input. The findings of this study reveal the relevance and statistical significance that sensory integration holds for autistic children, with profound improvement identified in children's engagement, attention space, and goal attainment through analysis and measurement by the Goal Attainment Scaling (GAS) tool (Pfeiffer et al., 2011). Even parents

of the participants reported the positive changes they had observed in their children's functional behaviour as well as sensory responsiveness at home (Pfeiffer et al., 2011). Pfeiffer's (2011) findings support the need for awareness and recognition of the impact that sensory strategies can have for autistic learners, advocating that sensory integration can be foundational for learning when targeted structured sensory input is implemented.

Case-Smith and colleagues (2015) conducted a systematic review examining the effectiveness of sensory processing interventions for children with ASD, many of which involved occupational therapy approaches. The review highlights the importance of tailoring interventions to children's individual sensory profiles (Case-Smith et al., 2015). The findings suggest that learning tasks may be most effective when designed to incorporate children's sensory needs, rather than relying solely on traditional educational incentives (Case-Smith et al., 2015). This has been supported in later research suggesting that integrating sensory responsiveness with task design allows for intentional stimulation and engagement of vestibular, proprioceptive, tactile, and auditory systems within the learning process (Camarata et al., 2020; Vives-Vilarroig et al., 2022).

Case-Smith et al. (2015) also reported that whether it be through sensory based strategies, or environmental modifications, the study showed benefits for reducing children's anxiety and improving their focus when performing tasks. This study identified the efficacy of implementing Ayres (1972) Sensory Integration Theory, observing positive impacts on adaptive behaviour, reduced sensory related distress, as well as enhanced attention and focus (Case-Smith et al., 2015). Hence, this study remains a critical piece of work for delving into sensory integration as it reveals the practical application of sensory integration within an educational context, giving insight to schools, teachers, and broader committees (Case-Smith et al., 2015). However, with a dominating focus on the research being presented in a clinical setting, it was unable to capture autistic children's typical and real learning environment.

Whether it be Case-Smith et al. (2015) or Schaaf et al. (2014, such approaches that use sensory integration raise the importance of acknowledging that for many autistic children, optimal engagement with tasks presented such as literacy, reading or even maths, all may require a certain level of intentional sensory input for there to be engagement and interaction with the task (Schaaf et al., 2014). For example, this may occur through incorporating movement breaks, tactile input as opposed to general traditional tools for learning, as well as the implementation of visual schedules as opposed to verbal instructions which align with the child's specific sensory needs. Case-Smith et al. (2015) highlights the lack of strong evidence-based research within the field of sensory integration and the need for structured as well as tailored sensory integration interventions for children. Therefore, there is a need to expand the research of sensory integration to move beyond just the change of the classroom environments (Hood, 2023).

Ausderau et al. (2016) conducted a longitudinal research part of the Early Development of Children with Autism (EDCA) project which examined how early sensory responsiveness is related to later development in young autistic learners. This study tracked and followed children across multiple developmental time points with the use of standardised assessment tools, including the sensory experiences questionnaire to identify and examine patterns of sensory responsiveness (Ausderau et al., 2016). These patterns included hyper-responsiveness; hypo-responsiveness, as well as sensory seeking behaviours that reflected an increased drive for sensory input (Ausderau et al., 2016). The findings of this study indicated that such sensory profiles were associated with differences in children's functional engagement as well as developmental trajectories over the course of the study (Ausderau et al., 2016). This evidence from the research highlights the importance of having awareness about noticing autistic children's sensory processing differences at an early on stage, as they may influence how the child interacts with the environment they are in and participate in

learning tasks (Ausderau et al., 2016). Furthermore, this research reinforces the importance of consideration of sensory needs when designing and creating supportive learning experiences for autistic students. This research serves as seminal work in the field of sensory integration for learning tasks as it suggests that sensory input and integrations do not only serve to aid children's ability to self-regulate but also allows for enhanced cognitive engagement when it is embedded within learning tasks (Ausderau et al., 2016). Rather than perceiving sensory integration interventions as separate to academic instructions, this research aims to acknowledge that sensory integration is complementary.

Similarly, Parsons et al. (2011) conducted an international review of research on the best available practices in educational provision for autistic children. Through the review of 92 studies, the authors identified that evidence supporting any one approach was limited and that a range of educational strategies is required to meet the diverse needs of autistic learners (Parsons et al., 2011). Furthermore, the research highlights the need for further research on different methods and educational interventions which can be implemented by schools or even parents, as well as the need for greater collaboration between researchers and practitioners to establish the best outcome for autistic students learning development (Parsons et al., 2011). This highlights the importance of flexible, individualised educational provision that responds to each child's learning and required support.

Parsons et al. (2011) raise awareness of the need to understand autistic students and their sensory profiles, to create individualised strategies which can, for example, address tactile, proprioceptive, auditory and vestibular input in a manner that improves engagement, comprehension, or even emotional response. This suggests once again the effectiveness of implementing multisensory pedagogical approaches of learning which align and support the neurodiverse needs that autistic learners present. By acknowledging the deep connection between sensory processing and cognitive functioning, these studies aim to create a

supportive shift which challenges traditional educational models which are not entirely inclusive and responsive to the way neurodivergent children experience and interpret the world around them through their bodies and systems (Baranek et al., 2019; Case-smith et al., 2015). By challenging traditional approaches and the conventional separation that exists between sensory needs from academic learning, there is an increased awareness and advocacy for proposing that sensory engagement should be considered foundational to instructional design, especially for neurodivergent learners (Ausderau et al., 2016; Parsons et al., 2011).

Research has often explored how sensory-friendly environmental changes and alterations within the school setting can support autistic students learning outcomes (Stearns, 2022). This is sometimes reflected through classrooms having calm corners for children to self-regulate, or even weighted blankets as it provides deep pressure stimulation to help children's bodies feel calmer and more grounded (Parker et al., 2016). Sensory integration has commonly been explored and widely recognised as a beneficial tool to implement with autistic children, specifically in its ability to support children's emotional regulation, anxiety levels, and to support children's focus and attention to better engage and interact (Pfeiffer et al., 2011; Schoen et al., 2019). There is a positive impact of such research which has raised awareness and the importance of sensory integration, however, very few research studies highlight and explore how sensory-integrated approaches and strategies can be effectively embedded within classroom learning activities. Although research within the field of sensory integration may seem promising, much of this work has raised concerns associated with its applicability of such interventions to real-world environments where learning demands may be more complex, and where stimuli may also be less predictable (Schaaf et al., 2014; Schoen et al., 2019). Much of this work has raised specific concerns about its ecological validity within the classroom (Case-Smith et al., 2015; Randell et al., 2022).

In sum, this literature review supports that interventions for sensory integration are not simply an adjunct intervention or one that can be externally implemented, but rather one that has the potential to be foundational and beneficial as a complimentary component for effecting learning and meaningful interactions to aid developmental, cognitive, and academic progress (Ayres, 1972; Schoen et al., 2019; Spielmann & Miller, 2020). Although traditional and previous research studies on sensory integrated have validated and emphasised the many benefits that implementing structured sensory input can have for children's emotional regulation, attention, and overall engagement, there still remains a distinct gap and limitation in the understanding of how such strategies can be applied practically within a classroom-based academic task, and how this may prove to be beneficial for autistic learners (Bodison et al., 2018; Schaaf et al., 2014).

The current research study will focus on responding to these gaps in research by focusing on investigating how a sensory-integrated academic task, when implemented in a real-time and dynamic special education setting, can influence engagement and attention for young autistic learners. In doing so, the research study seeks to contribute to the development of inclusive and evidence-based educational practices which are both developmentally attuned and sensory responsive. This study will give insight as to how educators can meaningfully and practically incorporate sensory strategies within academic learning planning, to ultimately enhance students' participation, and overall developmental outcomes for neurodivergent learners.

2.4 Teachers' reflections on sensory integration

Teachers and educators play a pivotal role in translating theory and research into practical implications, especially when it comes to implementing specific sensory integration strategies within a classroom setting (Howley-Rouse, 2023). Research has highlighted many teachers'

reflections who have incorporated sensory integration strategies, outlining the profound potential of its implementation as well as the complexity of using such techniques in fostering learning and engagement for autistic children (GriffinOT, 2024).

When focusing on a special education classroom, the integration of sensory strategies is not just a supplementary act but one that is complementary (Case-Smith et al., 2015). When describing initial responses to sensory integrated techniques, teachers have described their desire to address heightened sensory sensitivities that are present for autistic children, often resulting in behavioural expressions which can disrupt the child's participation and engagement abilities (Mills & Chapparo, 2018). However, through evidence presented in research interventions, teachers have shifted their view on sensory integration from being a reactionary method to a transformative and proactive method which can support autistic children's engagement, participation as well as self-regulation (Mills & Chapparo, 2018; Weiner & Grenier, 2020). For example, one prominent reoccurring pattern that has been observed in teachers' reflection is the benefit that sensory integration has in creating a sensory friendly learning zone within classroom settings which allows children to have calm corners, access to textured materials, or even wobble stools as a pathway for self-regulation within the classroom (Seeberger, 2025). With easy accessibility, children have the means to self-regulate whilst still being in the classroom environment (Classroom Accommodations, n.d.). This setup signals to children that their sensory needs are being validated and accommodated for, fostering a more inclusive and accepting environment (Dunn, 1997).

Furthermore, reflections on teacher feedback of sensory integration techniques reveals that one of its most challenging factors is associated with aligning this method with academic tasks, whilst also facing the challenges of limited specialised training and knowledge (Otr, 2023). However, practitioners and educators also reflect how often these logistical challenges and obstacles are outweighed by the significant benefits that such strategies have for autistic

children (Inclusive teach, 2024). For example, teachers have shared that the incorporation of movement-based learning through the implementation of gross motor activities when teaching autistic students has allowed there to be an increase of improvement in focus as well as retention for those who otherwise find it challenging with stillness or processing verbal instruction (Bhattacharya et al., 2015; Case et al., 2019). Others have reflected on their experiences with incorporating tactile learning material and methods such as the implementation of sandpaper or even textured number lines, helping children to anchor abstract and complex concepts in physical sensations (Jarrell, 2022). Such approaches are directly drawn from the foundation and principles of embodied cognition, which has a strong focus on revealing that sensory and motor experiences are both deeply intertwined with learning as well as memory (Wilson, 2002).

Educators have reflected and provided insight on how sensory integration methods can be effective, with an observable increase with children's on-task behaviour, task initiation, and overall determination to complete tasks amongst autistic students (Bhattacharya et al., 2015; Mills & Chapparo, 2018). Reflections expressed the importance of physical interaction with tasks, where children are given opportunities to interact in a way that is beyond just looking and reading (Bhattacharya et al., 2015). Through the incorporation of touch and smell, for example, children can develop sensory awareness, whilst also sharing a meaningful experience with others. Hence, teachers highlighted the value and importance of multisensory learning – emphasizing the positive effects of actively involving multiple senses within learning (Arriaga, 2024; Smith, 2019).

This understanding aligns directly with the research of Ayres (1972) and Pfeiffer et al. (2011), who demonstrates that sensory integration techniques can enhance children's functional participation and learning as students feel more at ease, and less anxious due to a reduction in sensory processing challenges. Additionally, teachers' reflections have also

revealed the challenges associated with sensory integration methods. There has been a common report of limited access to training tailored around how to assess and respond to children's sensory profiles within a pedagogical framework (Miller et al., 2018). More individualised guidance needs to be provided, which does not overview sensory profiles of children but instead allows teachers to understand students' sensory needs and requirements at a more individualised lens. In fact, research reflects on how having sensory processing training, which can be guided by occupational therapists, improves teachers' confidence and ability to implement sensory techniques within the classroom setting (Çorakcı & Bumin, 2025; Ruttledge & Cathcart, 2019). Furthermore, teachers have also commonly expressed their concerns over the lack of empirical research and evidence that specifically addresses how sensory integration can be effectively embedded within schools and organisations curriculum for learning tasks (Bhattacharya et al., 2015; Unwin et al., 2023). This gap often leaves teachers in the dark, uncertain whether they are implementing strategies within learning tasks which are effective and supportive, or whether it's just simply reinforcing avoidance behaviours (Mills & Chapparo., 2018).

Becky, an autism specialist teacher in UK, shared her experiences of applying sensory processing training and sensory integration methods into the classroom setting (GriffinOT, 2024). Becky was able to acknowledge that each child in her class had specific sensory needs. She mentions how having such training opportunities has helped her to identify sensory needs of students and how certain behaviours can be a result of different sensations that the child experiences (GriffinOT, 2024., para. 4). Having such training has allowed Becky to provide students with the right and appropriate support for learning to occur (GriffinOT, 2024., para. 4). This is only one of many examples that highlights how specific training modules allow teachers like Becky to see a new approach towards sensory integration for their students and the impact that it truly has (GriffinOT, 2024., para. 4).

The power of such training not only aids the way that teachers present themselves in the classroom setting, or plan specific tasks, but also gives autistic children an opportunity to grow and develop in an environment where they are supported and feel the constant value of their specific sensory needs.

This reflection from Becky encourages the need for more integrated and interdisciplinary approaches that allow occupational therapy and curriculum designs to be a collaborative process where teachers are provided with the appropriate sources and training to implement such techniques like sensory integration within the classroom (Bazyk et al., 2015; GriffinOT, 2024). Going through this process of responding to children's sensory preferences allows for there to be a deeper level of empathy to be fostered with each student (Dunn, 1997). Implementing such strategies have allowed educators to see transformative change in their view towards autistic children's challenging behaviour through meltdowns and avoidance no longer being viewed as defiance, but instead as a form of communication of unmet sensory needs (Mills & Chapparo, 2018). This aligns with the approach of neurodiversity affirming pedagogies that see such behaviours not as problematic, but rather as a form of communication (Edelson, 2022). As a result, when teachers have greater understanding of autism, they can become more responsive and flexible in the way that they deliver learning tasks or the way in which planning is done (Bolourian et al., 2021). For many teachers, this has allowed for professional fulfilment growth seeing the long-term benefits of sensory integration witnessed through children's engagement and overall wellbeing (Raising Children Network, 2025).

With even greater institutional support, whether it be through ongoing professional development opportunities or collaborative planning with occupational therapists, the effect and necessity of sensory integration strategies can deeply align with curriculum objectives to deliver the best learning outcomes for autistic children here in New Zealand (Petersson-

Bloom et al., 2022; Understanding sensory needs, n.d.).

2.5 Challenging dominant narratives

When looking at the field of sensory integration, especially its implications for providing support to autistic children in the classroom environment, it has been a field of research that has been dominated by clinical and therapist-driven narratives (Case-Smith et al., 2015; Schaaf et al., 2014). Although these serve to be valuable and informative, this approach has often also led to a failure in reflecting the true day-to-day dynamic and the complexity and contextual realities of educational settings. These research narratives have often dominated and centered a medicalised perception and view of autism as well as sensory processing differences, framing children in a deficit-based lens that requires correcting through interventions which are administered by specialist within a controlled environment (Ayres, 2005; Case-Smith et al., 2015; Kapp et al., 2013). This approach has resulted in the revelation and development of integral and foundational assessment tools and their accuracy; however the voices of classroom educators have often been silenced, and the dynamic day-to-day learning space which children spend majority of their time in is often forgotten. This has often resulted in teachers, specifically those in specialist schools, having to interpret children's sensory profiles with very little support and guidance, resulting in an emphasis of clinical advice as opposed to practical strategies that can be interwoven into the curriculum and learning tasks (Case-Smith et al., 2015). Hence, it is necessary to challenge such narratives and reinforce a practice-based understanding of sensory integration that encapsulates the lived experiences of educators as well as the students themselves.

The critical and underlying issue of traditional narratives is its tendency to isolate sensory needs from educational goals that autistic children have, creating a binary between regulation and learning. The shift and direction continue to now change to a more prominent

focus on emerging research based on how sensory adaptations such as flexible seating or perhaps movement base activities all have a great implication and lead to improvements in focus, emotional regulation, as well as overall classroom participation (Bhattacharya et al., 2015: Case et al., 2019; Sadr et al., 2017). However, despite this emerging research, these findings often come from an area of traditional research design processes and methods that silence the voices of teachers (Mills & Chapparo, 2018). The voices of teachers and educators who observe students' progress and academic achievements in real time need to be given more significance and brought to the forefront of research to ensure that the real effect of such strategies is revealed, and to create a more relational understanding of how sensory integration folds out and effects the classroom context (Mills & Chapparo, 2018). Another limitation of this approach and prevailing nature is its focus and emphasis on outcome-driven evaluations of behaviour for the efficacy of sensory integration, often leading to the understanding that a reduction in challenging behaviour is the key to success for autistic children (Piller et al., 2025). This reinforces a lens of reinforcement for compliance-based models of interventions, where the purpose is for children to adapt and fit into the classroom setting as opposed to adapting the classroom and environment to meet the specific needs of autistic children (Piller et al., 2025).

Furthermore, the Education Hub report reveals the need for more attention towards autistic children's needs to be in an environment where they see the potential of growth and experience support for their own challenges that they face (Hood & Hume, 2024). Feedback from 2400 individuals which includes parents, educators, as well as neurodivergent students themselves reveals a systemic failure in supporting neurodivergent children in Aotearoa, New Zealand, with many schools not having the appropriate or necessary resources and training to ensure that children's needs are met, understood, and valued (Hood & Hume, 2024). As the prevalence of autism continues to grow, frameworks to support autistic children are crucial,

to ensure that there are fair opportunities for all children to progress in their learning endeavours and have the essential resources to grow and succeed (Harstad et al., 2023).

There is an urgent need to challenge the dominating narrative that exists around sensory integration, which has previously marginalised and silenced the voices of teachers and the true realities of the classroom (Mills & Chapparo, 2018). By shifting this focus of conducting research with a dominating clinical lens to a more real time and dynamic setting of a classroom, the narrative can also shift from standardisation to contextualisation, to embrace a more inclusive and relational practice-informed approach to sensory integration. Teachers are proactive individuals that interpret behaviours, build relationships, and adapt environments to co-create learning experiences that honour and value children's differences and the diverse and unique ways in which children understand the world around them (Mills & Chapparo, 2018). Their reflections provide valuable insights as to how sensory integration can move beyond being presented as an isolated intervention to one that is holistic. Future research for this reason must rise to realise the importance of amplifying these unheard voices, and to challenge outdated assumptions to push the need for co-construction and co-development of approaches that are grounded in the dynamic and everyday realities of teaching and learning.

2.6 Summary and implication for present study

The existing literature on the field of sensory integration within autism education has underscored the vital role that sensory-based interventions play in supporting children's levels of engagement, emotional regulation, as well as participation, however with very limited exploration of how sensory integration strategies translate into the real time and dynamic environment of a classroom (Camarata et al., 2020; Case-Smith et al., 2015; Randell et al., 2022; Schaaf et al., 2014). Recent trends and approaches within the field of educational

research now advocate for more neurodiversity affirming approaches which acknowledge and value autistic ways of sensing, thinking, as well as engaging and interacting with the world around them in a lens of differences, not deficits (Kapp et al., 2013). This shift emphasises and raises awareness for more personalised educational approaches which value autistic children's sensory preferences and sensory profiles, highlighting them as integral for learning access and learning growth (Howley-Rouse, 2023).

The literature review points to several critical research gaps that require addressing. The direct use and implementation of sensory integration within academic and learning tasks, as opposed to traditional and general environmental modifications, has received very minimal attention and awareness (Ayres, 1972; Randell et al., 2022). Secondly, there is also a need for research to be conducted within a naturalistic setting which considers and acknowledges the complexity and unpredictability of everyday classrooms, as it allows for research studies to be powerful for the current situation autistic children experience, ensuring that the voices of educators, teachers, children as well as their families are heard and valued (Cowan & Allen, 2007; Pindiprolu, 2012).

The present study directly addresses these limitations and identifies gaps by shifting the narrative from one that is clinically based, to the lived realities and dynamic setting which autistic children engage with through a significant portion of their everyday lives. Through the implementation of structured sensory integrated academic tasks, this research shifts the focus to be one that prioritises obtaining an understanding of how autistic children in school engage with sensory rich content. With a direct focus and inclusion of sensory cues of tactile, vestibular, auditory, and proprioceptive engagement, the study further refines its focus to offer insight with sufficient evidence to determine how sensory elements support autistic children's learning to foster a deeper sense of engagement, self-regulation as well as task participation and attention (Ayres, 1972; Vives-Vilarroig et al., 2022). Doing so, this study

contributes to creating awareness and a growing movement within autism education research that aims to validate and acknowledge the importance for deeper understanding of neurodivergent experience's and that there should not be a one-size-fits all approach. This recognises the importance of creating a more inclusive and responsive learning environment where children feel valued and comfortable with learning tasks as opposed to feeling anxious and distressed when tasks are not tailored to their sensory profiles (Ashburner et al., 2008; Thompson et al., 2009). The findings of this research will help with informing and advocating for more teacher training and professional development opportunities, and the need to ensure that there is ongoing curriculum development which aids in children's needs and sensory profiles.

Chapter 3: Methodology

3.1 Epistemology

This study took the stance of a qualitative observational case study which was grounded in a critical realist approach that allowed for in-depth and real time exploration of the ways in which sensory integration methods can be implemented into the classroom setting, and the experiences that autistic students have in response. Firstly, the choice to approach the research topic through a case study was well suited and beneficial when focusing specifically on educational practices for autistic children as it supported the need for a holistic and context-sensitive analysis. It allowed for in-depth observations of the bounded system, which in this study refers to the specific classroom setting of a junior classroom at a Specialist School over a defined period. Taking this approach enabled the research to embrace the complexity of classroom experiences as well as the interplay between teaching methods, student engagement, as well as sensory responsiveness (Conn, 2015). Therefore, the focus of this study was to produce detailed insights and reflections of how techniques of sensory integration within learning tasks can be enacted in practice, how students react and respond to them, and how they compare to more traditional teaching methods for autistic learners (Schaaf et al., 2014; Webster, 2025). This approach and design are valued and acknowledged with the goals of autism education, through the emphasis on understanding individualised and real-world learning as opposed to a focus on experimental generalizations (Guldberg, 2017).

Furthermore, this study also adopts the approach of Critical Realism, developed by Roy Bhaskar (Fleetwood, 2014; Rutzou, n.d). which exemplifies that the lived reality of each person exists independently, however the way in which human perceptions are understood is through a web of socially constructed experiences. For this reason, this study took on a critical realist epistemology approach, ensuring that there is acknowledgement of both the

objective reality of sensory integration challenges that children may experience, as well as the subjective interpretations of such experiences by teachers and educators, to best understand the complexity and contextual nature of children's experiences within the educational environment (Kourti, 2021; Lawani, 2021). In particular, critical realism is well suited within the educational research sector, especially with neurodiverse learners, as the approach has the ability to investigate real world phenomena (such as in this case, engagement, behaviour, as well as sensory processing), whilst also ensuring to value the lived experiences, interpretations, and contextual knowledge of both teachers and students (Albert et al., 2020; Kourti, 2021; Lawani, 2021). Having this epistemological lens in this study allowed the researcher to explore not only the objective impact that sensory integration methods have on students' participation, but also the subjective ways in which such strategies are experienced by students and implemented by teachers within classroom learning tasks. Having this dual focus strengthens the analytical depth of this study, by accounting for the complexity that there is in association with human behaviour, especially within the specialised learning atmosphere and setting.

In alliance with this epistemological stance of critical realism, the study also adopted a qualitative observational case study design, to enable an in-depth as well as context-sensitive exploration of the junior classrooms at the chosen Specialist School (Morgan et al., 2017; Rutzou, n.d). Using a case study methodology is often deemed an approach that is particularly valuable within the special education context, where students have needs which are often highly individualised and unique to themselves, as well as where real-world, situated knowledge is seen as more informative than a generalizable claim or opinion (Politz, 2024). The design of the study supported a holistic examination of teaching practices, student behaviour, as well as the classroom dynamic, and is especially appropriate in its ability to capture the authentic and naturalistic interactions of participants.

Furthermore, to strengthen the contextual understanding of the experiences of students with learning tasks, the study incorporated an ethnographic lens to the research, as outlined by Hammersley (2006). An ethnographic lens allowed me to gain a deeper and more insightful understanding of how specific sensory integration techniques and strategies can be practically implemented as well as experienced within the classroom setting. Taking this ethnographic approach emphasised the cruciality of not just collecting data but observing the real-life impacts of sensory integration in the classroom, whilst also ensuring to capture the voice of the teacher (Reeves et al., 2013). This approach allows for an emphasis on the understanding of cultural and social dynamics that create the classroom environment (Hammersley, 2006; Reeves et al., 2013).

Through this ethnographic approach, this research study aimed to understand and document everyday lived experiences of autistic children at school, as well as the experiences of their teacher regarding their engagement with classroom learning tasks to best understand the impact that sensory integration can have (Pole, & Morrison, 2003). In this study specifically, ethnographic orientation has been reflected in my attention towards the classroom culture, the relationship between the student and teacher, as well as the everyday routines that occur to structure and format learning methods within the classroom. Having myself present but as a non-participant was essential in ensuring there to be unobtrusive collection of behavioural data to be collected, whilst also maintaining and respecting the sensitivity to the classroom's social fabric (Hayes, 2001). This ethnographic lens allowed for there to be support in capturing the lived, relational, and sensory dimensions of learning that occur for autistic students, and within the realm of autism education.

The observational case study methodology also ensured alignment with both the theory and foundational framework of a critical realist and ethnographic lens to allow for real time and direct examination of sensory integration strategies within a classroom (Kourti, 202;

Lawani, 2021; Reeves et al., 2013). Within this observational study, Ayres (1972) sensory integration theory remains integral to the methodology, to understand the impact that sensory integration can have towards learning and behaviour as well as engagement with learning tasks for autistic children. This theoretical lens gave further insight to understand the ways in which children's learning endeavors can be supported and how sensory-based activities and strategies for learning can aid development and engagement. The proposed study takes on this multifaceted approach to bridge the gap between the more common clinical theories and examinations of sensory integration and the more day to day, lived experiences of educational practice, to province further insight that is contextually nuanced as well as empirically grounded (Randell et al., 2022; Schaaf et al., 2014).

3.2 Specific objectives

The primary objective of this study was to explore how structured sensory-based tasks, which in this case being the "letter Safari" can be embedded and incorporated into daily classroom routines and learning practices for autistic children, as well as how such strategies are adapted by educators to support learning opportunities for their diverse learning needs students. This involved examining not only the mechanics of the implementation but also diving into the contextual factors which may influence children's success, such as the classroom structure, available resources, as well as teacher familiarity with sensory practices.

The second objective of this research was to observe the experiences of not only students, but also the teacher as they both engage in the two tasks. This study aimed to gain a more pronounced understanding of the impact that incorporating sensory integrated strategies has towards observable engagement, self-regulation, as well participation when compared to more conventional and traditional learning methods and non-sensory activities. Within this, there was attention given to how these tasks support foundational literacy skills, specifically

in this case through letter recognition as well as phonemic awareness that is experienced through tactile, visual, auditory, and proprioceptive sensory systems.

Another key objective of this research was to observe whether there were any identifiable differences between children's responses and reactions across both differing conditions (sensory and non-sensory), and how such differences may reflect broader implications for inclusive teaching practices. This included observing individual variations in sensory preferences and reactions, as well as understanding how these may influence engagement as well as learning outcomes.

Finally, the last objective of this study was to contribute to the field of inclusive education, and evidence-informed pedagogy by integrating structured observational data with qualitative insights, which in this study was through teacher interviews (Lynch et al., 2009; Petersson-Bloom et al., 2022). By capturing the teachers' perspectives on factors such as feasibility, practicality, as well as possible challenges, and the observed impact of sensory-based tasks, the study sought to inform sustainable strategies which can practically and realistically be adopted in autism centered classrooms.

The aim of having such objectives was to bridge the gap that exists between theory and practice, ensuring to offer practical guidance for implementing sensory integration approaches that enhance the outcomes of learning, participation, as well as emotional wellbeing for autistic children within the educational context.

3.3 Research design and data collection

This study took upon a multi-method qualitative approach to data collection, which combined the use of structured classroom observations, contextual field notes, and semi-structured teacher interviews to gain an in-depth understanding of how sensory integration methods can be implemented within learning tasks for autistic learners.

3.3.1 Specialist School

This study was conducted at a Specialist School, in Aotearoa, New Zealand. This specific educational institution caters to neurodivergent learners, specifically autistic children who present high needs, which is commonly indicated through high ORS funding. The specialist school at which this study took place is known for its inclusive and student-centered learning environments which support children who experience complex developmental and sensory requirements through individualised learning approaches.

The specialist school was specifically chosen as the site for research due to its well-established expertise within the field of autism education, its emphasis on sensory informed pedagogy, as well as the researchers' prior work experience as a teacher aid within the institution where concepts such as sensory integration had been introduced. Such familiarity has helped to build a form of trust and understanding with the school organisation and community, allowing for a smoother transition into the research activities that have been presented in existing classroom routines. Ethical consideration was given at all stages of the research with getting the permission of the school as paramount to this process. I began discussions with the school – a copy of the letter seeking permission can be located in Appendix A. Approval was obtained through the school's leadership team prior to the commencement of the study. This ensured that the research was in line with the school's values, policies, and their duty of care towards their students and families. Additionally, all the procedures had been conducted in accordance with Massey universities ethical guidelines, reinforcing a strong commitment to transparency, informed participation, as well as the protection of all students partaking in the study.

The research specifically took place in a singular junior classroom with students which were either completely non-verbal or had limited speech and had also been referred to the researcher with challenges in learning engagement and participation. Not only this, but

the inclusion criteria for this research consisted of those with a Diagnosis of autism, enrolled at the Specialist School, aged five-seven, and those that presented challenges in focus and engagement in learning tasks which had been confirmed by the classroom speech and language therapist. The exclusion criteria were those with significant physical impairments preventing participation in sensory activities, and those with high levels of distress in unfamiliar observational situations.

This research was conducted in accordance with the school's administration, and with informed consent that was obtained by parents or guardians for all participants (Appendix E). The selection criteria for participants were determined in collaboration with classroom teachers, with children being selected based on their observed challenges and persisting deficits with engagement, attention, and participation with academic tasks – all of which are areas where sensory integration has been found to be particularly impactful (Case-smith et al., 2015; Schaaf et al., 2014).

In total, I noted observations with five children (Loraine, Quartice, Perry, Ashton and Capri) – all of which were between the ages of five and seven from a single junior classroom. All students presented with a diagnosis of Autism Spectrum Disorder, with two of the five students being female, and three males. To ensure confidentiality of all students, all children have been referred to using pseudonyms throughout the thesis.

3.3.2 Classroom tasks

A core element of this design framework was the close alignment with Ayres Sensory Integration Theory (1972) to understand the impact that sensory integration can have towards learning tasks for children with autism. This theory underpins the rationale for the need to integrate sensory stimuli into learning activities for autistic children, as in accordance with Ayres (1972), children who experience sensory processing challenges often find it difficult to organise and interpret information within their environment in a way that supports purposeful

learning. Hence this learning design was created with this theory in mind, targeting multiple sensory systems – tactile, proprioceptive, vestibular, and auditory, with an overarching goal of facilitating engagement, participation, regulation, and reducing any sensory-related barriers to participation (Ayres, 1972; Smith, 2019). Having the observational and real time nature of this design supports the collection of context-rich data whilst also maintaining ecological validity of the classroom environment. Rather than manipulating behaviour or the potential removal of students from the learning context, one in which children spend a vast majority of their years, this design seeks to understand and support learning as it happens, and within the real time setting and space to obtain insight as to how inclusive educational practices of sensory integration can be adapted further and implemented in real classroom tasks going ahead.

The study involved observing two tasks over a two-week period followed by teacher interviews. For each day of the study, and for both non-sensory and sensory tasks, the duration remained a consistent seven-minute period for tasks to be completed. The seven minute time frame had been selected as students were already performing learning rotations within the classroom with the same time frame. Hence, to ensure familiarity and to avoid disrupting the flow, it was decided with the classroom teacher to keep this time frame the same. As the study took place in a singular classroom for the entirety of the study, interviews were conducted with only one classroom teacher. Data anlaysed was consistent of ethical guidelines by ensuring that video recordings of each student observed during the session had been taken from the back and chin down. The video allowed myself as the observer to go back and make sure that my observations were accurate.

Within the first week (Monday – Friday), students engaged in a conventional, non-sensory based literacy task each day, similar to what students may be given currently (a worksheet where they are required to draw lines to match letters – see figure 2). During the

second week, the same concept and learning objective was provided to children, but in a sensory format (letter recognition as well as phonemic awareness – see figure 3). During this week, the task was instead a sensory-integrated activity classified as the "Letter Safari". Within this specific task, the same children were required to search for foam letters which are distributed across three tubs. Each tub contained different textured and sensory material including rice, playdough, and kinetic sand. Once the letters were located, students were then guided to match letters to their corresponding wall display of animals and objects which begin with the same letter (see Figure 2 and 3). Students who were not partaking in the study (n =2) were not excluded from the same experiences as their fellow classmates. To ensure equity and fairness, they were provided with the same non-sensory and sensory tasks for both weeks, delivered by a teacher aide. This was conducted in a separate space within the classroom unit. No data had been collected from the encounters of these students.

Figure 2: *Non-sensory task presented in Week One of study*

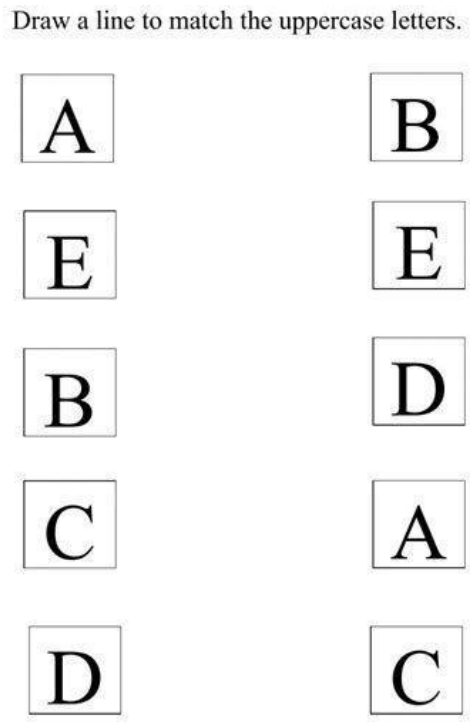
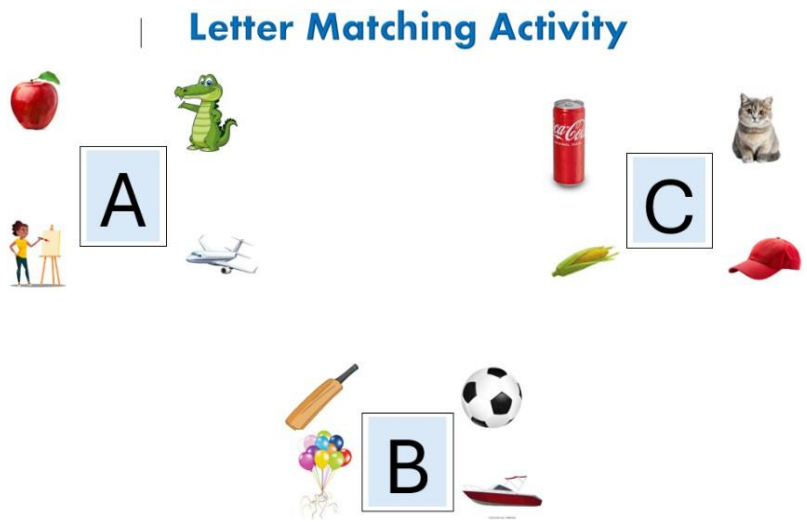


Figure 3: *Sensory task (Letter safari) presented in Week Two of study*



Although both tasks have a difference of sensory versus non-sensory, the objective and content remained the same, allowing teachers to effectively observe and compare students' engagement, attention, and performance across both learning conditions. The only difference that exists is that the Letter safari task consists of multisensory and embodied interaction as opposed to static and visual-only matching. The teacher remained the facilitator and conductor of both tasks to ensure that consistency remained, and to also reduce any variability in instructional delivery that children may be accustomed to.

A prominent component of this design framework was ensuring that the research was conducted and grounded in naturalistic observations. To reflect this within the study, the researcher adopted the role of a non-participant observer, where they attended classroom sessions and recorded the structured observations which were based on the predefined criteria as shown below in Table 1 and Table 2. Recordings were in accordance with confidentiality

measures and with approval from students' parents as well as the teacher (see Appendix B and D). This method was chosen with consideration of the communication styles as well as the learning profiles of all the participating students, all of whom are between the ages of five and seven, and all have limited verbal communication.

Table 1: *Observation Schedule for Week 1 Non-Sensory Task*

Day	**Observations**
Monday	Observe students' initial reactions to non-sensory task introduction. Observe engagement levels, attention shifts, persistence, and interactions with the teacher. Take notes on initial impressions of student responses.
Tuesday	Observe student behaviour during task execution, focusing on: Facial expressions (smiling, frowning, neutral). Communication (verbal, non-verbal, gestural). Eye movement (tracking, looking away, fixations). Body movement (fidgeting, postural adjustments). Engagement with tasks (attempts to complete, distractions).
Wednesday	Continue behavioural observations as previous day, noting any patterns in behaviour. Assess whether students show signs of distress or frustration. Document teacher interactions: prompts, encouragement, and redirection techniques.
Thursday	Observe variations in participation compared to earlier in the week. Identify any emerging themes in student responses.
Friday	Final observations for non-sensory task. Conduct teacher reflections for all children on overall experience and effectiveness of the task.

Table 2: *Observation Schedule for Week 2 Sensory Task*

Day	**Observations**
Monday	Observe students' initial reactions to sensory task introduction. Observe engagement levels, attention shifts, persistence, and interactions with the teacher. Take notes on initial impressions of student responses. Compare immediate engagement levels to non-sensory task.
Tuesday	Observe student participation and responses, focusing on: Facial expressions (smiling, neutral, frowning). Communication (verbal expressions, non-verbal cues, gestures). Eye movement (tracking, shifting, fixating on task components). Body movement (intentional interactions with sensory materials, stimming). Engagement with task (sustained focus, attempts at task completion).
Wednesday	Continue observations, noting sustained or increased engagement. Document student interactions with sensory elements (e.g., tactile, visual, auditory stimuli).
Thursday	Assess any changes in participation compared to earlier in the week. Continue observations of interaction with sensory elements as well as behavioural observation. Compare emerging themes with non-sensory task observations.
Friday	Final observations and reflections. Conduct teacher debriefing/ interview for all children on overall effectiveness of sensory-based learning.

The primary method of data collection implemented in this study was that of structured observations. This was conducted by the researcher over the course of two weeks

allowing the natural flow of routine classroom activities and to minimise any disruptions because of unfamiliar people. Having the researcher positioned as a non-participant observer enabled observations of students with authentic reactions and behavioural responses in real time, making this approach one that is best suitable for studying the process of engagement, task interaction, as well as sensory responses for young autistic learners (Berger, 2015). The section below on reflexivity outlines how I managed this.

The two-week observation was structured thoughtfully, to allow for direct comparison of both learning tasks. The method for data collection for these specific observations was guided by a structured observation template. This template focused on key aspects of student engagement (e.g. the time they may spend on the task), attention regulation (the amount of attention shifts that they may have), persistence with task demands, as well as the overall task performance/participation (e.g., completion, as well as the ability to follow the teachers prompts). In addition to this, specific sensory engagement behaviours had also been noted, which target the tactile, vestibular, proprioceptive, auditory, as well as visual sensory domains which are consistent with Ayres (1972) theory of sensory integration. For example, this meant that the researcher would note the student's willingness to explore and engage with the sensory material, their postural control, visual tracking, and their responsiveness to any auditory cues from the teacher.

To complement this, another process of the data collection method was that of contextual field notes which were taken during each of the observation sessions conducted. These field notes included observations of the classroom environment, teacher-student interactions, peer dynamics, as well as any potential environmental factors such as noise and distractions that may influence the research and task presentation. Any unexpected occurrences that had the potential to distract the child or to influence the authentic reaction of student's response were also noted. Having such qualitative notes ensures that there is added

depth and flexibility to the structured data, whilst also ensuring that any factors that could impact the results of this study are recorded for analysis allowing for rich interpretations of each student's response in relation to their environment. Field notes were of particular importance in capturing subtle behaviours of children, emotional cues, and strategies that teachers adopt that are not always so easy to capture by just the use of checklists or perhaps behavioural codes. To ensure that there was no confusion and that these field notes were individualised, each child had their own field notes file with only their notes placed inside and were then reviewed in conjunction with the structured observation data to identify any possible patterns or divergences.

3.3.3 Teacher interviews

The design framework also supported the need for teacher involvement within both the delivery of the learning tasks as well as the post intervention reflection process. The classroom teachers' perspectives were gathered through semi-structured interviews once the observational phase had been completed. A copy of the interview questions can be found in Appendix C. Having these interviews with the classroom teacher ensured that the researcher is provided with insights into the feasibility as well as the perceived value of the sensory-integrated task, and whether there are observable differences between both tasks. This added an important collaborative lens to the research and the design framework, making the research grounded in both practitioner knowledge as well as lived experiences. Having the incorporation and involvement of educators themselves as opposed to the researcher conducting the research allowed the findings to be rooted within the realities of the classroom and aligned with inclusive teaching practices (Mertler, 2009; Nunan, 1990).

The main aim of these interviews was to explore the views of the teacher in relation to feasibility, effectiveness, and the overall impact perceived of the intervention when presented with sensory integrated input, versus without. The use and implementation of a semi-

structured format allowed the teachers to elaborate and expand on their thoughts and opinions, whilst also ensuring that there remained consistency across key thematic areas. All interviews had been audio-recorded with consent from the teachers obtained first and then transcribed for later analysis.

3.4 Reflexivity and quality

Having a triangulated approach towards the methods of data collection (observations, field notes, and teacher interviews), was designed specifically to strengthen the research's credibility, dependability, as well as depth and insight (Bans-Atukey & Tiimub, 2021). Although structured observations in this study provide strong evidence for behavioural outcomes, having field notes and teacher interviews added to the contextual understanding and provided professional reflections and interpretation. Together these methods have formed the foundation of this study and have allowed me to construct a multi-faceted approach guided by both direct observation as well as professional and practitioner knowledge and insight. The approach of methodological triangulation also further enhances the credibility as well as trustworthiness of qualitative research through drawing on multiple data sources to support well-substantiated interpretations (Arias Valencia, 2022).

As the primary researcher of this proposed study, I believe it is crucial to acknowledge my positionality. I approached this study with a strong commitment towards sensory based learning, having had the opportunity to work within a classroom setting with autistic children. My experience with the specialist school has shaped my perspective and understanding, as well as through existing research that has been conducted on the educational environment for autistic students and the impact that this has on learning outcomes (Case-Smith et al., 2015; Schaaf et al., 2014). I used journaling throughout the project to constantly reflect on any possible biases I may unknowingly attribute, and to

ensure that I am not overpowering the research through my expertise but allowing the voices of teachers and other involved members to be heard and acknowledged as the centre of my research. Doing so ensured that I consistently reflected upon what I was doing, learning, and critically think about the assumptions of power dynamics and positionality (Berger, 2015).

This reflexive positioning was actively maintained throughout the course of the study. I also chose to take upon the role of a non-participant observer to ensure I had minimal interference with the learning environment and practices that children will already be accustomed to. Research indicates that building trust with someone new is more challenging for autistic children, as they are not always able to cope with changes or unfamiliarity, which may pose a risk in my study (Mullally et al., 2024). I sought to ensure that the natural flow of the classroom remained, and that the teacher themselves carried out the proposed sensory interaction strategy to ensure that the classroom dynamic is not compromised and that students can reflect as much comfort as possible when performing the task. As an external researcher, I remained mindful and aware of how my presence can influence the way students engage, to ensure that the data that I collect maintains its authenticity (Berger, 2015).

3.5 Ethical Considerations

Given the sensitive nature of working amongst neurodivergent children, specifically in this case those with an autism diagnosis, it was crucial to ensure that there was careful attention towards ethical considerations throughout the design of the study and when implementing the methodology (McNeilly et al., 2020). Ethical approval was sought and obtained under the supervision and guidance of Dr. Kathryn McGuigan, as well as in accordance with Massey University research ethics guidelines and requirements. The project was reviewed and approved by the Massey University Human Ethics Ohu Matatika 3, Application OM3 25/25.

For this research, one of the key central ethical priorities was to ensure that informed consent was obtained from all participants, whether it be from the children's families (see Appendix E), or the teacher (see Appendix F) participating (Loyd, 2013; Van Goidsenhoven & De Schauwer, 2022). As a large portion of the participants were nonverbal and all students were under the age of 16 years, there was an ethical obligation for parents to discuss the process of the research and what is required with their children first before providing informed consent to ensure that children still have a say in the participation process. Parents and caregivers for this reason were provided with the resource of a comprehensive and detailed information sheet which outlines the purpose of the study (see Appendix B), the procedure, potential risks of participating, as well as the right to withdraw at any stage of the research phase through the voluntary nature of participation. Within this sheet, it was also made clear that they have the full right to ask any questions, to seek clarification, as well as the ability to withdraw at any stage from the study without facing any penalty or consequence. Only once this information sheet was reviewed by parents/caregivers, and informed consent forms had been signed, the study commenced. The classroom teacher was similarly given their own information sheet too, which was also required to be signed (see Appendix D). Alongside this, due to the participants young age, assent was also monitored behaviourally during the observations, where both teachers as well as the researcher ensured to remain vigilant and aware of any potential signs of distress, withdrawal, discomfort, or the experience of finding the tasks to overwhelming, all of which may indicate the potential want to discontinue from partaking in the study.

Furthermore, confidentiality as well as data protection were prominent considerations to the study (Hiriscau et al., 2014; McNeilly et al., 2020). This meant that all participants were given a pseudonym to ensure confidentiality would not be breached by sharing individuals' real names and personal details (Thackray, 2018). This remained consistent even

when recording data for the observation templates as well as when conducting interviews with the classroom teacher. Once the data had been collected, it was stored securely on a password protected device, where access was only granted for the researcher as well as supervisor of the study, which remains in compliance with the guidelines and protocols of institutional data management. There had also been special consideration for the possibility of their being sensory overload or emotional distress and anxiety that may occur during the presented tasks, in alliance with ethical research practices which involve vulnerable populations (Van Goidsenhoven & De Schauwer, 2022). If any cues or displayed signs of sensory discomfort or expression of anxiety, avoidance, agitation or distress, the tasks would immediately be paused. Once paused, the researcher would then make the call as to whether the task should be adapted in a different way or discontinued for that participant, with the professional judgement of the teacher. Although this was not required at any stage of the research, it was crucial to put in place these clear management protocols to uphold the ethical integrity of the study.

Additional to this, ethical reflection was also necessary to uphold cultural safety and inclusion (Murray et al., 2019). Te Tiriti O Waitangi (Treaty of Waitangi) reveals the core and foundational principles towards ethical research practice of Partnership, Participation, and Protection (Hudson et al., 2009). Although this research did not specifically target Māori participants, there was still a possibility that Māori students would be involved within the research practice, hence crucial to acknowledge. Cultural responsiveness had also been integrated within the planning of the research and the implementation of the study to ensure that any possible cultural specificities or preferences are valued during the process (Lee et al., 2025). This included being mindful of communication preferences, any possible family engagement processes, as well as broader historical context of research involving Māori communities (Cram et al., 2015).

3.6 Data analysis: Thematic analysis

For this research study, data had been collected through structured observations, contextual field notes, and semi-structured interviews with the classroom teachers. All methods of data collection were analysed using the framework of thematic analysis, as guided by the work of Braun and Clarke (2021). This qualitative method allows for contextual interpretation and discovery of patterns of meaning within research, commonly referred to as themes within a dataset, allowing an exploration of not only explicit content, but also underlying concepts emerging from participants experiences, behaviours, as well as contextual dynamics (Braun & Clarke, 2021). As outlined by Braun and Clarke (2021), thematic analysis consists of six crucial steps, all of which are integral for its success. This includes familiarising the data collected, generating initial codes, searching for possible themes, reviewing themes, defining and presenting names for themes, and finally producing a final report of all the themes and data collected.

This approach of thematic analysis was specifically chosen due to its suitability within qualitative research, and its ability to identify meaningful patterns within data sets while remaining grounded within the experiences of participants and the real-world context of the classroom in which the data had been collected (Christou, 2022). All observation templates, field notes, and interview transcripts of teachers were transcribed and reviewed multiple times to ensure full immersion in the data. Doing so was crucial in identifying both recurring and subtle features that may be present, specifically regarding engagement patterns, sensory responses, as well as any shifts in behaviour across both the learning tasks.

The initial codes had been generated inductively, ensuring that it was not done in a way where it was forced into pre-existing theoretical categories, allowing for openness to any unexpected insights. The coding was predominantly focused on behavioural indicators consisting of sustained attention, task persistence, sensory interaction (tactile, proprioceptive,

auditory and vestibular), emotional regulation as well as any cues of potential distress. There were additional codes which captured teachers' observations as well as professional feedback highlighting the factors of task feasibility, student responsiveness, as well as classroom management considerations. These codes had been specifically clustered into broader preliminary themes which had been titled as "sensory engagement as a pathway to participation", "increased focus and attention through tactile input", as well as "teacher adaptability in sensory strategy delivery". Furthermore, I used both inductive and deductive approaches. Although some codes had been developed based on established sensory and educational theory (e.g., "tactile seeking," "self-regulation through proprioception"), the majority had emerged more organically through patterns observed during the research such as delayed engagement, or teacher-led sensory scaffolding (Ayres, 1972). Hence, the goal was not to just report descriptive data, but to also surface meaningful and impactful insights on how autistic students within this study have responded to classroom tasks when their sensory needs were being valued, and supported, as well as when unmet and ignored.

Taking this approach also was consistent with Ayres (1972) sensory integration theory. This theory was adopted as the theoretical lens to support the interpretation of such themes, especially when identifying how the different sensory systems (tactile, vestibular, proprioceptive, and auditory), had seemingly influenced the participants behaviours and regulation. For example, themes had emerged around the ability for students to self-regulate or persist with a task presented to them when they had engaged with familiar or potentially stimulating sensory material, which is consistent with Ayres (1972) understanding and knowledge of viewing sensory input as a tool that can help children organise their behaviour and improve task performance for those experiencing sensory processing difficulties. While this analysis remained open to any possible emerging themes, integrating Ayres (1972) theory enabled there to be a useful guide for interpreting specific patterns of behaviour which

are linked to sensory integrated learning experiences and outcomes. Furthermore, taking the approach of a comparative structure towards the research study meant that there was the opportunity to contrast students' responses across both conditions of sensory versus non sensory tasks, allowing for a clearer identification of the shifts that had occurred in attention, motivation, as well as task completion.

Lastly, the integration of teacher interviews into the analysis provided a critical interpretive dimension within the data analysis and collection process, by grounding the observed behaviours in more professional insight and guidance. The incorporation of the teacher reflections allowed for validation of observational findings obtained by the researcher, whilst also offering explanations for behaviours that may otherwise be misinterpreted or possibly decontextualised. For example, having the teacher's insight and valued knowledge about a child who may have an aversion to rice provided substantial knowledge of interpreting the possible hesitation that may have occurred during the sensory learning task. Therefore, having multiple data sources, all of which are triangulated though the approach of thematic analysis, allowed for a more nuanced and contextual understanding of the effects and impacts of sensory integration on student engagement (Christou, 2022). The process also ensured that the findings obtained were not just rooted in observable classroom phenomena but also rooted in findings that were theoretically informed and practically applicable.

Overall, this analytical approach enabled me to construct a coherent narrative around the role that sensory strategies play within the context of autism education, aiming to bridge behavioural data within educational insight and form inclusive and evidence-based classroom practices that can be adopted on a larger scale within educational institutions.

Chapter 4: Findings

4.1 Introduction

Within this chapter, a presentation of the key findings from the two-week observational study will be discussed regarding the ways in which sensory integration techniques within learning tasks can influence engagement, participation, and emotional regulation for autistic learners. The research question that guides this research is: *How does the integration of sensory strategies into classroom learning tasks impact engagement, participation, and emotional regulation amongst autistic students in a special school setting.*

To provide clarity, precision, and coherence, the findings are all presented thematically. The chapter begins by discussing students' initial reactions to both tasks, before moving ahead into the more detailed analysis of the engagement patterns that were evident and observed across the course of the study. This will also be followed by a focus on emotional and behavioural regulation, reflecting on any potential signs of distress or dysregulation, as well as signs of calmness as observed during task participation. The core components of tactile, auditory, vestibular, and proprioceptive will also be discussed, highlighting which was the most effective or challenging amongst learners. Having a section on how participation was observed over time also tracks any behavioural shifts and learning trajectories, whilst the semi-structured interviews with teachers will be discussed to offer professional insight into the feasibility and practicality of sensory implementation and the intervention at a larger educational scale. I conclude with a summary of the key themes of this study.

4.2 Initial student reaction and task orientation

The first point centred around the initial reactions observed on the onset of each of the tasks. A prominent focus on initial reactions was focused on the first day of the non-sensory

task of week one as well as the first day of the sensory task in week two. This section will explore and provide an analysis on student's early engagement between both tasks, focusing on their attention, body language, affective expressions, alongside willingness to engage with and interact with the task material provided. Analysing these early responses offer crucial insight into how autistic learners can orient to new classroom tasks, and how specific sensory designed learning tasks can either act to support or hinder this orientation phase. The distinction between both presented tasks reveals the clear differences in participants comfort, curiosity, and motivation to engage, all of which served as essential early indicators of the intervention's potential impact.

4.2.1 Non-Sensory task: Hesitation and low motivation

During the first day of week 1, all students/participants were introduced to a literacy-based task which excluded any sensory element but instead consisted of a more traditional and conventional learning format. The child sat behind a desk and completed a standard literacy worksheet through verbal instructions and guidance from their teachers conducting the task.

My observations noted that for all participants, initial reactions were noted as signs of hesitation. This was also reflected through children's passive body language such as having slumped shoulders, limited eye contact during the task, and slow hand movements. During multiple instances, it was observed that students presented a delayed task initiation, with students unsure of what was expected of them and how to effectively complete the task. Students' hesitation and disengagement was also associated with denial to complete the task initially for two participants, who refused to hold the pencil or to partake with the task offered. For example, Loraine sat at their desk with their pencil idle for over three minutes, with repeated glances towards the teacher rather than the worksheet itself.

Quartice was observed constantly fidgeting in their seat, looking around the room with

no genuine effort or attempt to engage with the task material in front of them. Furthermore, my observations noted that facial expressions further reflected a sense of emotional neutrality or confusion amongst the participants. This was reflected with most students exhibiting a flat affect, with very little indication of interest or enthusiasm with the task presented. Only one of the five students had shown a brief smile, however it was not clear whether this was towards another classmate or the task itself. From a communication perspective and standpoint, the interactions that occurred were largely teacher-initiated, with students offering minimal responses or gestures. These findings suggest that the non-sensory design did not sufficiently provide and activate the students' interests, needs, or offer any opportunities to scaffold understanding and learning.

These initial responses all align with Ayres (1972) theory in indicating that such responses highlight a lack of alignment with the sensory processing profile of autistic learning. This makes it challenging for autistic students to regulate their attention and respond adaptively. Furthermore, in alignment with Dunn's (1997) model, these findings also suggest that students who persist low neurological thresholds can result in feeling overwhelmed or disengaged by tasks which have a heavy reliance on verbal instructions.

When the teacher had been questioned informally through semi-structured interviews about their impressions for the first day of the non-sensory task, there were many comments about the "slowness" and "hesitation" of student's response, with them noting how it resulted in a repetition of the same prompts many times within the seven-minute timeframe. The teacher states: *"It's like the activity just didn't register — they were present physically but not mentally involved."*

4.2.2 Sensory-Integrated task: Curiosity and immediate interaction

By contrast, during the second phase of the research which was conducted on the Monday of the second week, all students/participants had a different set of initial reactions.

This specific task featured tactile letters which had been embedded in soft alphabetic material, coloured visual cues, as well as sensory stimuli like kinetic sand, playdough, and rice. As a result, what was observed was a documentation of varying initial responses as opposed to the previous tasks, reflective of immediate curiosity as well as orientation towards the sensory integrated task.

My observations noted that multiple students had voluntarily, without continuous prompts, reached out to touch the tactile components before any formal instructions had been provided. This was coupled with smiling, and eye tracking, both of which were much more prevalent as compared to the previous condition. One student specifically (Loraine), who had shown no interest in the previous task, was now showing much more interest by running their fingers over the textured letters and had in fact also whispered the sounds to themselves, showing clear signs of spontaneous engagement. Loraine was a student who would previously throw away the marker pen when handed to complete the worksheet in the first week. She would sit for the duration of seven minutes throwing things in all directions, but when presented with the sensory task, for the first time she was interested in engaging and getting involved with the task. Although Loraine did not start the first day by completing the task correctly, she was able to get her hands into all the sensory elements without hesitation. She used the teacher's hand to guide herself to each of the objects on the display sheet associated with a specific letter, asking the teacher to name it and make the right sounds which she would then copy. In another instance, Perry was seen flapping their hands, a sign of joy and excitement for many autistic individuals, when handed a squishy alphabet object, which once again displayed the effectivity of the current task as opposed to the previous (APA, 2022).

In contrast to the passive posture that had been seen during the non-sensory task, students' body language was also different within the second week, with more alertness and

interest being reflected. This was seen through observing students' upright posture, increased motor coordination, as well as their physical movement that occurred towards the task material. Not only this, but there was also a notable increase in mimicking actions as students showed their materials to others during the rotation. This may suggest that this sensory task may have not only had the impact of engaging individuals' attention, but also indirectly facilitating a sense of social awareness through shared sensory interactions. Loraine is someone who even the teacher was not aware could verbalise and communicate as much as she was able to during the task. She was observed saying words like "meow" and "crunch" when she saw a cat and apple, something that took the teacher by surprise.

When looking at this from a theoretical standpoint, these reactions reinforce Ayres (1972) claim that when sensory input and stimuli is implemented, it helps autistic children in organising their behaviours, and form more purposeful responses. Having observed immediate orientation towards the sensory stimuli reflects the participants sensory-seeking behaviours, especially in students who present high sensory thresholds who require more stimulation to become engaged and interact effectively with tasks (Dunn, 1997). Furthermore, the varied entry points of the tasks (touch, movement colour), may have also accommodated a larger range of sensory preferences, enabling students to have the support and ability in finding their own point of interest within a specific activity. In a similar manner to the previous task, a teacher reflection had also taken place, all of which had validated this shift. The teacher noted: *"It was the first time I saw Quartice smile when introduced to a literacy activity."* The teacher also shared *"The students didn't wait to be told what to do — they just started exploring."*

These contrasting responses reflect how having a sensory design to learning tasks can behave as a facilitator to engagement and interaction. Through focused observation of both tasks, initial responses, and reactions, it revealed a lack in tactile or visual variation within the

non-sensory task as it was a task that did very little to draw the attention of students or to reduce any form of ambiguity. In contrast, the sensory integrated task appeared to instead function as a regulatory anchor and presented a task that offered a consistent and meaningful cue which scaffolded students understanding of the task and encouraged spontaneous participation to occur. The findings also suggest that sensory orientation cues helped to reduce the anxiety and cognitive load, making the task environment one which was more predictable, stimulating, as well as inviting for participants. Even those students who had reflected signs of hesitation and low motivation within the first week, responded with much more eagerness and involvement when introduced with sensory-rich materials within the second week. These initial reactions and responses set the tone for subsequent engagement patterns, all of which are explored within the following sections.

4.3 Student engagement across the week

In the following findings section, a further in-depth exploration and analysis will be revealed on how student engagement unfolded across the two weeks of the research study. Within this study, engagement has been defined as a multidimensional process which involves behavioural, cognitive, and effective components (Fredricks et al., 2004). When conducting this research, it was operationalised through observed indicators such as task initiation, attention span, physical orientations, verbal and non-verbal interactions, emotional expression and overall persistence. The resulting themes which had been applied were "Passive Compliance and Prompt Dependency," "Multisensory Anchoring and Emotional Investment," and "Emerging Autonomy and Sustained Engagement", all of which had been supported by observational vignettes as well as in-depth field notes. The analytic process also involved a constant comparison between days and for each of the students, foregrounding both the depth as well as variation of engagement in context.

4.3.1 Passive compliance and prompt dependency (Week 1)

During this period of the non-sensory task, students' engagement was generally low and externally driven. It was reflected that most of the learners within the study had exhibited minimal self-initiated activity and were requiring continual verbal or physical prompting and guidance throughout the task to engage with the material and to successfully attempt the task from the teacher. For example, throughout the entirety of the week for the non-sensory task, Loraine refused to partake in the task and persistently threw away the pen as well as the worksheet, showing her disagreement to participate. Not only this, but she even verbalised this disagreement by consistently saying "No" to the teacher when she had attempted to have her try once more. Furthermore, eye contact with the task was also observed to be often fleeting, and instead it was more apparent and frequent for the persistence of off-task behaviour such as looking away, fidgeting, as well as vocalising unrelated content to the teacher conducting the task.

Additionally, on the second day of the non-sensory task (Tuesday), a student named Quartice was presented with the letter-matching worksheet by their teacher. However, upon being provided the task, they refrained from engaging and instead placed their pencil on the desk, staring ahead for almost five minutes of the task time. Despite the occurrence of three verbal prompts from the teacher as well as one physical gesture to guide their hand in completing the task, they attempted to partake in the task for no longer than 90 seconds before their attention had shifted elsewhere. This was not a one off, but in fact a consistent recurrence for Quartice in the first week of the study.

In a similar manner, Perry had also shown signs of disengagement with the task, through a repetition of placing their head on the desk in front of them during the sessions of the task. During the third day of the study (Wednesday), they showed signs of distress and the need to leave the room within the first four minutes of the task. Perry was given the space

they needed to regulate, and they were not required to attend to the task for the rest of the week, especially when they had explicitly reflected their disinterest.

Even amongst the students who did partake and engage with the study, such as Ashton and Capri, task completion still appeared to be effortful and externally motivated. On the second day during the first week, Ashton completed the tracing task, but only after being offered his lunchbox as a reward. When the same task had been presented on Thursday without such incentive in place, they were only able to complete half the task in the same time frame. Hence, it was common to note and observe surface-level engagement in the first week.

During the semi-structured interviews which had occurred with the teacher on the last day of the first week (Friday), it was revealed by the teacher that student's demeanour was rather "checked out" as they noted: *"They weren't disruptive, just vacant—present but not really participating."* The lack of sensory input and stimuli within the task seemed to in turn increase the cognitive as well as emotional demands of the students. Without the presence of any tactile or movement-based supports, students found it challenging to regulate themselves as well as with orientation.

4.3.2 Multisensory anchoring and emotional investment (Week 2)

By contrast, during the second week, the task had been created to involve tactile, auditory, proprioceptive, and vestibular stimuli. From the outset, student engagement was both more immediate as well as more emotionally expressive. On the first day of the second week, Loraine, who was previously passive, had approached the materials provided with very few prompts from the teacher. The observation brought clarity by confirming that the child had reflected immediate interest in the sensory bins, attempting to find the missing letter and dig her hands into each of the tubs. They repeated this interest and focused coordination with the task for all three sensory bins, smiling occasionally as well as glancing towards the

teacher with what appeared to be a sense of pride. She not only engaged herself with the task for the entire duration but was also pointing to each of the objects on the display sheet and making the associated sounds. For example, she would point to cat and say “meow”, or to the apple and say, “munch munch”. This was in stark contrast to the non-verbal and disconnected behaviour which had been observed over the course of the previous week.

Additionally, Perry, who also previously disengaged with the non-sensory task reflected through an attempt to leave the classroom, now remained seated for the full task in week 2 when sensory elements had been implemented. There was a change in expression and experience, as now the same student was flapping his hands in excitement and getting into the task straight away without prompting, whilst also using spontaneous gestures such as pointing and nodding indicating deeper understanding and meaningful engagement. Midway through the research period of the second week (Wednesday), the child was observed not only matching the letters correctly, but also repeated the task a second time, putting away and hiding each of the letters in their tubs by himself before starting once again. This showed an increase in attention as well as meaningful interaction, something which remained absent during the non-sensory task. When analysing field notes and teacher feedback from semi-structured interviews, it was revealed that Perry was described as *“smiling and bouncing in their seat while flipping over squishy letter tiles and saying the sounds aloud.”* Their teacher shared: *“They didn’t wait to be told what to do—they were already engaged by the time I reached them.”*

This theme of multisensory anchoring is evident within this task, and successfully captures how tactile, as well as proprioceptive input had served as a regulatory mechanism. Students who had previously struggled with attention span or physical restlessness had now become more focused when their bodies were permitted to move and interact with sensory material in a meaningful way. According to Ayres (1972), implementing such sensory-motor

activity allows children to organise input to the brain, ultimately improving persistence and positivity. Most importantly, affective engagement had also increased nearly with all students in the study, through evidence of students smiling, laughing, and expressing excited vocalisations. Even when students had found it challenging to complete a certain part of the task, they still appeared emotionally invested throughout it. For example, when Loraine had accidentally mixed some of the sensory material, they said “oops” and giggled before retrieving it and continuing with the task. Therefore, the absence of frustration, distress, and avoidance which was highly common in week 1, was notable.

4.3.3 Emerging autonomy and sustained engagement

Another prominent and defining pattern that had emerged during the second week of the research study was the gradual shift from teacher directed to student-initiated performance and engagement. This theme was described as “emerging autonomy”, one that was grounded in codes such as “independent material handling”, “task anticipation” as well as “self-correction”. Through observation it was revealed that mid-way through the second week of the study (Wednesday of the Sensory task), many of the participants had now begun to individually initiate task routines before they had even been instructed to do so by the teacher. This was particularly evident for Capri, who on Thursday was observed walking over to the sensory station, and had begun to identify and locate the missing alphabet letters in the sensory bins. She assembled them into the display sheet with little to no support or guidance from the teacher.

In a similar manner, Perry was someone who was rather hesitant on engaging with the activity during the first week, however, was observed to show an increasing amount of ownership with the sensory task. Perry was observed approaching the task location earlier than required, verbally mentioning to the teacher “my turn”. They were able to place the alphabet letters in the correct displays accurately as they placed all the letters on each of the

displays saying either yes or no if it was the right one. This moment is one that not only demonstrated cognitive flexibility, but also the playful and exploratory orientation that had not been observed earlier.

Such shifts illustrate the changing relationship between both the learner and the learning environment with the sensory task. Therefore, autonomy within this specific context was not just defined solely by task completion but instead by the increase in willingness students had reflected to take initiative, persist through any challenges, and interact in a creative manner with the materials provided. In fact, the teacher noted a sense of "flow" in students' participation – a term that had been used to describe the smooth continuity of engagement: *"Once they got into it, I didn't need to do much. They were in the task."*

4.3.4 Teacher reflections on engagement: From control to co-participation

During the first week of the study (non-sensory task), a common thread of thought was the teacher expressing their frustration with the level of prompting that had been required to maintain students' attention. The teacher said "*I felt like I was running a marathon. Every few minutes I had to remind, encourage, direct. They weren't misbehaving—they just didn't care."* It was for this reason that they described the task as "flat" or "dull," with minimal opportunities for spontaneity or connection to occur. However, during the second week of the research study (Sensory task), the teacher described the activity and interaction as one that felt *"alive",* "*self-regulating*" as well as "*enjoyable"* for everyone including the teacher and the participants. They shared that they were able to step back from providing constant instructions and instead were able to observe, support, and celebrate this learning process, sharing that "*There was a spark—students were involved, not just compliant. That makes a big difference for them and for us."*

The teacher reflects the shift from the instructor role or as task enforcers, to now being facilitators and co-discovers of the study. This relational shift was significant,

especially in the context of inclusive education, where the teacher's role is commonly viewed as integral in having scaffolding autonomy occur (Radford et al., 2015).

The findings of this research study confirms the pedagogical value of sensory integration for inclusive teaching (Inclusive teach, 2024). Although the traditional and conventional task presented in the first week had presumed that students would attend through verbal instruction and static materials, the activity and task presented in the second week was designed to assume the variability in sensory preferences as well as engagement styles. Taking on this multisensory approach to the study allowed for differentiated access, where students could enter the task through what had appealed and engaged them the most, whether it was touch, movement, sound, or any visual stimuli or sequencing. This approach is one that aligns with principles of Universal Design for Learning (UDL), particularly the call to provide "multiple means of engagement" as well as "multiple means of action and expression" (Moffat, 2022; Sharma, 2024). Students who would typically find it challenging to focus and process learning in static and decontextualised learning settings had shown significant increases in task focus, persistence, and affective engagement when that task was created and delivered in a sensorially enriched manner.

It is also worth noting that this specific approach is one that had also benefited students with different and varied sensory profiles. For example, Ashton, someone that is sensitive to sound as well as touch, was observed selecting only the element of rice as it was not sticky or 'dirty' for them. Ashton declined the attempt of taking out the squishy letter tiles with their bare hands in the other tubs. Despite this, they remained focused and successfully completed the task using sensory tools like the given scoop, which ensured that they did not touch the playdough and kinetic sand but were still able to complete the task using the visual and proprioceptive components. This once again highlights that sensory integration is not just about using all senses equally, all at the same time, but rather is about providing students with

varied pathways that accommodate and respect their sensory needs and their neurodiverse requirements.

Another critical and integral finding within the research was that the level of engagement did not diminish as the novelty of the sensory materials provided wore off. Instead, it was observed that students demonstrated an increase in fluency and confidence as the week progressed and they became more aware and certain of what the task would involve. The teacher had also additionally noted that the routines were seen to become smoother, transitions much quicker, and task initiation as much more independent. By the last day of the research and sensory task (Friday of the sensory task), most of the students were seen having internalised the task structure and were needing only minimal cues to successfully complete the task, with some beginning to expand on the task independently.

When looking at Ashton and Loraine, they had started to think of their own words that begin with the different alphabet letters without any prompts or guidance. For example, Loraine had a car that she brought to the desk. When she had correctly matched the letters, she placed the car on C saying “car”. Ashton similarly bounced the letter B to match it on the display sheet saying, “B for bounce”. Such spontaneous generalisations were not observed in week 1.

This sustained and adaptive engagement suggests that the benefits of sensory integrated tasks were not seemingly just linked to novelty. Rather, the sensory supports provided consistent scaffolding which helped students to regulate their bodies, sustain their attention, and express their agency. As theorised by Ayres (1972) and supported in more recent research by Schaaf et al. (2014), when sensory input is well matched to a learner’s need and sensory profiles, it enables higher level-functioning, performance, attention, and participation, ultimately leading to more meaningful learning.

4.4 Emotional and behavioural regulation

Furthermore, the research also focused on emotional and behavioural regulation amongst the autistic learners across two distinct classroom learning conditions presented over the course of two weeks. Within the specific context of the study, emotional behavioural regulation refers to the student's ability to manage arousal, express or modulate emotion, and maintain behavioural stability in relation to task demands (Mazefsky et al., 2013). During this period of observation, the analysis focused on facial expressions, vocalisations, physical self-regulation, and the role of teacher strategies. Three major themes were constructed: "strained containment and internal withdrawal"; sensory anchoring as "emotional grounding" and "relational co-regulation and emotional reciprocity."

4.4.1 Strained containment and internal withdrawal (Week 1)

The theme of strained containment and internal withdrawal specifically captures the overarching pattern of emotional tension as well as subtle dysregulation which had been observed during the first week's non-sensory literacy task. There was no sensory interaction within this task. Although the students within the classroom remained quiet and visually uncluttered, several students demonstrated challenges associated with regulating their emotional states, specifically when managing arousal, expressing their needs and wants, and engaging without the use of external support. These observed challenges associated with regulation abilities were apparent in a subtle manner and mostly observed through flattened or tense facial expression, delayed or muted vocalisations, and students physically withdrawn through agitated body language.

For example, on Tuesday of the first week, Perry was observed to be seated at their desk for over four minutes with their hands folded, staring blankly with very little interest in the task in front. His body observed as motionless, and face without expression. When prompted to begin the task, they gave a slight nod but chose to remain still until the teacher

had prompted again. Upon this second prompt, the child then decided to pick up their pencil and pressed very lightly on the worksheet drawing scribbles. Upon seeing this, the teacher described such actions and expression as "*an eerie stillness*", noting that *"They weren't visibly upset, but something was clearly off—they weren't in their body."* This presentation of low motor movement, reduced facial expression, and delayed response, are all themes and concepts which align with Ayres (1972) theory of sensory integration which identifies such behaviours and responses as under responsive regulation in a learning environment which is sensory deprived.

Loraine had presented a slightly different pattern of dysregulation – one which had been characterised by muscular tension and physical withdrawal. On Wednesday, this same student was observed with their arms crossed tightly against their hips, their lips pursed, and their feet being hooked under the chair legs. They had made an intermittent glance towards their teacher but remained hesitant to engage with the worksheet. The teacher had chosen to crouch beside them, to give more support, and pointed at the page, yet the child responded with a smirk on their face saying "no" abruptly as they turned their body away in the opposite direction. Although they weren't overly disruptive, this reflects emotional containment through a guarded, and rather defensive posture that had been accompanied by verbal withdrawal. The teacher described this interaction as if it was *"trying to reach someone behind a wall."*

Across the course of the first week, similar patterns of being flat or having distressed facial affect with minimal engagement had been observed with several students. These also included furrowed brows, tight jawlines, a lack of smiling or animation, as well as showing downward gazes. Although the overall noise level within the room was low, the vocalisation that did occur and could be heard from students were often signs of distress or disengagement. For example, Loraine had repeated the word "no" many times for several

minutes during Wednesday's literacy session, blankly staring at their worksheet. Another instance is that of Capri who had begun to make loud humming sounds, with their pitch and volume increasing throughout the task. They were flapping their hands rhythmically making squealing sounds and began to tap the desk with increasing intensity. Teacher noted that these expressions and movements as a rising state of dysregulation, stating *"I could tell they were starting to spiral, but there wasn't anything in the task they could latch onto to bring themselves back."*

These behaviours had only increased in intensity over the course of the week. By Thursday, Quartice had begun to show complete avoidance with the task altogether, observed through seeing them lingering by the windowsill, and only returning after multiple prompts or if they were provided something like a toy to entice them to return to their table. For this reason, their session would be filled with sighs, constant fidgeting, as well as occasional verbal outbursts of the student saying "finished". This sense of emotional fatigue – frustration without release – had been echoed from the teacher reflections and feedback stating *"They weren't acting out, but they weren't with us either. It was like a slow drift away."*

Looking at it from a sensory integration perspective, such regulation challenges can be understood as a mismatch between the students' sensory processing needs and their demands of the task itself. According to Dunn's (1997) sensory processing framework, learners with high thresholds for sensory input may then show signs of disengagement or slowness to respond when they are presented with tasks that are low in sensory richness and rely on passive self-regulation techniques. However, on the contrary, those who present low thresholds may show signs of becoming overwhelmed when faced with the absence of regulation support (Dunn, 1997). When students had been presented with a traditional worksheet, uniformity, visual monotony, as well as lack of tactile and kinesthetics involvement failed to offer opportunities for grounding. Instead of sensory regulation being

embedded within learning processes, it was now left to the student to manage independently, a challenge that many found stressful and could not meet. These themes illustrate how emotional dysregulation in autistic students does not always manifest in a way that is deemed as explosive behaviour; but in fact, it can present as social withdrawal and bodily disconnection. Within a learning environment that does not account for sensory diversity, students may respond in a manner where they are quiet or compliant while in fact struggling to remain grounded, focused, engaged, as well as emotionally safe and secure.

4.4.2 Sensory anchoring as emotional grounding (Week 2)

The second apparent theme was that of sensory anchoring and emotional grounding which describes markedly different patterns of regulation which had been observed during the second week when a sensory integrated version of the literacy task was presented to students. This task entailed the use of tactile letters felt textures, as well as visual sequencing prompts and movement-based components such as letter retrieval. From the outset, students appeared to be much calmer, more emotionally expressive, and physically settled. In contrast to the first week, emotional regulation was not something that needed to be externally forced or managed but rather was supported in an organic manner through the approach of a multisensory structure of the task itself.

Loraine, who had previously in the first week remained disengaged with the worksheet task, immediately was observed to engage in pulling out the soft textured letter tile out of each sensory bin and began placing them on the display sheet. Within this task, their face lit up, and they would whisper the letter sound repeatedly, with a prominent smile on their face. Another point of observation was also that their shoulders were relaxed, and their breathing less frantic. The teacher shared their thoughts within the semi-structured interviews indicating that *"They looked alive. They were moving, they were connected—it was like flipping a switch."* Furthermore, on Wednesday, this student had initiated a special request to

their teacher for more tiles/letters using a core board and maintained involvement for longer than five minutes without the need for constant redirection.

Additionally, Perry and Quartice, who had also both previously indicated signs of refusal and shut down, were seen showing more engagement through the tactile nature of the materials which seemed to create a more expressive and regulated interaction. On the second day of the sensory task, they began to vocalise letter names spontaneously as they themselves placed the letters on the display sheet, clapping softly after matching correctly. Upon seeing this, their teacher describes such a response as *"a rhythm they created for themselves—a kind of focus that flowed out of the materials".* It was also noted that even those students who had continued to stim or vocalise during the task did so in a way that was much more regulated and synchronous. For example, Capri continued to hum during the task during the second week, however now in a way that was much more melodic and softer as opposed to the loud and aggressive sounds in the first week.

Not only this, but physical regulation was also observed to have improved, where students who had in the first week's task struggled to remain seated or who had used large, dysregulated movements, were now engaged in a more meaningful manner with repetitive actions which appeared soothing. An example is of Perry who was seen rocking gently while assembling the alphabet letters on the display sheet, maintaining a high level of focus throughout. Quartice also highlighted a change as previously they had been seen covering their ears, but in the second week selected their preferred textures whether it be wet, dry, soft or hard. Through this process they remained seated for the entirety of the session and showed no signs of auditory sensitivity. This specific idea of the integration of sensory choice and consistency enabled children to find materials or modalities which helped to stabilise arousal and allow task engagement to occur. Within the semi structured interviews, the teacher had noted that the task "*did the work*" and mentioned that *"I didn't have to talk them down or*

redirect—I just gave them the tiles and watched them settle." Hence the reduced dependency for external regulation allowed the teacher facilitating the task to engage in a quieter and more relational interaction, by sitting beside students, mirroring their pace, and by commenting supportively without interrupting their rhythm and pattern of processing and engaging with literacy tasks.

4.4.3 Relational co-regulation and emotional reciprocity

The third and final theme of emotional and behavioural regulation captures how the specific sensory-integrated task served to not only improve individual emotional regulation but also had the power to enhance the quality of interactions between the teacher and student. This dimension of regulation was one that was not apparent in week one, when students were observed to be either passive, resistant, or even self-contained in their attempts to manage arousal. Looking at the observations of week two, there were multiple moments which allowed for attuned, synchronised interaction.

Specifically, Ashton, who was rather withdrawn during the first week's task, was now observed to be initiating shared attention on the third day of week two. Having the student say words like "match" and "all done" whilst looking at the teacher indicated a growing sense of emotional safety, where the student was not just working to regulate themselves, but was also able to reach out to those around them. Furthermore, the teacher was also quite amazed with the shift in reciprocity. This was also reflected by Capri who in fact spontaneously turned to the teacher and signalled that they themselves would put away and clear the task saying "finish". They indicated that they wanted to pack up the task once they had completed their letter sorting. Upon seeing this the teacher reflected that *"I was surprised—not just that they asked, but how calmly and clearly, they did it. That's not typical."* Although it may seem small, such gestures and actions that reflect care, helpfulness, alongside connection, all emerged more repeatedly during the second week when the sensory task had been presented.

Furthermore, Perry presented frequent behavioural outbursts during the first week of the research study through multiple occasions of refusal to sit at the table. During the first week there was also an instance where they had torn the worksheet in half. However, when contrasting to the second week when a sensory task was now presented, there was a noticeable positive shift. During the sensory task in the second week, they remained on their chair behind the table for the entire duration of the task but also engaged in a manner reflective of shared regulation (Howley-Rouse, 2024). This was shown through the constant eye contact towards the teacher, as he would pass the completed letter in the hands of the teacher each time. On the third day of the sensory task in week 2, Ashton was seen helping Loraine start the task when they had seen the task setup. Out of excitement, they themselves had demonstrated the way to complete the task, saying "a" once completing and then looking towards each other to begin doing the next letter. When seeing such peer interactions, the teacher had commented saying *"That moment was extraordinary. It wasn't just that I didn't expect it—it was that I saw them doing for someone else what they usually struggle to do for themselves."*

These examples are all demonstrative of the positive impact that children experience when they are adequately regulated through the implementation of sensory alignment and task structure. It allows them to not only perform and engage better but also become more emotionally available too. Hence, the development of social regulation readiness is of particulate importance for autistic learners, who are most often described to experience ongoing challenges with co-regulation or empathy (Howley-Rouse, 2024; Sensory issues, n.d.). Students were able to efficiently demonstrate capacities for relational presence when their emotional baseline was being supported.

It was also apparent that the strategies taken by the teacher had shifted towards a more proactive and co-constructed form of regulation towards the end of the research

study(Howley-Rouse, 2024). The teacher was now mirroring student tempo, joining their focus, and offering soft commentary or encouragement. Perry, who was previously withdrawn into silence during the first week's task, responded efficiently to this approach as the research study continued. The teacher had noted the way in which rhythmic sensory elements had made it much easier to modulate the classroom, stating *"There was a kind of gentle background noise—students talking, letters tapping, mats sliding—and I could move through it without anyone getting startled or overwhelmed."* Having this rhythm of task appeared to create a consistent sensory backdrop against which emotional variation could be efficiently supported without any rupture or loss of regulation in the process. More importantly, this form of regulation is not uniform, but highly individualised and mutually respectful. A great example of this is Quartice, who preferred working in a quieter space with fewer peers around. The teacher had provided them with a quiet corner of the room to complete this task. Having done so, Quartice remained focused and engaged for the entirety of the seven-minute period of the task. No words had been spoken and only very brief eye contact made, however the teacher shares this moment to be one that was "emotionally full".

This approach aligns with the Universal design for learning principles (Sharma, 2024), where emotional access is designed flexibly rather than being imposed through standard behavioural norms. Emotional reciprocity was not a goal that had been forced or imposed by educators onto students, but rather a natural outgrowth of improved regulation. When the students were no longer consistently using all their energy to manage their environment, there was an increase in capacity to connect with others, help, respond, and enjoy the presence of those around them. This had also in turn transformed the emotional climate of the classroom. Teacher feedback described the sensory week as *"more peaceful," "more joyful," and "more human."* As they wrote: *"I felt like I got to see who they really are—when they're not bracing or blocking or trying to survive the task."*

4.5 Interaction with sensory material

This section focuses on how the students interacted with different sensory components embedded in the sensory integrated literacy task. There was a focused lens on observation which had been conducted on the days of both Wednesday and Thursday for both tasks to compare the results and findings and see the overall impact that sensory material had. The interaction with sensory material had been interpreted through a deeper understanding of the framework informed by Dunn's (1997) sensory processing model, which categorises individuals based on their thresholds for sensory input and their associated behavioural responses such as seekers, avoiders, sensitive, and low registration. Not only this, but the analysis also drew from observation notes and teacher reflections to determine in-depth insight of which sensory modality (tactile, vestibular, auditory, proprioceptive) was most effective for students in improving engagement, supporting regulation, and in some cases, triggering overstimulation. As a result, three core themes were clear from the analysis: (1) "Tactile Preference as Pathway to Focus," (2) "Movement and Modulation: Vestibular Strategies in Action," and (3) "Seeing and Hearing: Navigating Visual and Auditory Input."

4.5.1 Tactile preference as pathway to focus

One of the most consistently observed patterns which had occurred across the period of Wednesday and Thursday of the sensory week was the student's spontaneous gravitation towards the tactile material of playdough, rice, and kinetic sand, all of which had different tactile textures. I observed that these materials served as the primary site of sensory interaction and often also functioned as a grounding anchor for sustained focus and emotional regulation.

Perry, who was hesitating in the non-sensory literacy task, had now immediately approached the table on the third day of the sensory task in week two. They sat themselves down and began to select which soft alphabet letter to take out of the sensory bin first.

Without the need of teacher prompting, they successfully matched the letter to the display sheet, whilst also quietly sounding out the letter and looking up towards the teacher after successfully placing each letter. During this time, their body remained still, posture upright, and attention was uninterrupted for close to six and a half minutes of the total seven. This sequence was analysed and marked as one of the longest sustained engagement periods that had occurred for Perry across the entirety of the study. For Perry tactile textures offered a calming effect and allowed them to focus more accurately on the linguistic component associated with the task, without continuous distractions and disengagement. According to Dunn's (1997) model, such behaviours align with a *sensory seeking profile* where the student will actively engage with the sensory input that they are provided with in a self-regulatory way to maintain optimal arousal and task involvement.

In contrast, Ashton had demonstrated the appropriate characteristics which define and categorise a *sensory sensitive profile*. I noted on Wednesday of the second week when the sensory task had been presented that Ashton was much more attuned and interested in holding and experiencing objects which were softer on their hands. During the second week they were able to select the foam letters and although they were hesitant to touch the play dough and kinetic sand, they did enjoy thoroughly engaging with rice. While the overall engagement was relatively high, their interaction with materials was selective and cautious at the same time. The teacher had become aware of such sensitivities and then offered Ashton a felt mat under the letters as opposed to a laminated display sheet, which allowed the student to engage more openly and comfortably. This interaction reflects the nuanced role that tactile input holds, where not all textures and feelings are equally beneficial amongst all autistic students. It seems that having options and choices as well as predictability is crucial for engagement to occur.

In a similar manner, Loraine who had very minimal verbal communication and often

uses tactile stimming to regulate, had spent a substantial amount of time pressing the playdough into the letter moulds, followed by flattening it back out repeatedly. This form of engagement was observed as rhythmic and accompanied by soft vocalisations. They were seen looking up quite often at the teacher and once towards their neighbouring peers, but primarily they remained immersed with the tactile manipulatives. This student had displayed what is referred to as *low registration with specific sensory stimuli* – needing extended as well intense tactile input to achieve a sense of grounding. Playdough had offered the student both pressure as well as repetition, which was predictable, providing them with the required stimulation without it being too overwhelming. Upon seeing such progress, the teacher' remarks: "*They seemed calmer, more connected. The material gave them something to do with their hands and their attention."*

Across the group of students who participated in the study, the tactile material had provided both entry points into learning as well as an essential mechanism for regulation. Students had sought out and in fact preferred having such textures presented and were able to adjust how long they interacted with the material, and in some cases had used them to bridge into language tasks. The fact that a large majority of the students began the session by either touching, sorting, or even pressing the materials before even beginning or engaging with the letters, suggests that tactile input served not just as a form of sensory enrichment, but also an integral prerequisite for readiness. Schaaf et al's (2014) argument affirms this, as they share how sensory support can scaffold and lead to improved access to higher-order cognitive tasks by stabilising the sensory motor system.

4.5.2 Movement and modulation: Vestibular and proprioceptive strategies in action

The second major and most apparent theme is one which highlights how both the proprioceptive and vestibular elements, especially through movement breaks, weighted or resistive actions, as well as embodied components of the specific task had served to support

modulation of arousal, especially for those students who were prone to hyperactivity, low muscle tone, or presented motor disorganisation. The classroom design and environment for where the study was conducted, was created and selected in a manner where students had space to stand up freely and did not feel trapped or confined. There was an optional weighted cushion that was placed next to the table if students were wanting to use it during the study. The storage boxes containing the sensory material had been placed further away from the front of the desk to encourage students to stand up and get moving as well. Having such elements and creating the research in such a manner had allowed students to have the opportunity to regulate through both movement as well as deep pressure without needing to leave the vicinity of the study.

On Wednesday of the second week (sensory task), Perry, who was previously seen struggling to remain seated during the task in the first week, was now given the option of starting the tasks whilst standing and without any chair. They had chosen to retrieve the letters from separate sensory bins which had been placed around the site of the research study, before coming up and matching it to the display sheet. This process is one that had allowed for continuous but structured movement and lifting the container of the letter tiles had provided proprioceptive input through joint compression as well as muscle activation (Blanche et al., 2012; Middletown Autism, n.d.). During the semi-structured interview, the teacher had noted that "*They stayed with it longer than I've ever seen—moving between tasks and carrying things seemed to keep them engaged rather than distract them."* Dunn's (1997) framework would characterise this as a vestibular and proprioceptive sensory seeking profile, where the student's neurological system in fact benefits from having frequent, and rhythmic input to sustain regulation and attention.

Another compelling example of embodied self-regulation is the encounter that had occurred with Ashton who used the movement as well as weight-bearing aspect of the task

more as a pacing strategy. They were observed to periodically stand up to collect their foam letter from the sensory bins which required gentle pulling and lifting, which in turn had engaged their proprioceptive receptors through the process. They then rocked slightly on their heels whilst they performed the task. Having such combination of movements and resistance appeared to be something that was self-soothing for the student, and at no point did they show signs of distress or disengagement with the sensory task. Rather than the student reflecting any off-task behaviours, it was observed by the teacher as an internal rhythm which was supported by structured sensory input within the sensory literacy task. The ability and opportunities provided to children to move and lift in a meaningful manner, without any imposed reprimand or restriction, was a key factor behind Ashton's sustained participation and emotional stability.

Collectively these findings emphasise the positive effect when both vestibular and proprioceptive needs are accommodated and supported for autistic students, allowing them to better modulate energy level, maintain improved focus, as well as express agency in the way in which they navigate their learning space and environment. The main pedagogical insight is not simply to "add movement" into tasks, but to have teachers provide structured, and intentional opportunities for movement and resistance to occur, all of which align with students' individuals' sensory profiles. This has allowed the environment to co-regulate with the learner themselves, rather than requiring the learners to suppress or dismiss their sensory needs and requirements to remain compliant or seem productive.

4.5.3 Seeing and hearing: navigating visual and auditory input

The third and final theme centres around the role that visual and auditory elements play within the task, both deliberate such as the colour coded material, or incidental like the peer noises or background activities that had occurred all of which have either supported or challenged sensory engagement. Unlike the tactile, vestibular, as well as proprioceptive

inputs, responses to visual and auditory elements reflected more variance, with some students drawn to them whilst others also reflected slight signs of overstimulation.

For example, Capri had appeared visually motivated during the sensory task, specifically on Wednesday of the second week when they had placed the foam letters in a rainbow sequence which was not part of the assigned activity. The teacher allowed this to occur as they recognised it to be a form of self-directed entry to engagement. Once the student had completed that sequence, they also began to match the letters by sounds. They were observed tracking each letter carefully with their eyes, making a high-pitched sound for each of the letters every time they matched correctly. The visual arrangement therefore had supported both the focus and motivation of the student, aligning deeply with a visual sensory seeking pattern.

Conversely, Quartice had presented sensitivities towards visual clutter. For example, when there were too many items crowding the table, they paused and for a fraction of time looked away. Upon seeing such a response and behaviour, the teacher responded by offering a reduced set of alphabet and sensory bins (only one at a time). This adjustment was one that led to immediate re-engagement for the student. During the teacher interviews, they shared: "*They needed visual quiet to stay calm. Too much on the table was just too much in their head."* This case supports Dunn's (1997) sensory sensitive profile – where even small increases in such input can influence and cause disengagement unless the environment is altered or controlled.

Auditory responses observed reflected students gradually responding well and successfully to soft, rhythmic language prompts or even sing-song phrases that had been implemented by the teacher. Such findings suggest that having structured auditory input – when its more predictable and patterned, can enhance verbal participation as well as memory. However, incidental noises such as the chairs scraping or having other students in class

express their distress or excitement, did occasionally lead to signs of distress which had continued for a short amount of time before students were able to re-engage. For example, Perry needed to cover their ears when the student next to them were performing a separate task and were making loud vocalisations. During this moment, the teacher responded in a manner by inviting them to use the classroom's noise-cancellation earmuffs. Perry accepted these, in which it allowed him to resume the task, illustrating the dual nature of auditory input. Although certain sounds may be encouraging and facilitate participation, others can destabilise it and can cause distress and disengagement. Teachers who are attuned to this type of variation can make real-time adjustments that help in preserving regulation without having the student feel isolated.

4.5.4 Unexpected findings: importance of sensory profiles

While the overall patterns and findings of this research study have pointed towards sensory tasks resulting in an improvement in engagement, participation, and regulation, a closer examination of the data also reveals outliers within the dataset as well as unanticipated findings which are worth noting. These anomalies are not peripheral but are in fact analytically significant to incorporate as they challenge assumptions about the universality of sensory strategies and underscoring the diversity of individual sensory profiles. These include children who had been observed as disengaged even when they were provided with sensory support, emotional responses towards unexpected stimuli, as well as limitations in observation or documentation, and contextual constraints which had shaped the delivery of interventions. Taken together, the findings suggest that sensory integration is certainly not a one-size-fits-all approach, and that the educational environment must always have a sense of adaptability, be reflexive, and be informed by continuous observation of student responses.

One such surprising finding was that of Capri who had shown moderate task involvement during the non-sensory literacy task in the first week. During the second week,

although initial response to the task was positive, towards the end of the week when Capri was offered the sensory tool which was the scoop, they were seen quickly doing the task in a way to have it done and move on to the next. This was unexpected, particularly given the overall trend that had occurred across all other students of increased engagement in the second week's task. When questioning the teacher about this during the weekly semi-structured interviews, the teacher had responded and reflected saying: *"I thought the sensory tools would help, but they seemed to make things worse. Maybe the texture reminded them of something unpleasant, or maybe it was just too much input all at once."* Hence, this raises an important consideration about sensory defensiveness and the possibility that the implementation and use of sensory tools, which generally may be beneficial for autistic learners, can also be aversive or even triggering for some learners (Dunn, 1997). According to Dunn's (1997) Sensory Processing Framework, students who had low thresholds for sensory input and passive self-regulation strategies, may in turn become overwhelmed even by moderate stimulation, especially when it is offered and delivered in a way that is unpredictable or unfamiliar (Howley-Rouse, 2024). This student's response is one that highlights the need for preference-informed implementation, where students have voiced agency in selecting the sensory material, rather than them receiving it as a form of standardised accommodation.

In sum, these unanticipated findings deepen our understanding and conceptualisation of individuals' sensory needs by highlighting the boundaries and complexities of sensory integration in real-world classrooms. Although a vast majority of the students in the study had benefited from the sensory integrated literacy task this student is a reminder that no intervention is universally effective. Future iterations of sensory integrated programming should incorporate pre-assessment of student preferences per each classroom, contingency plans for material failure, as well co-create sensory menus that empower all students to select

work that best suits their sensory needs. They should also prepare teachers to expect unexpected reactions and responses, not in the lens of failure, but as data. Only by honouring both successes as well as the surprises and the unknown, can educators and researchers design learning tasks for autistic learners that are not only sensory formed but also sensory respectful.

4.6 Changes in participation over time

Another key component of this study has been the exploration of how student participation has changed and evolved across the two-week observation and research period, with a prominent focus on the changes observed and noted on the fourth day of each week's activities. Participation within this context is understood not only as task completion, but as a dynamic process which involved the initiation of learning behaviours, sustained involvement, emotional investment, and autonomy. Observations of these changes took place specifically on the Thursday of each week as it was more towards the end of each of the conditions, hence, providing a valuable opportunity to assess whether students' engagement and participation with the literacy task had become consistent, self-directed, and less reliant on prompting. Through comparative mini case summaries, this section focuses on examining how students' participation shifted across the period of the task presented for both weeks, and how the incorporation of sensory elements within the second week influenced these changes significantly. There was a clear trend whereby the Thursday of the second week, more students were completing tasks, requiring fewer prompts, and had begun to increasingly self-regulate and internally motivate themselves.

Critically, this theme is one that extends beyond just the immediate contrast of sensory and non-sensory conditions, by instead illustrating how participation develops cumulatively across the period of the second week. Rather than just reflecting on isolated

improvements, the data indicates a progressive layering of engagement, where the repeated exposure to the specific sensory integrated task built familiarity, confidence, alongside self-direction. Hence, this positions the concept of participation not just as a fixed behavioural outcome, but rather as an evolving process that is shaped through consistent environmental support.

One apparent and striking contrast of such participation over time has been observed with Loraine. During the fourth day of the first week's non-sensory task, the student arrived at the literacy table with quite a flat affect and sat down only after four separate prompts from the teacher to begin the task. The students' gaze was in fact focused primarily on the walls for the first three minutes of the task, and their pencil rested idle. Despite the student eventually attempting to hold the pencil to engage with the worksheet, their engagement yet remained minimal as they completed only a few scribbles on the sheet before abandoning the task, constantly saying "no". During the semi-structured interviews, the teacher had described the encounter with the student saying: *"They were physically present, but not emotionally or cognitively in the task."* However, in comparison during the second week when the sensory task was presented, on the fourth day, the same student's behaviour and response to the sensory based task had been observed as markedly different. They were seen to come to the task desk with visible excitement and enthusiasm and walked directly to the table without any reminders from the teacher and had begun to manage the sensory bins and sensory material without any prompting required. They maintained this consistent rhythm of arranging, vocalising, as well as checking their own work, often softly smiling each time they moved onto the next step. The teacher feedback of this student's performance mentioned: *"They stayed focused for the entire session. It was all self-driven. I did not intervene once."* Therefore, this shift is one that illustrates more than just improved compliance from the student, but in fact indicates a transition from externally prompted participation to more

intrinsic task ownership, which had been facilitated by a more encouraging and sensory rich learning environment that met the sensory and regulatory needs of Loraine.

Another such compelling example is that of Perry, who also showed evolving participation over the course of the study. During the first week's non-sensory task, Perry had reflected increasing resistance and denial over the course of the week when prompted to complete and engage with the literacy task. By the end of the week, they had refused to even come to the literacy table itself when it was their turn during the classroom work rotation, which involved a significant amount of coaxing from the teacher and teacher aide to get Perry in the right place at the right time. Once he had finally seated themselves, their vocalisations were signalling a groaning sound, as they tapped their foot rapidly on the floor. Despite such verbal prompts, they still completed a small fraction of the worksheet. When the teacher had been questioned of this response, their reply noted: *"Each day got harder. It felt like they were pushing back more because the task offered nothing new or interesting."* In contrast, during the Thursday of the following week when the same task goal was presented with a sensory integrated approach, the student reflected being re-engaged as well as much more confident with the task. The student had approached the table independently without the need for any staff to direct them, and they began pulling out the foam alphabet letters from the sensory bins on their own without the teacher's assistance. They were able to verbalise many of the letter sounds and smiled when they would receive a praise from the teacher such as "well done" as they completed the task within the seven-minute time limit. Once done, they looked towards the teacher, suggesting the wanted to redo the task, showing the students eagerness to engage and take part. The teacher reflected on this mentioning: *"They were proud. That sense of ownership was missing last week."*

Looking across the class and all the students more broadly, these patterns all indicated clear overall increase in students' participation by the end of the research study. In the first

week only one student was observed to fully compete the non-sensory literacy task by Thursday, without the need of constant prompts from the teacher, however when comparing to the second week when a sensory task was presented, four out of five of the students had completed the task with self-initiation before the teacher had prompted to begun or provide instructions. Furthermore, students were not constantly needing to leave the activity space, which was common and frequent during the first week's non-sensory task. It was also observed that the tone of the room was much calmer, and the rhythm had shifted to be more predictable, leading to the interactions being more student led as opposed to teacher led. Not only this, but the teacher had also reported that they had given significantly fewer verbal cues by the end of the second week – which had shifted their role from being managers to now facilitators.

Quartice's case was one which reflected considerable progress. On Thursday of the first week, the student had sat with their arms folded, reflecting signs of disappointment as well as disengagement despite multiple low-pressure prompts being provided. They were only able to complete one single line of the worksheet and avoided contact with the task as much as possible. The teacher had shared their thoughts, stating that: *"It felt like they were shielding themselves—like they were in survival mode."* However, in contrast, by Thursday of the second week when the sensory task was presented, the student had chosen their preferred material in order of most favourite to least, then placed them carefully onto the display sheet and completed all three full sequences with little support and guidance.

Although they remained quiet and composed, their posture was observed as much more relaxed, and they also maintained their focus for the full session without being distracted. Although this change may seem subtle, it marked a return to participation which was entirely on the students' own terms. The teacher's reflection also supported this and the observational shift as they noted "*By the end of Week two, I felt like I was watching them, not*

pushing them. The task invited them in—it did not pull them. "Hence, such insight strongly highlights a key pedagogical outcome; that sensory integration not only had the impact of improving task performance but also can cultivate a sense of familiarity, autonomy, as well as emotional safety. These all enable students to internalise the structure and rhythm of the learning process.

When interpreted longitudinally, participation evolved significantly when comparing over the first and second week, with Thursday serving to be a powerful and insightful comparison point. The first week's observations had revealed that students who were physically present but perhaps emotionally or behaviourally disengaged, often required substantial prompting from the teacher, continual re-direction, as well as reassurance. By contrast, during the second week, specifically on Thursday, students had reflected an increased independence, sustained focus, and most importantly an apparent sense of agency. Through comparative vignettes, it becomes clear that having the integration of sensory materials had transformed the conditions under which participation occurred and was possible for students, not by demanding more of students, but by ensuring to create a task and learning space that allowed the student to bring more of themselves to the task.

Taken together, these observations strongly indicate that the changes that were observed during the second week were not simple reactions to novelty, but reflected a compounding effect, whereas each day progresses, students' willingness and capacity to participate strengthened. This pattern suggests that sensory integration functioned as a strong scaffold for engagement, gradually decreasing teacher prompting and increasing autonomous learning behaviour (Howley-Rouse, 2024).

4.7 Teacher reflections and feasibility insights

As we move onto the next section of the findings, a thematic analysis of teacher's

reflections, had been collected on the final day of each week (Friday of Week 1 and Friday of Week 2). There was a particular focus on the teacher's own experience of delivering the literacy task under both conditions to enable inductive exploration of the meaning-making processes in response to each of these conditions and the week's events for the teacher conducting the study. The teachers shared their detailed encounters of students observed behaviours, alongside their own emotional and cognitive responses, logistical challenges, and their perceived implications for teaching practice. The main overarching themes which emerged from the data are: (1) "From Resistance to Reciprocity: Observing Student Transformation," (2) "Holding Space vs Holding Control: Shifting Pedagogical Roles," (3) "The Practical Promise and Pressure of Sensory Integration," and (4) "Support, Training, and the Emotional Labour of Change." These themes had been explored with rich quotation excerpts to honour and appreciate feedback and embed findings in their lived experiences.

4.7.1 From resistance to reciprocity: Observing student transformation

One of the most dominating themes in teacher reflections was the stark contrast that existed in student participation, mood, and interpersonal connections that occurred between week one and two. It was observed that the teacher had consistently described the first week as more emotionally and cognitively taxing – not just for students, but also for the teacher as the learning task itself felt "*flat"*, "*rigid"* and *"barely manageable*". However, in contrast, during the second week, the teacher observed it being much more *"lighter*," "*more natural*," as well as *"surprisingly joyful"* for themselves as well as all the students. These contrasting affective experiences were often discussed through the lens of individual student transformations. The teacher described week one as "*a week of tension*" where she "*had to micromanage every moment or they'd disappear*." Reflecting on the same group in week two, she noted: *"They came in curious. They stayed longer. There were fewer tantrums, fewer refusals. And they looked... calmer like they had space to breathe and be themselves."* It is

for this reason that the teacher had expressed not just an improvement in compliance but also shifts in relational tone as well as emotional connection. Specifically, Loraine who was previously needing constant presence of an adult, was observed by the end of the second week as *"more available and present*" in a way that had never been seen before. The teacher described: *"In Week 1, I sat next to them the whole time just keeping them steady. In Week 2, I watched them find their own rhythm. I got to step back and just enjoy watching them learn."*

These reflections capture the shift from managing resistance to participating in mutual responsiveness. The sensory task was not just more engaging than the non-sensory task, but it also enabled there to be a different kind of interaction where students initiated, explored, as well as shared learning moments. The teacher also expressed their surprise at students' capacity for focus and social reciprocity when their sensory needs had been met, acknowledged, and scaffolded. The shift was one that had been experienced not as a matter of "better behaviour" but as evidence of students becoming "more comfortable" and "more themselves."

4.7.2 Holding Space vs Holding Control: Shifting Pedagogical Roles

A second theme that emerged was centred on the role that the teacher played and how it had transformed between the two weeks. During the first week, the teacher described themselves as an enforcer or even motivator, holding the responsibility of keeping the lesson moving despite disengagement as they mentioned*: "I felt like a taskmaster. There was no space for reflection or creativity—just tick the boxes and keep them from melting down."* This in fact contrasted quite sharply with what had been observed in the second week during the sensory task, where the teacher reflected on "*being present*" "*following the child's lead*," and "*co-regulating rather than managing*." The sensory materials alongside the flexible structure of the task itself created opportunities for the teacher to shift their engagement and behaviour from being controlling to being observant, encouraging, and connecting. The

teacher provided feedback on this shift as one that was personal and provided professional relief: *"In Week 2, I did not have to perform teaching. I could teach—respond to what they were doing, celebrate their wins, adapt as we went."* Furthermore, they had stated that *"I had never thought of sensory input as a teaching tool. But when I saw them settle into the rhythm of the task, I realised that is where the learning begins."* The reduced need for promoting or correcting students had created more space for relational teaching to occur. As a result, they reported feeling more in tune with students' emotional cues and responses and were able to appreciate such subtle learning moments. Therefore, these insights and valuable feedback suggest that integrating sensory strategies not only impacts student engagement but also can reshape the relational and emotional texture of teaching itself.

4.7.3 The Practical Promise and Pressure of Sensory Integration

Although the teacher was overwhelmingly positive about the outcomes that had been reflected with the sensory integrated task, they also spoke candidly about the practical challenges that had been involved in implementing such approaches. As a result, another major theme that emerged is the tension that had occurred between recognising the value of sensory integration and grappling with logistical and time demands of its efficient and effective delivery. The teacher frequently described the sensory task as one that was "*more work upfront,"* especially in terms of setup, material management, and classroom organisation, noting: *"It took me longer to prep everything. The tiles had to be sorted, the mats cleaned, the materials reset every day."* They also suggested and mentioned that: "*We had to rethink traffic patterns. Kids moving to collect letters meant we had to create safe routes, keep things predictable."*

However, despite these challenges, they believed that the benefits of the task itself outweighed the workload, with them saying: *"Yes, it is a little more work. But it's meaningful work. Not just babysitting worksheets—it is designing for real learning."* The teacher

provided suggestions for the task, such as rotating the sensory material that children would be offered to ensure that students do not get bored of the same material when doing a literacy task that is the same every day. Nonetheless, they also expressed a strong desire for practical structures to support the implementation of the task more efficiently when integrated into the school curriculum. With such resources the feasibility of the task was encouraged and approved by the teacher, with them indicting it to be a positive shift in learning for autistic learners.

4.7.4 Support, Training, and the Emotional Labour of Change

The final theme that emerged highlights the deeper emotional and professional reflections the teacher experienced as they engaged with the sensory-based pedagogy. Teaching is commonly recognised as a profession that is emotionally demanding, often requiring the need to regulate one's own feelings whilst responding to complex needs of students – better known as emotional labour (Hochschild., 2012; Yin, 2015). It was common for the process to be described by the teacher as illuminating, whilst also simultaneously emotionally demanding. Although the shift in students' engagement and participation was energising as the sensory task had been introduced, it also raised questions about their own preparedness as well as their professional identity. One such remark stated: "*I was not sure what to do when one of the kids started using the foam letters as a fidget. Was that, okay? Should I redirect or let it be?"* Such uncertainty reflects the emotional complexity that teachers commonly navigate when adapting and altering pedagogical practices, particularly within a specialised learning setting and its associated professional demands (Beltman et al., 2011). They also shared their experience of feeling worried, unsure if they were making a mess of the task and the research itself. Such worries point to a broader need for professional development to support changes in teaching. In fact, the teacher had stated: *"I'd love a PD [professional development] session where we actually try the tools, not just talk about them*"

encouraging coaching support and modelling from occupational therapists to gain confidence in what they were presenting to children (Çorakcı & Bumin, 2025). The emphasis was not just on acquitting new techniques for this reason, but to build that level of confidence and clarity to ensure that students would be delivered a literacy task that is presented with more enthusiasm and with an understanding of the power that it holds.

Furthermore, the emotional dimension and its shift was one that was also evident. The teacher had reflected on their feelings of guilt of past practices, realising that they may have also previously misinterpreted the student's behaviour of dysregulation as defiance, sharing: *"I used to think they were just being difficult. Now I see they were struggling. That hits hard."* Experiences like this align with research which suggests that emotional labour can prompt critical professional reflection, often resulting in reshaping of teacher beliefs and their approach to learning (Yin, 2015). However, this awareness of understanding such dysregulation beyond the lens of defiance was one that was freeing too. The teacher remarks: *"Now I see the sensory layer in everything. It is like I have a new lens. And I am excited—not scared—to try more."*

Overall, the teacher had viewed the method of sensory integrated literacy tasks not as a burden, but rather as a transformative pedagogical opportunity – one that has the potential to support teacher growth and learning practices with adequate support, space, and professional learning opportunities.

4.8 Summary of key findings

Overall, the analysis of these themes provided a rich, nuanced picture and understanding of how engagement is not a fixed trait but instead a relational process which can be significantly influenced by task design. Engagement was summarised in three themes: "Passive Compliance and Prompt Dependency," "Multisensory Anchoring and Emotional

Investment," and "Emerging Autonomy and Sustained Engagement". Engagement in the first week was externally managed, emotionally flat, and often resisted and denied. In contrast, during the sensory week, engagement had become much more internalised, emotionally positive, and more self-directed – all of which was anchored in sensory cues that supported autonomy. The findings of this research suggest that sensory integration holds a considerable promise as a pedagogical tool, but it is also important to note that it must be grounded in relational ethics, student voice, as well contextual responsiveness. The study for this reason highlights the potential and power of sensory strategies to create a more inclusive, humane as well as emotionally sustainable learning opportunity for autistic learners through sensory integrated literacy tasks, not only for students with sensory processing differences, but also for the educators who support them. These insights set the stage for the upcoming chapter of the discussion, by considering how these findings will contribute to theoretical frameworks, while addressing the broader implications for educational policy, teacher training, as well as classroom practice. In doing so, the discussion will move from what had been observed to what it might mean for students, teachers, as well as the ongoing pursuit of sensory-responsive education.

Chapter 5: Discussion

5.1 Introduction

The purpose behind this research was to investigate and explore how embedding sensory strategies within a classroom-based literacy task influences neurodivergent children's engagement, participation, and emotional regulation within a specialist school and classroom setting in New Zealand. Although the world of sensory integration has been extensively studied within a more therapeutic and clinical setting, there remains limited research in settings such as a classroom where children spend a vast majority of their lives (Pfeiffer et al., 2011; Schaaf et al., 2014). This study therefore addresses this gap, by situating the research within the setting of a special school classroom, where structured observations and teacher reflections had been conducted to compare traditional literacy tasks with sensory integrated tasks under the same conditions.

When reflecting on the findings, an evident pattern is revealed. When children were presented with the sensory-integrated task during the second week, there was a greater level of autonomous engagement, enhanced regulation, and increased participation without continuous prompting as opposed to the non-sensory task in the previous week. Students reflected hesitation, reluctancy, and an overall flat affect with the non-sensory task, with many completely refusing to partake. However, there was a vast difference in students' patterns and engagement, with increased curiosity, more spontaneous interaction and effective investment observed when children were provided with this multisensory learning opportunity through the sensory integrated task. The sensory materials of rice, playdough and kinetic sand were observed not to just act as entry points into learning, but also functioned as a regulatory mechanism and anchor, helping students to feel at ease, comfortable, and reduce their levels of anxiety and distress to in turn present more sustained and effective engagement. Additionally, it had been observed that the level of participation for students had

shifted from externally prompted compliance to more intrinsic and self-driven involvement when students engaged with the sensory task. To support this, teacher reflections noted that the use of sensory elements as opposed to a more traditional literacy task, reduced the need for children to require prompting. The teacher also shared that the sensory integrated task altered the relational dynamics of the classroom, creating a calmer and joyful classroom atmosphere during learning.

The observed findings all extend to existing theoretical perspectives of sensory integration for neurodivergent learners. Specifically, Ayres (1972) sensory integration theory and the sensory processing framework initiated by Dunn (1997), serve as a foundational basis for gaining deeper insight as to why neurodivergent learners, especially autistic learners, orient in different ways towards multisensory stimuli and input. On the other hand, the Universal Design of Learning (UDL) also highlights the pedagogical significance that there should be towards ensuring to provide multiple pathways of engagement and expression for neurodivergent students (Moffat, 2022; Sharma, 2024). This study hence highlights regulation not just as a prerequisite to learning, but rather as a process that is co-constructed between teachers, organisations, families, as well as students to ensure the best and most appropriate outcome for learners (Howley-Rouse, 2024). As reflected, across the seven core themes the sensory integrated method enhanced student participation, engagement, and regulation, but also reshaped classroom dynamics as well as pedagogical relationships in purposeful as well as often transformative ways.

In the following discussion, the findings will be examined in relation to the theoretical frameworks that have served as the basis of this research. Not only this, but the discussion will also be situated within more broader debates and critical research on inclusive education in Aotearoa, New Zealand. The discussion will start with an interpretation of the key themes that had emerged from the observations, before drawing more closely to the connections with

existing research, with consideration to practical as well as pedagogical implications. Lastly, this chapter will discuss and acknowledge any potential limitations that may have occurred within the study. In doing so, this discussion is one which will argue that sensory integration and sensory-responsive pedagogies are not just an accommodation for autistic learners but rather serves a transformative and life changing practice that affirms and encourages agency, fosters genuine wellbeing, and reimagines what an inclusive classroom can practically look like within a special school setting.

5.2 Engagement

A central finding of this study was the striking contrast between autistic learners' engagement with the literacy task, depending on whether they had been presented with or without sensory stimuli. When presented with the non-sensory literacy task, students displayed hesitation, avoidance, reluctance, and passive compliance. During this week, students required substantial amounts of prompting due to minimal attention and participation with the activity itself. However, in contrast, when students were presented with the sensory integrated literacy task under the same conditions, learners were reflecting curiosity, exploratory behaviours with eagerness to explore the sensory material, and effective signs of enjoyment. It was during this phase of the study that engagement had become much more active and self-directed where minimal prompting was needed as students self-initiated task-related actions. This difference emphasises how the sensory integrated task not only helped children sustain their attention but also fundamentally transformed the quality of their learning and engagement too. This was observed in facial expressions, vocalisations, and body positioning of the students, as well as teacher student interactions. The students were more likely to remain with the task, initiate interactions, and complete sequences independently when sensory elements were present. Sensory support such as tactile material

(e.g., foam letters), vestibular movement (e.g., walking and standing to retrieve letters), auditory (e.g., using less or more sound for each child's specific needs) and proprioceptive input (e.g., carrying weighted items) allowed students to have structured opportunities to regulate their arousal levels. Students who were prone to reflect dysregulation during the first week, were observed to show avoidant behaviours, emotional outburst, or rapid disengagement – however displayed more sustained attention, positive affect as well as flexible task navigation during the sensory integrated literacy task.

Ashburner et al. (2008) had reflected on the challenges associated with having traditional classroom demands such as remaining seated for extended periods to complete work for example, as it is often a core reason for disengagement due to the sensory overload as well as the lack of regulatory opportunities. In a similar manner Goodall (2013) has also reported that conventional based tasks where children are required to sit behind a desk and follow instructions can inadvertently marginalise autistic learners as it neglects students specific sensory processing needs. Students showed less interest through refusal and ignoring the directions of the teacher. Such behaviours can be understood not as a lack of motivation or determination, but rather a response to a learning design that is inaccessible for the students and overwhelming to cognitively process (Ayres, 1972). Once again, in contrast, when students showed curiosity by wanting to dive straight into the activity and engage with the sensory material, it was reflective of what occurs when pedagogy acknowledges and supports sensory differences rather than against them or without considering them (Ayres, 1972).

When reflecting on Ayres (1972) sensory integration theory, it gives further insight into these outcomes. According to Ayres (1972), effective learning is dependent on the capacity that one's brain has to organise and interpret sensory information in ways that present and support purposeful action. However, when this process occurs but is disrupted, children may appear as being inattentive or disengaged with a task, despite whether they

cognitively are capable to do so (Ayres, 1972). It is through this understanding that this study has provided students with multiple opportunities for regulation to occur through the sensory materials and tools, making participation neurologically more accessible as well as less anxiety filled.

Additionally, Dunn's (1997) sensory processing framework was one that provided extensive and useful insight into the research. Many students signalled behaviours and responses reflective of "low registration" or otherwise "sensory avoiders" when presented with the non-sensory task (Bang & Igelstrom., 2023; Dunn, 1997). However, when presented with the sensory integrated task, there was heightened engagement as children were aware of the task providing them with structured and predictable sensory input. For sensory-seeking learners, having multisensory activities channeled their drive for stimulation into more purposeful and meaningful exploration, and for avoidant learners, having tactile and visual anchors provided a manageable and soothing pathway into participation (Dunn, 1997). Therefore, this dual effect is one which highlights the flexibility of sensory integration for accommodating and supporting the different thresholds of sensory responsiveness for autistic learners.

The patterns which had been identified through the observation process of this study mirrors findings from intervention research. For example, Pfeiffer et al. (2011) reported that sensory integration therapy is one that has resulted in improved attention as well as goal attainment for autistic learners as compared to more standard practices, while Parsons et al.(2011) had identified that no one approach can be generalised for all autistic learners. Instead, multisensory literacy tasks have the power of enhancing comprehension alongside enjoyment for students who present sensory processing differences. This study extends these insights by focusing on and showing how sensory integrated techniques within literacy tasks for autistic learners can foster engagement within the everyday ecology and environment of

the classroom, where multiple learners, as well as peers and teachers demands intersect.

A significant observation was the apparent shift that occurred from externally maintained compliance to more self-driven and autonomous participation with the tasks. When presented with the non-sensory condition, engagement was dependent on continuous reinforcement from the teacher through prompting and modelling. However, in contrast, when the sensory integrated task had been presented, there was a reduced need for such interventions and prompting, as students began initiating their own participation and sustaining their involvement with the task. These findings of engagement can be understood through the interpretation of Fredricks et al. (2004) multidimensional model of engagement which focuses on identifying behavioural, emotional, as well as cognitive components. This model provides insight as to how sensory integration serves as a tool to support all three dimensions: behaviourally (students willing to take part), emotionally (display of joy and reduced distress), as well as cognitively (persistence and problem-solving strategies) (Fredricks et al., 2004).

Furthermore, the reflections provided through the teacher interview also reinforces this interpretation. When questioned about engagement of students, the response reflected that multisensory activities led to a smaller number of behavioural incidents and heightened behavioural outbursts, less time spent towards redirecting children, and an overall calmer experience for both the teacher and student. The reflections all suggest that sensory integrated techniques within literacy tasks for autistic students does not only enhance the students' learning outcomes but also resulted in alleviating teacher workload by minimising the intensity that there can be with classroom management during learning blocks when heightened behaviour is commonly apparent. This echoes the findings presented by Case-Smith et al. (2015) who emphasise how implementation of sensory based strategies, can improve attention and reduce behaviours that reflect anxiety. Importantly, the teacher that

had provided insight also emphasised that the engagement level when students performed the sensory task, felt much more natural and authentic, as all students were motivated and encouraged by the task itself rather than needing external prompting.

It is also important to note that engagement during the sensory task was more dynamic as opposed to uniform. Some students had initially approached the sensory task with a lot of caution and gradually built confidence and increased the level of involvement as they continued engaging with the task over the course of the week. This trajectory highlights the value of repetition, repeated exposure, and individual pacing for autistic learners, all of which are central to the Universal Design for Learning (UDL) (Sharma, 2024). UDL advocates for there to be multiple means of engagement and recognises that students vary in the way they access and sustain interest (Moffat, 2022; Sharma, 2024). The availability of sensory pathways within literacy tasks allows students to have their own choice as to how they would like to interact with the content, in this case being able to choose whether they want to dive into the playdough, kinetic sand, or rice first. Doing so reinforces their sense of agency with the task, increasing overall interest and engagement.

When taken together, these findings position sensory integration methods within learning tasks as a catalyst for transforming the way autistic learners engage with literacy, but more broadly learning as a whole. Engagement was not just being able to complete the task successfully under the prompts and guidance of the teacher, but more so about meaningful, self-driven practice and participation which had been supported by an alignment between sensory needs as well as pedagogical design. This research is one that has underscored the potential that sensory integration within literacy tasks hold, identifying the approach as one that promotes inclusive practice (Kapp et al., 2013; Piller et al., 2025).

5.3 Participation and Task Ownership

Additionally, alongside the positive association of engagement with the sensory task, the findings also indicate a notable shift in the quality of participation. During the non-sensory task in the first week of the study, participation had been characterised by compliance, where students were able to complete the task only with repeated prompts. Their involvement also was externally maintained as opposed to being intrinsically motivated. In contrast, when students were presented with the sensory task, they fostered ownership, with them initiating their own actions without needing the teacher to constantly guide, as well as greater persistence without the need for continuous redirection. This demonstrated a strong sense of agency within students learning, highlighting the role that sensory-responsive pedagogy plays in learning and participating in a manner beyond children completing tasks at a surface level, but in a more meaningful and autonomous manner.

The observed distinction between compliance and ownership resonates with critiques that have a heavy reliance on behaviourist approaches to participation (Parsons et al., 2011). Within such research, participation is often measured by observable compliance with a strong focus on behaviour-oriented and structured research. The findings from this research highlight that when literacy tasks are created and designed with sensory involvement and support, students' participation can increase, not due to them being coerced, but because of the task being accessible and intrinsically rewarding for autistic learners. For this reason, participation can shift from being externally imposed, to naturally occurring from the learning interaction.

This shift is one that closely aligns with the UDL once again through its emphasis on the need for providing students with multiple means of engagement, representation, and expression for inclusive education to prevail (Sharma, 2024). In this manner, sensory integration can be considered as a UDL-informed practice as it offers students a diverse

pathway into learning (Sharma, 2024). For example, having tactile materials like kinetic sand provided a physical entry point for students into the literacy task itself, while giving opportunities to stand and move around provided a movement-based element for kinaesthetic and vestibular engagement to occur. This enabled learners to select their own modes of participation which aligned with their specific sensory profiles, preferences, and regulatory needs.

Additionally, the findings are also connected with broader discussion around agency in inclusive education. Agency is referred to learner's capacity to influence, direct, and lead their own learning, where students become "active agents", a dimension that is commonly overlooked in research that focuses narrowly on outcomes such as test performance (observable outcome) or even behavioural compliance (Fredricks et al., 2004; Williams, 2017). When looking at this study, agency had become more prominent when students persisted with the sensory task at a level that was beyond the teacher's expectation, as well as when they were able to engage with the material in creative ways or initiate communication about their learning. Students when they were wanting to complete the task more than just once, setting it up themselves, experimenting by mixing all the sensory material together and then taking it apart and matching the colour of the sensory material to the letter of the alphabet. Another example is of students reflecting communication through saying the names and the associated sounds of the objects on the display sheet. These moments of self-directed participation all illustrate how sensory integration is not just about regulation or engagement but can also be about creating conditions where agency is able to occur.

Furthermore, through teacher interviews it was reported that when the sensory integrated task had been presented, the teacher was no longer playing the role of redirecting and forcing tasks on children but was rather "*an experience of being able to just facilitate learning and witness a completely unimaginable level of interest and participation that had*

till now felt hidden or under the covers." Furthermore, the teacher remark *"It almost felt like I was not needed. I went from really pushing them and having to at times really push tasks on students to now having them happily and willingly perform the task with little redirection and guidance from myself."* This subtle shift is one to note, as when participation is framed as compliance, teachers are viewed as enforcers. However, when participation is framed as ownership, teachers are no longer hierarchically superior and students' inferior, but rather co-collaborators with students in the learning process (Radford et al., 2015).

The reflective comments within this study also suggest that the teacher valued this shift and repositioning, noting that doing so enabled them to interact in a more positive manner with students and allowed them to celebrate their autonomy as opposed to focusing on the deficits. The teacher said, *"I now see disengagement not as a lack in the student, but a lack in my understanding in creating a task that truly caters to their sensory needs, providing me with an opportunity to grow, learn, and work harder to provide each student with tasks that truly support their sensory needs and profiles"*. Hence, this aligns with the neurodiversity paradigm that perceives autistic differences not as deficits, but as variations in the way that processing and interactions occur (Kapp et al., 2013).

In summary the findings associated with participation and ownership demonstrate that sensory integration and its impact do so much more than surface level engagement, as it Can transform the relational dynamic of learning. By creating this shift of participation as compliance to autonomy, the sensory-responsive pedagogy challenges deficit-based models and frameworks and instead aligns with the need for inclusive, and neurodiversity affirming approaches to learning for autistic students (Kapp et al., 2013; Radford et al., 2015). Having such an approach to learning within a special school setting can allow for there to be a redefinition of participation, suggesting that sensory integration can be the change in shifting classrooms from control-oriented approaches to one where autistic learners are encouraged to

exercise agency, creativity, and self-determination.

5.4 Emotional and behavioural regulation

Alongside engagement, participation and ownership, another key finding that emerged was the prominent contrast between students emotional as well as behaviour regulation across both the sensory and non-sensory tasks. During the first week when the non-sensory task was presented through a traditional worksheet, it was evident that many learners displayed minor signs of dysregulation and anxiety. This ranged across various behaviours from withdrawal and refusal to behaviours of hitting and frustration which at many times required teachers to intervene to maintain their attention and participation. However, in contrast, when students were presented with the sensory integrated task, they were observed to sustain their emotional equilibrium, better at self-soothing, and overall remained a lot more present during the activity. In this specific context, regulation was not just the mere absence of distress, but the active presence in students reflecting calmness, confidence, as well as persistence, demonstrating the critical role that sensory integration plays in supporting students' capacity to regulate within their own learning environment.

These findings align with research that highlights the challenges experienced by autistic learners in regulating their emotions and behaviour within overstimulating or even poorly matched environments. For example, Samson et al. (2014) elaborated on how autistic children experience heightened difficulties with emotional regulation, which often is associated with increased behavioural outbursts when demands exceed their capacity for coping. The withdrawal and avoidance which were apparent during the first week's non-sensory task was represented by students hitting, shouting, and physically walking away, revealing that when given tasks that provide insufficient regulatory support, students tend to resort to protective strategies such as resistance, refusal, or disengagement. All behaviours

had been monitored by the teacher to ensure that it was not at a level which was harming or distressing the child or more than at other times during the day. On the other hand, when presented with sensory based tasks during the second week, the task provided students with an opportunity for proactive regulation, allowing them to remain attentive and engaged for the duration without needing to resort to withdrawal.

As re-iterated by Ayres (1972) sensory integration theory, sensory input can be perceived as a regulatory anchor, emphasising how well-organised sensory processing underpins adaptive behaviour. Within the study, the implementation of tactile stimuli for example was presented through the textured material as well as foam letters, all of which offered students calming and repetitive input. Similarly, the movement-based elements of the study also gave students an essential outlet for energy that might otherwise be understood as disruptive behaviour. The implementation of sensory stimuli therefore functioned as a mechanism that helped to stabilise students' emotional states, making the literacy task and the participation possible at the level that it was.

Similarly, Dunn's (1997) sensory processing framework also further clarifies these dynamics. Within the study, learners who presented low sensory thresholds as well as active self-regulation methods (sensory avoiders) were less likely to reach states of being overwhelmed. The reason for this was addressed by Dunn (1997), as individuals can manage the incoming sensory input, and in this case, the task itself ensured manageable, and structured sensory input. On the other hand, students who presented high thresholds and active regulation methods (sensory seekers) such as Capri, Perry and Loraine, were all able to channel their need for stimulation into more purposeful activity through the task. Hence, it is through this dual impact that it underscores how the implementation of sensory strategies can reduce both hyper as well as hypo-arousal, creating balanced conditions for regulation across the diverse sensory profiles of each student (Arky, 2025; Dunn, 1997).

More importantly, the findings that had been observed prominently focus on how regulation was not just a solitary endeavour but was co-constructed with teachers and peers (Howley-Rouse, 2024). Rubin et al. (2013) explains the role that emotional regulation plays, and how it can be understood as a socially supported process where teachers play the role of scaffolding students' regulatory capacities (Howley-Rouse, 2024). In the instance of this study, teachers can be more attuned to responses and the design of the task itself, which scaffolds students' ability to manage their emotions. To support this notion, teacher reflection notes that the sensory integrated task created more calmness amongst the students. The teacher explained how Capri was presenting her frustration and anxiety through hitting which remained consistent through the entirety of the first week (Capri is a student who regularly reflects dislike through hitting), but as soon as the sensory task had been presented, this behaviour had immediately stopped which was quite surprising for the teacher to witness and experience.

From a more pedagogical perspective, these findings taken together challenge the common perspective of framing regulation as a prerequisite to learning, explaining the idea that students must first be calm and in the right behavioural zone to participate in any task (Kane, 2018). However, within the study, regulation specifically took the stance of being an ongoing process, one which was embedded within learning activities. Hence, the sensory integrated task enabled students to regulate as they engaged, as opposed to only being able to complete the task if regulation was present (Howley-Rouse, 2024). This blurred the artificial boundary between behaviour management and academic work which is significant especially in the practice of inclusive education, as it strongly suggests that regulation is not something that needs to be externally imposed through having control-oriented strategies, but can also be fostered within the structure of the task itself as displayed in the research (Howley-Rouse, 2024). Not only this, but the findings also deeply resonate with the embodied cognition

perspective, which argues that the way in which learning occurs is deeply grounded in bodily experiences and sensory interactions with the environment (Wilson, 2002). In this view, emotional and behavioural is not deemed as only peripheral to cognition but rather as integral. The observed improvements and effects in regulation amongst students when presented with the sensory task supports this position and furthermore shows how embodied engagement has the power to stabilise emotional states and support persistence in activities like literacy which can be cognitively demanding for autistic students.

By embedding opportunities for regulation to occur within tasks, there is space for sensory-responsive pedagogies to reduce distress (Dunn, 1997). Hence, it is important to note that regulation is not a precondition, but instead an active and relational process that should be interwoven into learning processes for autistic students, to truly provide students with the best opportunities for learning development.

5.5 Teacher reflections and feasibility

When focusing on teacher reflections, the feedback provided was crucial in gaining a stronger perspective on the feasibility and impact that sensory integration strategies have within classroom learning tasks. Teacher reflections also strongly provided critical and integral insight into how sensory elements not only benefited students but had transformed the broader learning environment for students too. The teacher who partook in the study and completed the research described that in week two it was more relational, less reactive, as well as emotionally more sustainable for themselves as educators. They had spoken of experiencing "*lightness"* and *"curiosity"* in the classroom, in contrast to the control-oriented, as well as high-stress atmosphere and study conditions presented in the first week. The sensory task was perceived not simply to manage students' behaviour, but rather as a catalyst for deeper learning, connection, and co-regulation (Howley-Rouse, 2024). The teacher

reflected that with the sensory integrated version of the task, there was less prompting, experienced fewer behavioural outbursts, and observed a calmer and more fostered classroom atmosphere. This not only supported students learning outcomes but also alleviated the workload as it decreased the constant need for redirecting student, and those who may be dysregulated otherwise. The teacher shares *"I was no longer having to tell Capri "Please be gentle to my body" or needing to spend over five minutes to help Perry be redirected to their seat as they would instantly run away. For once I was able to sit for the entire duration and see these students happily engaged and witness the flow on effect that it had for those around them."*

The teacher also expressed a renewed sense of professional agency, reporting that the integration of sensory tools had allowed them to observe, adapt, and engage with students in a more nuanced and responsive way. At the same time, the teacher also acknowledged the challenges around feasibility, particularly about the importance of additional training, access to resources, and institutional support to encourage sensory integration within educational institutions. Despite acknowledging practical challenges, educators still overwhelmingly supported the feasibility and value of sensory based methods and integration within literacy tasks, and its increased potential if there were adequate resources and guidance in place to integrate the approach within the learning curriculum for autistic learners (Inclusive teach, 2024). However, the study also revealed the importance of individual differences that call for flexibility and caution in implementation. These outliers and exceptional cases had emphasised the need for student agency in choosing sensory inputs, as well as the importance of ongoing observation as well as adaptation.

While the sensory integration strategies had been perceived as beneficial, and the teacher shared how powerful and effective the method was, to ensure that this is shared across teachers and implemented in the appropriate way, they mentioned the importance of

professional development as well as systemic investment to make the approach sustainable in the long term. This also mirrors broader discussion within the Aotearoa, New Zealand context, which outlines the inequities experienced where access to diagnosis as well as specialist support remains uneven, often resulting in a hindrance in inclusive practice (Bowden et al., 2020). Importantly, the teacher emphasised that the benefits of sensory integration had outweighed all of this, viewing the method as one that should not be perceived as optional but as necessary for supporting autistic students, and giving students the best opportunity for optimal growth (Inclusive teach, 2024).

5.6 Theoretical connections

The findings of this study extend existing theoretical frameworks that inform understanding in relation to sensory processing, engagement, as well as inclusive pedagogy. By situating the foundation of this study and its key findings with core theories of Ayres (1972) sensory integration theory, Dunn's (1997) sensory processing frameworks, the Universal design for Learning model (Sharma, 2024), alongside the principles and understanding of embodied cognition (Wilson, 2002), there is a demonstration of how sensory integration can be understood as a neurological and pedagogical phenomenon. Additionally, the findings also resonate with neurodiversity affirming practices, reframing the common notion that views autistic learners as passive recipients of accommodation, to instead viewing them as active participants whose sensory worlds and experiences shape the possibilities of inclusive education (Kapp et al., 2013).

5.6.1 Ayres sensory integration theory

Firstly, Ayres (1972) sensory integration theory remains pivotal to this research study, as it argues how learning and adaptive behaviour is dependent on the brain's ability to organise and interpret sensory input in an effective manner. Disruption during this phase, as

suggested by Ayres (1972), typically results in difficulties with maintaining attention, behaviour, and participation. When reflecting on the findings of this study, it was apparent that the patterns which had been observed were supportive of this theory. During the non - sensory task, students were reflecting signs of withdrawal, resistance, and the need for prompting and hand-to-hand guidance. In contrast, when students were presented with the sensory integrated task, they were provided with opportunities for tactile, vestibular, and proprioceptive regulation, which provided children with a realm to stabilise their arousal level and in turn resulted in participation that was purposeful.

These results, taken together, affirm Ayres (1972) central claim that for learning, sensory processing is foundational, demonstrating that literacy tasks which are designed and created with sensory supports and integration can support students learning outcomes and development, as well as make classroom learning neurologically more accessible for autistic students. Not only this, but this current study is also one that extends Ayre's (1972) sensory integration theory beyond just clinical and therapeutic contexts. While a substantial portion of the early sensory integration literature was on individualised therapy that had been delivered within specialist settings, this research shows how sensory principles can be embedded within everyday practice and in a routine manner at a place that autistic learners spend a vast majority of their developmental age within (Randell et al., 2022; Schaaf et al., 2014). Having this extension can be transformative as it situates sensory integration and the implementation of it not just as a treatment model, but as a practical, as well as inclusive approach within educational practice.

5.6.2Dunn's sensory processing framework

In a similar manner, this research has also taken guidance from Dunn's (1997) model of sensory processing. The framework is one that identifies four basic patterns: sensation seeking, sensation avoiding, sensory sensitivity, and low registration. These basic patterns are

all shaped by the individual thresholds that each person has towards sensory input, and corresponding behavioural responses (Dunn, 1997). The varied responses of students are illustrative of how sensory-integrated tasks can address a diverse range of processing styles. For those that were identified as sensation seekers (Capri, Loraine, Perry), having the sensory task and multisensory opportunities offered rich stimulation that allowed them to channel their drive and passion for novelty in a way that was proposed and academically meaningful. Calming sensory anchors also reduced their likelihood of feeling anxious or overwhelmed, hence supporting their regulation and persistence. Having sensory tools such as a scoop within the study also supported this notion, giving confidence to students that if they did not want to touch with their bare hands they did not need to. Having these measures provided students with the opportunity to capture their attention and for them to sustain involvement without feeling overwhelmed.

By demonstrating benefits amongst the diverse sensory profiles of students and across different sensory processing profiles, the findings and observations reinforce Dunn's (1997) proposition, viewing sensory processing differences not as deficits but as variations that require substantial and thoughtful environmental and personally catered design (Kapp et al., 2013). More importantly, the study shows that teachers can play the role of addressing this diversity in an initiative-taking manner through the way in which tasks are designed, knowing that a one size fits all approach is not suitable (Howley-Rouse, 2023). Task design can also be the method that is put in place instead of constantly pushing for behavioural management for true development and growth to occur.

5.6.3 Universal Design for Learning (UDL)

The principle of the Universal Design of Learning (Moffat, 2022), which has been widely adopted through education organisations in Aotearoa, New Zealand, advocates for there to be a vast range for engagement, representation, as well as expression to occur and

accommodate the diversity of learners, promoting inclusive education. The sensory integrated task exemplifies this approach as it provides multiple entries into the literacy task itself, giving students the opportunity to engage with tactile manipulatives for kinaesthetic access, visual supports through the display sheet to anchor comprehension, as well as movement-based components allowing children to stand up and move around whilst doing the task. This all helped in offering bodily pathways into learning, and such multiplicity enabled students to access content, and choose preferred modes of engagement which best aligned with their sensory preferences and profiles.

Hence, this study's alignment with the UDL model of learning is particularly evident through the shift that had occurred from compliance to autonomy in the observed participation (Moffat, 2022; Sharma, 2024). When the task that students were given allowed them to make their own choice and allowed for sensory alignment to occur, students were observed to move from externally prompted involvement, where a teacher was required to consistently guide and instruct, to now being able to participate in a way that was reflective of intrinsic motivation. This outcome and core finding truly illustrated that UDLs emphasis on ensuring that there are flexible and adaptable learning pathways, is genuinely a practical necessity for autistic learners, especially in contexts such as literacy or even numeracy that commonly and traditionally have been dominated by static, desk-based approaches (Moffat, 2022; Sharma, 2024).

5.6.4 Embodied cognition

The observed role that sensory input had played in this study in regard to sustaining attention as well as regulation also deeply resonates with theories of embodied cognition, which posit that learning is grounded in bodily experiences and sensory interaction with the environment (Wilson, 2002). Regulation was not a prerequisite of engagement for children to participate in this study but rather emerged through embodied interaction with the sensory

material. For example, through textured material such as the kinetic sand, play dough, and rice, all enabling students to self-soothe while simultaneously engage in the literacy task in a manner that did not feel like a burden. It demonstrated how regulation and cognition are intertwined (Howley-Rouse, 2024). This challenged the commonly known cartesian separation of mind and body, which had historically shaped the way in which educational practice occurred (Herman & Hoffman, 2019). Instead, these findings affirm the idea and understanding that sensory as well as motor activity are not peripheral to cognitive development but rather can be essential to it. For this reason, embodied cognition provided a strong theoretical rationale for why sensory integration does not only support behavioural regulation but also support deeper cognitive investment in learning (Wilson, 2002).

5.6.5 Neuro-affirming perspectives

Finally, the obtained findings also strongly resonate with neuro-affirming perspectives, which are known to challenge the common deficit-based narrative of autism, and instead frame such neurological differences as valuable forms of human diversity, whilst also acknowledging areas of support required (Kapp et al., 2013). In this study however, such behaviours were revealed as a response to inaccessible tasks rather than viewing it as an intrinsic deficit. When the task changed to the second week's sensory task, students demonstrated agency, more curiosity, as well as persistence – all qualities which would be disregarded in deficit-based models (Kapp et al., 2013).

To support this idea and underscore this shift, the teacher reflection provided insight through the change in mindset from viewing such behaviours or outburst as "*problems to be managed*" to now "*learners who are capable to self-regulate and direct when supported appropriately*". This shift is one that aligns with calls in the Aotearoa, New Zealand context to decolonise and de-pathologise education, recognising and perceiving autistic learners as active contributors to inclusive classroom rather than as passive recipients of accommodation

(Hood & Hume, 2024).

Taken as a whole, these foundational theoretical connections all highlight the way the findings both affirm and extend existing frameworks. Ayres (1972) and Dunn's (1997) models both explain the 'why' behind sensory integration to support and promote regulation and engagement, whilst the UDL (Moffat, 2022; Sharma, 2024) model situates these practices within an inclusive pedagogy that advocates for inclusive education where autistic learners are provided with the appropriate support and opportunities to personally and academically thrive. On the other hand, embodied cognition (Wilson, 2002) also reveals the inseparability of regulation and learning, while the neurodiversity affirming perspective (Kapp et al., 2013) is one that reframes autistic participation as agency rather than compliance. By weaving these perspectives together this research highlights that sensory integration within curriculum and literacy tasks specifically, is not just an add-on strategy, but rather a transformative approach that challenges traditional assumptions of learning, behaviour, as well as inclusion.

5.7 Implications for practice

The research provides some evidence of how integrating sensory methods within everyday literacy tasks can aid in supporting and transforming the educational experience of autistic students. By affirming theoretical frameworks, the results suggest implications not just for teachers, but also for schools, educational institutions, and policymakers who seek to create inclusive environments that not only support autistic learners' agency, but also their equity and wellbeing. This section delves into four key areas of practical application: (1) classroom strategies for sensory-responsive pedagogy, (2) teacher roles and professional development, (3) collaboration with specialists, and (4) systemic considerations for inclusive education in Aotearoa, New Zealand.

5.7.1 Classroom strategies for sensory-responsive pedagogy and support for teachers

At the classroom level, these findings suggest and identify that sensory integration should not be treated as supplementary, but rather as the core element within learning for autistic students. Teachers can design individualised literacy activities that integrate tactile, visual, auditory, and movement-based components, according to students' sensory profiles for the best learning outcomes (Ayres, 1972). Examples of this can include using textured letters, incorporating rhythm or songs into reading activities, or incorporating movement breaks for longer tasks. This approach aligns with the Universal Design for Learning (UDL), encouraging teachers to anticipate variability and provide multiple avenues for engagement to occur from the outset (Moffat, 2022; Sharma, 2024).

Additionally, this research highlighted that engagement is both dynamic as well as individual. For some students such as Quartice and Ashton, new sensory tasks were approached with caution, which initially required repeated opportunities to engage before they were able to successfully engage with the task independently. Thus it was important to offer choice as well as flexibility rather than forcing a single mode of engagement which might not be appropriate. Ashton was given the option to use a sensory tool as he displayed a little discomfort on getting his hands messy, and doing so allowed him to engage with the task much more effectively knowing that he was not being pushed to do something he did not like. Doing so, respected students' agency whilst also accommodating the diverse and varying sensory profiles of each of the students (Howley-Rouse, 2024). In practice, this could entail allowing students to select between tactile as well as visual material or perhaps even choosing whether they are wanting to engage with a movement-based element whilst performing a task (Howley-Rouse, 2024).

The reflections from the teacher highlighted a shift in professional roles transforming the role of the teacher from being enforcers of compliance into collaborators whose aim is to

scaffold student agency (Howley-Rouse, 2024). To sustain this shift, the implementation of professional development would be necessary. Research in Aotearoa, New Zealand have reported limited training for teachers in the field of autism, specifically about learning interventions and strategies (Autism A, 2024b). Providing teachers with learning opportunities that goes beyond theoretical foundations and explores and identifies practical strategies of sensory integrated methods for literacy learning not as a "fix" but targeted at educating teachers on how to design tasks where the students strengths, sensory needs, and preference are acknowledged and central (Hood, 2023). In this manner, professional development should also be a collaborative approach, one that involves opportunities for teachers to share and explain their own strategies that they have implemented, reflect on challenges they may have faced, as well as understanding ways in which practices can be adapted to their unique classroom contexts.

5.7.2 Supporting inclusive education

This research while small points to the value of other professionals in developing and implementing educational strategies for autistic learners. Occupational therapists bring expertise in the field of sensory processing and can provide valuable advice on how to tailor tasks to specific sensory profiles (Grandisson et al., 2020). Occupational therapists have knowledge as well as information regarding each student's individual sensory profiles, hence, such knowledge and collaboration with teachers can ensure an action plan for literacy that considers each student's needs, preferences, and requirements (Çorakcı & Bumin, 2025; Grandisson et al., 2020).

Teacher aides also play a pivotal role in the classroom, and hence discussing potential ideas is beneficial as they too provide hands-on support that is necessary for sensory strategies to be implemented in real time (Gibbs & Beamish, 2024). Regular meetings with teacher aides can also generate valuable feedback on how students are responding and where

changes and adjustments may be seen as necessary. In this research, the teacher mentioned how weekly meetings allowed them to communicate with teacher aides about their vision but also gain feedback from teacher aides in the way that programmes work and any possible changes. She mentions *"there is so many things that I do not pick up myself in the moment and the teacher aides do, so it is so essential for me to discuss with them and always ask for their opinions. Because I am always the one to be conducting one to one work, I do not quite realise how students are doing elsewhere."* Building such collaborative structures into school timetables can assist in ensuring that sensory integration is not left to just the individual teachers to manage in isolation, but rather a collective approach where expertise from all angles work together for the best solution.

At a more systemic level, the findings from this research raise questions about the additional resources and training needed to make sensory integration part of a curriculum. This would require support from government and practical investment in resources as well as with professional training and development (Bazyk et al., 2015; GriffinOT, 2024). The teacher noted the current funding model is different for each school. Another important implication is in relation to how participation is understood as well as conceptualised within a school setting. Rather than viewing autistic students through a deficit lens, the research of Kapp and Colleagues (2013) highlights a need for broader measures to incorporate agency as well as ownership, wellbeing, and meaningful engagement as true and core indicators of success. Having such a shift would align with neurodiversity paradigms and affirm that inclusion is not merely about assimilating learning into concrete and preexisting structures, but more so about transforming structures to recognise and acknowledge the diverse and unique ways of learning and being (Kapp et al., 2013). The current research supports sensory integration as a way to reframing behaviour and engagement as relational outcomes of the way tasks are designed for students to support curiosity, confidence, autonomy, comfort, as

well as persistence – all of which are qualities that often obscured in a deficit perspective (Kapp et al., 2013).

This reframing and change of perspective align with global calls for neuro-affirming perspectives, which have a specific emphasis on valuing the importance of designing environments and opportunities that support students as opposed to suppressing their neurological differences (Kapp et al., 2013). Within the Aotearoa, New Zealand context, this perspective also resonates with Kaupapa Māori principles of education that emphasise and prioritise the importance of relationality, holistic wellbeing, as well as respect for individual strengths (Savage et al., 2014; Smith, 2017). Thus, the sensory responsive pedagogy is one that contributes not only to autistic inclusion within school settings, but also to broader efforts to decolonise and humanise education.

5.8 Strengths, Limitations and Future Research

As with any research study, it is crucial to acknowledge both the strengths and limitations of the research to ensure that the findings are situated within the appropriate context. This section outlines the contributions that this study makes, whilst also reflecting on the methodological and contextual constraints. It concludes by identifying areas for future investigation and research that can expand on the insights that have been generated from the study.

One prominent strength of this study lies in the research's ecological validity. Rather than examining sensory integration with a clinical or therapeutic setting which previous research in this field had been conducted within, this research is situated within a real-life context of a classroom, and the study was presented during regular literacy activity sessions that were already being conducted in the classroom (Randell et al., 2022; Schaaf et al., 2014).This ensured that the findings were reflective of an authentic learning environment,

and a place where teachers, students and peers demand intersect. The ability to observe sensory integration in action allowed for valuable contributions and knowledge towards the field of sensory integration that extends beyond clinical or therapeutic settings.

Another strength of this study was the research design allowing data observations and interviews across time. The process of having structured classroom observations which had been complemented by teacher reflections, ultimately offered both a perspective on engagement, regulation, and participation. Having this triangulation is one that enriched the analysis, allowing for a nuanced understanding of how sensory techniques shaped the literacy task and learning dynamics. Having the teacher give feedback was crucial as they are central to this practical implementation of inclusive pedagogy. Not only this, but the research advocates the importance of shifting from a deficit-based evaluation of autistic behaviour, towards a more positive and strengths-based approach that values a neuro-diversity-affirming perspective that does not view behaviours of disengagement or withdrawal as problematic (Kapp et al., 2013). By documenting observations of autonomy, curiosity, and persistence, the research highlights the opportunities for autistic learners when their sensory needs and profiles are acknowledged and respected. Hence, the research challenges dominant narratives that understand participation to occur with compliance and rather focuses on positioning the method of sensory integration as an essential tool to foster agency and ownership as opposed to control (Howley-Rouse, 2024; Wiliams, 2017).

The main limitation is that this study was conducted in one New Zealand special school with a group of five autistic learners. The methodology works for such as the classroom as they were minimally disruptive but are also time and resource intensive and are reliant on researcher observations. Future research could include more rigorous outcome measures to measure success of different tasks. Additionally, more research is needed in different schools with more learners. For example, within mainstream classrooms where there

is a mix of neurotypical and neurodivergent students and where the ratio of neurotypical students to neurodivergent in the classroom is vastly different to what it would be in a special school setting, the challenges that are experienced may be very different and present a dynamic that is not the same and not captured within the research conducted (Ashburner et al., 2010). A further limitation is the lack of focus on different cultural understandings of autism including Māori and Pasifika students (Autism A, 2024). Future research could focus in on research grounded in Māori and Pacific methodologies and schools.

Another limitation of the study is the potential duration of only two weeks of field research and observations. Although immediate improvements and changes in engagement, participation as well as regulation had been identified and observed across this period, it remains unclear the lasting benefits and improvements that this sensory integration method has on students. For this reason, longer-term research which spans for potentially a few months would help to determine whether these observed improvements remain sustained and whether students continue to build on these skills over time.

A key priority for future research would be to conduct a longitudinal study that further extends this current research to examine the sustained impact that sensory integration implementation in literacy tasks for autistic learners has over a course of months. Presenting such research could help in determining whether improvements associated with engagement, participation, and regulation translate into broader academic achievement, social inclusion, as well as wellbeing outcomes. Furthermore, research that was co-designed with autistic learners would be beneficial.

Another important direction that can be explored is the role of sensory integrated literacy tasks in the context of a mainstream classroom, where several autistic students also spend their schooling years (Ashburner et al., 2010). Although a special school setting provided a concentrated setting for studying for autistic students, a large portion of autistic

students attend mainstream environments, both here in Aotearoa, New Zealand as well as internationally (Ashburner et al., 2010). Hence, exploring how sensory integrated strategies can be altered and adapted to such a context would expand the study relevance and promote inclusion on a larger scale.

Lastly, future research can also aim to investigate the systemic and institutional dimension that sensory integration holds. For example, this would include examining the ways in which training programmes for teachers, resource allocation, or even policy frameworks can all serve to enable sensory response practice to occur effectively, or in contrast restrain it. Having research that foregrounds these important and structural factors can help in ensuring that the implementation of sensory integration methods for teaching literacy to autistic learners is not left to the discretion of individual teachers and their own initiative, but rather something that becomes embedded within more broader systems of inclusive education for all students regardless of ethnicity, education, or socio-economic status.

5.9 Conclusion

This thesis highlights the impact that sensory integration methods within literacy tasks have on engagement, participation, as well as regulation for autistic learners in a New Zealand specialist school context. The findings observed demonstrated and explained a consistent pattern: when sensory elements are incorporated and integrated within literacy tasks, learners displayed heightened curiosity, more autonomous participation, as well as improved regulation. Across behavioural, affective, and relational dimensions, the sensory-integrated task were observed to consistently produce more sustained, joyful, and autonomous engagement compared to the non-sensory equivalent. These findings specifically suggest that engagement is not just simply about compliance or productivity, but also about

how learners are supported to access, sustain, and enjoy their participation in learning.

Ayres (1972) sensory integration theory as well as Dunn's (1997) sensory processing framework both provide a solid foundation and neurological basis for understanding why sensory implementation and stimuli support and enhance participation. The Universal Design for Learning (Moffat, 2022; Sharma, 2024) also positions these practices within an inclusive pedagogy, one that values and acknowledges flexibility and learner choice, viewing students as the experts of their own knowledge. Finally, embodied cognition (Wilson, 2002) ties into the research as it highlights the inseparability of regulation as well as learning. This works with the neurodiversity paradigm reframing and viewing autistic participation no longer as a deficit (Kapp et al., 2013). Together, these foundational perspectives and theories all illustrate that sensory integration is not an extra intervention, but rather one that serves as a transformative pedagogical approach.

The practical implications of a sensory integration method within literacy tasks are also important. Within a classroom setting, and for teachers, sensory integration offered a strategy to make literacy tasks accessible and engaging for students as it considers students sensory profiles and sensory needs. Additionally, for teachers, it allowed their role to shift away from managing behaviour, to facilitating learning. The findings also point to the importance of resourcing, training, as well as policy recognition and professional development support to ensure consistent access is available for autistic learners. Importantly, the study challenges the common deficit-based narrative of disengagement, which categorises students' disengagement as problematic, demonstrating that when tasks presented to students are designed in a manner where sensory needs are acknowledged and valued, autistic learners are able to engage, connect, as well as participate with more motivation and with self-direction (Kapp et al., 2013).

In conclusion, this study provides support that sensory integration when implemented

within literacy tasks for autistic learners can function as a catalyst promoting inclusion, shifting classroom practices from compliance-driven participation to more authentic engagement where agency and ownership are encouraged. By embedding and implementing such sensory strategies within the everyday pedagogy of literacy tasks, schools can support in creating an environment and learning opportunity that support students' engagement, participation, and regulation whilst also affirming diversity, nurturing wellbeing, and extending the possibilities of education development for all autistic students.

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Appendix A: Consent to use/enter Specialist School

Himali Soma
Massey University – Master's of Science [redacted]@gmail.com
Date: 20 April 2025

Request for Permission to Conduct Research at Specialist School

Dear [redacted] (Principal of Specialist School)

I hope this letter finds you well. I am writing this letter to formally request permission to conduct research at Specialist School as part of my Master's thesis research project. My research is focused on understanding the effects of sensory integration strategies on student engagement as well as learning outcomes for autistic children within the Specialist School.

Having the experience of a Teacher Aide at the Specialist School, I have been able to gain a profound understanding and insight into the significance that sensory integration holds to support students learning endeavors and their engagement capabilities. This study therefore aims to contribute to the growing knowledge of sensory integration within a classroom setting for autistic children, but more specifically within learning tasks that are delivered to children.

Research Details:
Participants: We will require 4-5 autistic children, aged 5-7, who experience difficulty engaging in learning tasks (selected based on teacher recommendation and with parental informed consent).We seek to gain insight from your administrative team, and specialists, to ensure that participants that are selected are best suitable for this study.

Methodology:
This research adopts an observational case study which will be conducted over two weeks. During this time, we will be comparing student engagement in sensory-integrated tasks versus non-sensory-based tasks.

Data Collection:
Structured classroom observations, teacher interviews, and field notes focusing on student engagement, sensory responses, and task performance.

Ethical Considerations:
The study will strictly adhere to ethical guidelines and requirement to uphold the mana and rights of all participants involved. This will include obtaining informed consent from parents/guardians for all participants, maintaining participant confidentiality through the use

of pseudonyms for participants as well as the organisation, as well as ensuring that students wellbeing is a priority through providing the chance of opting out if the research study task is to overwhelming or discomforting. Furthermore observations of the tasks will be recorded, but we will ensure to not capture the students face to maintain confidentiality, and also ensure that this data is only accessible to the research or supervisor via a password protected device.

Institutional Support:
For this research, institutional support will be appreciated. I kindly request permission to:

1. Conduct classroom observations of selected students during structured sensory-integrated and non-sensory-based tasks.

2. Interview classroom teachers regarding their experiences and perceptions of sensory integration strategies. This will take place outside of school hours, but within the teachers classroom to ensure that the location of these interviews are safe and secure.

3. Use school facilities and materials necessary for the implementation of sensory-based tasks.

It also comes to my attention, the importance of ensuring that children that do participate, do not feel a disruption not the school environment. For this reason, the teacher will conduct the research, whilst I as the researcher will observe, to ensure that children are not overwhelmed with an unfamiliar person. Therefore, this research will be conducted in alliance and collaboration with classroom teachers as well as Specialist Schools policies and schedules. I am more than willing to discuss any modifications or additional measures required to align with the school's protocols.

I would truly appreciate the opportunity to meet with you or the relevant school representatives to further discuss the research proposal and to also discuss any possible questions or queries that you may have.

Please sign below, if you consent for this research project to take place at your Specialist School

Best regards, Himali Soma

Researcher Contact Details: Himali Soma
Email: [redacted]@massey.ac.nz

Supervisor Contact Details: Dr Kathryn McGuigan
Email: K.Mcguigan@massey.ac.nz
Phone: +6492136115

Appendix B: Information Sheet for parents

Research Study: Exploring the Impact of Sensory Integration Strategies in Autism Education

My name is Himali Soma and I am a student researcher with Massey University's School of Psychology. I am studying for my Master's of Science, and I am doing a research project as part of this programme.

What is this study about?

The chosen Specialist School has agreed to partner with me on a research project for my Master's Thesis. The purpose and aim of this study is to explore the impact of integrating sensory-based activities within classroom learning tasks affects learning engagement for children with Autism Spectrum Disorder (ASD).

Many autistic children experience challenges in staying focused and engaged with traditional learning tasks often making them feel overwhelmed and anxious. Therefore, this research study aims to see if integrating sensory elements (like textures, movement, or visuals) into tasks can create profound difference in students participation and allow them to perform learning tasks more comfortably and effectively.

What will participation involve?

I would like to ask you for your permission to observe your child in the classroom over the period of two weeks (between May and June, 2025).

If you agree for your child to take part, as part of their typical school day they will take part in two different tasks:

- Two types of tasks will be used in your child's classroom:
- Week 1: Non-sensory task (e.g., a typical worksheet matching letters to pictures).
- Week 2: Sensory-integrated task (e.g., a fun "Letter Safari" where children find letters hidden in sensory materials like sand, playdough, and rice).

Both tasks will be taught by your child's regular classroom teacher to ensure consistency. I will be present in the classroom as a non-participant observer, simply watching how the children engage with the tasks.

I would also like to ask you for permission to video just the period of time where they are doing either task one or task two. This recording will not be used in my thesis, rather I would like to use this data to note different aspects e.g., time spent with the task, facial expressions during task, body movements.

What data will be collected?

During the tasks, I will observe and record:

- How long your child stays engaged with the task
- How focused and comfortable they appear
- How they interact with the sensory materials
- Their ability to complete the task
- Any signs of anxiety or distress

Children's observations will be recorded, capturing only their hands and back performing the tasks, not their faces. All recorded data will be protected and secured on a password protected device to ensure that the content remains confidential and only accessible to the researcher and their supervisor at all times.

Additionally, after the activities, your child's teacher will be interviewed to share their observations about how the tasks worked for the students.

Will my child's privacy be protected?

Absolutely. All information that is collected by the researcher will be kept confidential. Your child's real name will not be used in any reports or publications. Instead, each child will be given a pseudonym (fake names) which will be used to protect their identity. The school will also not be identified in my thesis. The recorded data is only used for me to analyse observations around engagement, kept for the duration of the project and then destroyed. The focus of the research is on the value of different sensory tasks for learning and engagement in a real-world setting, so your child's identity will be protected.

All data will be securely stored on password-protected devices, accessible only to myself and my supervisor.

Are there any risks?

The activities are designed to be safe and enjoyable for all children to perform. Despite this, we

are also cautious of the many sensory sensitivities that autistic children may have. To ensure that children feel safe and comfortable, we will monitor and observe any signs of distress, or discomfort, to pause the task immediately if we believe the task is affecting them in a negative manner. The researcher and teacher will discuss necessary adjustments that can be made to the task to address the discomfort, and if we believe it to be overly stressful for the child, we will decide whether it is best for them to opt out. This will be done in consultation with the teacher and you as the parent.

Participation is will be completely voluntary, and you are free to withdraw your child any time up to two weeks following the data collection period.

Are there any benefits?

This study may help teachers better understand how sensory-based learning activities can support children's engagement and participation. The insights gained could improve teaching strategies at the chosen Specialist School and potentially other schools, supporting more inclusive learning environments for autistic children.

What happens next?

If you agree to the information provided in this documents and are happy for your child to partake in this study, we request for you to please read and sign the attached consent form, if there are any concerns or questions In regards to this research study, please feel free to contact me or my supervisor.

Researcher Contact: Himali Soma [redacted]@massey.ac.nz

Supervisor Contact:
Dr Kathryn McGuigan K.Mcguigan@massey.ac.nz Phone: +6492136115

Committee Approval Statement

This project has been reviewed and approved by the Massey University Human Ethics Ohu Matatika 3, Application OM3 25/25. If you have any concerns about the conduct of this research, please contact the Chairperson, Massey University Human Ethics Ohu Matatika 3, email humanethics3@massey.ac.nz.

Appendix C – Interview questions for teachers

Interview Questions
1. Can you please describe your teaching background, particularly your experience in special education and amongst Autistic children? 2. How would you describe the classroom dynamic? what do you believe works best for your students to reflect engagement with learning tasks and activities? 3. Have you previously implemented any sensory-based learning strategies in the classroom yourself? If so, what were they, and how did students respond? 4. When conducting this research activity, how feasible did you find implementing the sensory based 'Letter Safari' task within the existing classroom routine/work rotation? 5. Did you observe or encounter any logistical challenges (e.g., time, resources, student management)? 6. What support or resources would you like to receive, or would be helpful to better support the success of sensory integration strategies in the classroom? 7. How manageable or challenging was it to conduct both the non-sensory and sensory-integrated tasks under the same conditions? Did you face any obstacles? 8. How did students respond to each task type? Were there noticeable differences in their engagement or performance? 9. Did you observe if students showed a particular interest in, or discomfort with, any specific sensory material used? 10. Overall, when reflecting back on the tasks that you had conducted for this research study, what are your impressions of the sensory-integrated task? Do you think the task made a positive effect or impact on the child's learning?

11. Do you think sensory-based tasks could be integrated into the curriculum regularly? Why or why not?
12. Do you have any recommendations or suggestions for adapting or improving the sensory-integrated task for future use?

Appendix D: Teacher information sheet

Research Study: Exploring the Impact of Sensory Integration Strategies in Autism Education

My name is Himali and this information sheet is to give you information about my research project as part of my Master's of Science in Psychology.

Invitation to Participate

You are invited to participate in a research study which will explore how sensory integration strategies are implemented and experienced within a classroom setting for children with Autism Spectrum Disorder (ASD). This research aims to better understand the effects of sensory-integrated learning tasks on student engagement, participation, and learning outcomes.

Purpose of the Study

This study seeks to examine how sensory-based interventions are implemented practically in classroom environments and how they influence both student learning and engagement. Specifically, it involves observing and comparing two types of learning tasks—one incorporating sensory integration strategies and one without such strategies.

What Your Participation Involves

As a participating teacher, you will be:

Conducting two types of pre-designed learning tasks (one sensory-integrated, one non-sensory-based) with selected students over a two-week period. Parents' permission will be sought prior to data collection.

- Receiving prior guidance/training on how to deliver both tasks consistently.
- Being observed during the task delivery. The primary researcher will record observations related to student engagement, participation, and sensory responses.
- Participating in a short, semi-structured interview after the observation period. This will occur at the end of each 5 days through a 30-minute interview for each child to allow teachers to share their reflections on the feasibility, benefits, and challenges of sensory integration strategies. This will be recorded with your permission.

Your teaching methods and facilitation style will not be judged or evaluated; rather, the focus is on understanding the effectiveness and practicality of the sensory strategies.

Confidentiality and Anonymity

You can request that the recording be paused or stopped at any stage of the interview. Recording the data will allow the researcher to re-visit the interview to ensure that no crucial information is missed in the analysis. Once the recording is complete using ScribeSound, which is a secure auto-transcription software, the recording will be deleted from the software to maintain confidentiality. You will also be given the opportunity to review the recording once the transcript is available. You will have two weeks to edit and respond with any changes to their transcript.

All information collected will be kept strictly confidential. Your name, the school's name, and any identifying details will be replaced with pseudonyms in all written reports and publications. Any data collected will be securely stored on Masseys One-Drive which will be accessed through a password-protected device and destroyed five years after the completion of the research.

Potential Benefits and Risks

Benefits: You may gain insights into the practical implementation of sensory integration strategies. Your contribution will help enhance understanding of effective strategies in ASD education.

Risks: Minimal risk is anticipated. Care will be taken to ensure classroom routines are minimally disrupted.

Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- decline to answer any particular question.
- withdraw from the study, until two weeks after the interview.
- ask any questions about the study at any time during participation.
- be given access to a summary of the project findings when it is concluded.

- ask for the recorder to be turned off at any time during the interview.

Contact the research team

Please do not hesitate to reach out to myself or my supervisor with any questions you may have about the study. We are always happy to help and are best contacted via email.

Researcher: Himali Soma [redacted]@gmail.com	Supervisor: Dr Kathryn McGuigan Email: K.Mcguigan@massey.ac.nz Phone: +6492136115

Committee Approval Statement

This project has been reviewed and approved by the Massey University Human Ethics Ohu Matatika 1, Application OM3 25/25. If you have any concerns about the conduct of this research, please contact the Chairperson, Massey University Human Ethics Ohu Matatika 1, email humanethics1@massey.ac.nz.

Appendix E: Parent consent form

Research Study Title: Exploring the Impact of Sensory Integration Strategies in Autism Education

Researcher: Himali Soma Supervisor: Dr Kathryn McGuigan Institution: Massey University

Please read the following statements carefully. Tick each box to confirm your understanding and agreement.

- ☐ I have read and understood the Parent Information Sheet for this study.
- ☐ I have discussed with my child the contents of the information sheet and what will be required before giving consent.
- ☐ I understand that my child's participation in the study is voluntary and that I can withdraw them from the study up to two weeks past the data collection without any consequences.
- ☐ I understand that my child's real name will remain unidentified and will not be used in any reporting of the research and that all information collected will be kept confidential.
- ☐ I understand that the researcher will be observing my child during classroom tasks and will not interfere in the learning environment or the child's normal routine.
- ☐ I understand that if my child shows any signs of distress or discomfort, the activity will be paused immediately.

☐ I understand that the sessions will be recorded just so I can make more comprehensive notes on the child's engagement and that no image or video will be used in any data output.

- ☐ I understand what the research involves, including the two different classroom tasks and the

way data will be collected.

- ☐ I have been provided with the opportunity to ask questions about the research and am satisfied with the answers I have received.

I give consent for my child to participate in this study.

Child's Name: _____

Parent/Guardian Name: _____

Parent/Guardian Signature: _____

Date: _____

Researcher Contact Details: Himali Soma

Email: [redacted]@massey.ac.nz

Supervisor Contact Details: Dr Kathryn McGuigan

Email: K.Mcguigan@massey.ac.nz

Phone: +649213611

Appendix F: Teacher Consent Form

Exploring the Impact of a Sensory Integration Strategy within a Classroom Learning Task in Autism Education: A Case Study at a Specialist School

Researcher: Himali Soma Supervisor: Dr Kathryn McGuigan

Consent Statement

Please read the statements below and indicate your agreement by signing:

1. I have read and understood the Information Sheet provided.
2. I have had the opportunity to ask questions and have received satisfactory answers.
3. I understand that my participation is voluntary and that I can withdraw at any time without penalty.
4. I understand that the data collected will remain confidential and that pseudonyms will be used in all reports/publications.
5. I agree to participate in the delivery of the sensory and non-sensory learning tasks as described.
6. I agree to be interviewed about my experience and perceptions.
7. I understand that my teaching practice will not be evaluated or judged.
8. I understand that data will be securely stored and destroyed after five years.

Teacher's Name: _____

Signature: _____

Date: _____

Researcher's Name: _____

Signature: _____

Date: _____