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The Interrelationship between Sensorimotor Deficits and Maladaptive Behavior in the Classroom

L B Marie Filion
Walden University

Walden University

College of Psychology and Community Services

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L B Marie Filion

has been found to be complete and satisfactory in all respects,
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Review Committee
Dr. Anthony Perry, Committee Chairperson, Psychology Faculty
Dr. Hedy Dexter, Committee Member, Psychology Faculty
Dr. Ann Romosz, University Reviewer, Psychology Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

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Abstract

The Interrelationship between Sensorimotor Deficits and Maladaptive Behavior in the Classroom

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Mainstreaming special education students has created challenges for teachers, resulting in significant lesson time allocated to classroom disruptions related to maladaptive behavior. This correlational study examined the extent to which specific sensorimotor deficits predict maladaptive behavior among special education students (aged 8-12 years) based on archival data of teacher assessments in New Zealand. Piaget's cognitive and affective development theory was used as the theoretical foundation. Results from standard multiple regression demonstrated that higher levels of sensorimotor deficits (vision, touch, taste and smell, body awareness, balance and motion) predicted high levels of maladaptive behavior (internalizing, externalizing, and overall maladaptive behavior indices); similarly, higher deficits in taste and smell predicted low levels of adaptive behavior. These results may lead to positive social change by stressing the importance of early sensory assessment among young school children. In addition, the results may also be used to improve interventions or programs designed to reduce maladaptive behavior in the classroom, reducing teachers' time devoted to managing maladaptive behavior and improving special education students' mental health.

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Dedication

I dedicate my success to my savior Yeshua HaMashiach (Jesus Christ.) I completed this work in Your strength to Your glory. I also dedicate this work to my four children, who allowed "mom" to disappear into her room to do her studies and supported my call to higher education. I am proud of each of you and love you dearly.

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Chapter 1: Introduction to the Study

Classroom management is the most challenging part of teaching (Floress et al., 2018; Hopman et al., 2018; Scherzinger & Wettstein, 2018: Sinclair et al., 2021). In an international survey, one in four teachers reported losing at least 30% of lesson time due to classroom disruptions and administrative tasks (TALIS; OECD 2014 as reported in Scherzinger & Wettstein, 2019). Most of the research examining maladaptive behavior in the classroom typically cite a DSM-5 diagnosis as the cause of the behavior (e.g., Kulkarni, Sullivan, & Kim, 2021). There are few studies examining origins of maladaptive behavior among special education students including the role specific sensorimotor deficits may play in the development of those behaviors. Sensorimotor deficits should be examined to determine the extent to which they are associated with maladaptive behaviors such as withdrawal (Hoff et al., 2017), disrupting other students doing their work, physical and verbal aggression, stealing (Oldfield et al., 2016), hyperactivity, agitation (Kamphaus et al., 2014), problems with social communication (Hannant, 2016), anxiety, depression and somatization (Bartoli et al., 2011), sustaining attention (Hyseni et al., 2019), inability to shift attention (Ibrahim et al., 2016), and self-regulation (Biotteau et al., 2019; Kwan et al., 2013; Lai et al., 2019; Robles et al., 2011). This study examined sensorimotor deficits in relation to each of the maladaptive behavior categories: externalizing behavior, internalizing behavior, adaptive skills, and behavioral and emotional risk index (BERI) score.

The implications for positive social change are vast with the research demonstrating a correlation between sensorimotor deficits and maladaptive behavior.

Students with maladaptive behavior need to be provided with support for their sensorimotor deficits, not simply a program to minimize the behavior. The consequences of less teaching time influence scholastic results for disruptive students and classmates. Mental health problems such as long-term anxiety and depression for the disruptive child are also concerns.

This chapter will begin by reviewing the background literature available on the topic of sensorimotor deficits and maladaptive classroom behavior, followed by the problem statement, purpose of the study, research questions, theoretical framework, nature of the study, definitions, assumptions, scope and definitions, limitations, significance, and finally a summary.

Background

Since maladaptive behaviors in the classroom take up a large percentage of the teacher's time and divert attention away from teaching (TALIS; OECD 2014 as reported in Scherzinger & Wettstein, 2019), research has attempted to find solutions for the maladaptive behavior as opposed to explaining why the behaviors are occurring. For disruptive maladaptive behaviors, the majority of studies concentrate on exploring the use of universal programs that teachers can implement class-wide, ideally with minimum preparation and maximum benefit (Aspiranti et al., 2018; Kirkhaug et al., 2016; Kowalewicz & Coffee, 2014; Maggin et al., 2017; Malboeuf-Hurtubise, 2018; Sinclair et al., 2021; van den Berg and Stoltz, 2018). Many schools in the United States use a form of inclusive classrooms and universal programming, but teachers must maintain the often time-consuming management plans (Aspiranti et al., 2018; Kowalewica & Coffee, 2014).

Special education students have a higher rate of disruptive behaviors when compared to the average student; therefore, special education students' classrooms tend to have a much higher rate of disruptive behavior than the inclusive classroom and, therefore, are not the solution (Abry et al., 2017; Aelterman et al., 2018; Aspiranti et al., 2018; Bradshaw et al., 2019; Flores et al., 2018; Gilmour, 2018; Kowalewica & Coffee, 2014). However, there is scant research on the possible sensorimotor origins of the maladaptive behavior that disrupts classrooms. Therefore, this research examined the special education population and how possible sensorimotor deficits were related to maladaptive behaviors.

Problem Statement

Classroom management is the most challenging part of teaching with an estimated 30% of lesson time being allocated to classroom disruptions and administrative tasks (e.g., Floress et al., 2018; Hopman et al., 2018; Scherzinger & Wettstein, 2018: Sinclair et al., 2021; TALIS; OECD 2014 as reported in Scherzinger & Wettstein, 2019. Students lacking cognitive and social skills can disrupt the classroom and undermine learning (Linca, 2018); special education students made up over 13% of the student population in the 2017-2018 school year (Education Week, 2019). Sixty-one percent of students with special needs are mainstreamed and often exhibit poor self-regulation, reduced attention span, low energy level, anxious temperaments, and impulsive actions (Hui et al., 2016). There is a recognition that students with sensorimotor issues can cause classroom disruptions (Evans et al., 2014) but to reduce maladaptive behavior, increase learning, and lower classroom disruptions, new sensorimotor treatments are needed (Hui et al.,

2016). Recent studies acknowledge the presence of underlying sensorimotor deficits and examine the resulting behavior (e.g., Linca, 2018). Linca (2018) suggested that more research is warranted to examine the relationship between sensorimotor deficits and maladaptive behavior for the purpose of informing classroom management. The basic self-regulation treatment suggests detailed interventions provided to teachers do not sufficiently modulate classroom behavior (Hui et al., 2016) and universal programs implemented in the classroom often add to the teacher's administrative load.

Maladaptive behavior in the classroom can take up a large amount of the teacher's time—the consequences of less teaching time influence scholastic results for disruptive students and classmates. In addition, mental health concerns such as long-term anxiety and depression for the disruptive child are also a concern. Although there is much research on students with ASD with adaptive behavioral problems in relationship to sensorimotor deficits, there is scant research on all students that fall within the special education category who exhibit maladaptive classroom behavior. Most of the research on maladaptive behavior in the classroom has focused on the special education student's diagnosis (e.g., Kulkarni, Sullivan, & Kim, 2021), the impact of maladaptive behavior on academic achievement (e.g., Kessles & Hayder, 2020), and the effectiveness of teacher classroom management strategies to reduce maladaptive behaviors (e.g., Sinclair et al., 2021). The relationship between sensorimotor deficits and children's maladaptive behavior among special education students (aged 8-12 years) was explored. The problem of maladaptive behavior in the classroom is a current, relevant, and important topic within education.

Purpose of the Study

The purpose of this quantitative archived data study was to examine the relationship between sensorimotor deficits and maladaptive behavior in special education students aged 8 to 12 years old in New Zealand via teachers' online surveys. Data analysis included six sensorimotor deficit areas and an overall sensory total score for the predictor variables. The criterion variables under the category of maladaptive behavior were divided into (1) externalizing risk index, (2) internalizing risk index, (3) adaptive skills risk index, and (4) overall behavioral and emotional risk index, as measured by the Behavioral and Emotional Screening System (BESS). The overall behavioral and emotional score was measured using the Behavioral and Emotional Risk Index (BERI). In this study, I evaluated the data through the archived data provided by *Frontiers of Hope* in New Zealand. The archived data contained psychometric tests that were completed by teachers based on their experience with and knowledge of a special education student they had taught for a minimum of six months.

Research Questions

RQ1- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's internalized maladaptive risk index scores, as measured by the BESS, among special education students?

H_{O1} Sensorimotor deficits are not a significant predictor of internalized maladaptive risk index scores.

H_1 Sensorimotor deficits are a significant predictor of internalized maladaptive risk index scores.

RQ2- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's externalized maladaptive risk index scores, as measured by the BESS, among special education students?

H_{O2} Sensorimotor deficits are not a significant predictor of externalized maladaptive risk index scores.

H_2 Sensorimotor deficits are a significant predictor of externalized maladaptive behavior.

RQ3- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's adaptive skills risk index scores, as measured by the BESS, among special education students?

H_{O3} Sensorimotor deficits are not a significant predictor of adaptive behavior skills risk index scores.

H_3 Sensorimotor deficits are a significant predictor of adaptive behavior skills risk index scores.

RQ4- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's overall behavioral and emotional risk index (BERI) scores, as measured by the BERI score on the BESS, among special education students?

H_{O4} Sensorimotor deficits are not a significant predictor of overall behavioral and emotional risk index (BERI) scores.

H_4 Sensorimotor deficits are a significant predictor of overall behavioral and emotional risk index (BERI) scores.

Theoretical Framework

The central theoretical propositions for this research are based on Piaget's cognitive development theory, considering his later writings on the affective component of development (Piaget, 1952; Piaget, 1981). The central theoretical propositions assert that development in the sensorimotor motor stage is vital for maturation to progress to the other three stages. Affective development progresses alongside sensorimotor development. If affective development is immature, other aspects of sensorimotor development may also not align with normal development. Underdevelopment in the first stage leads to underdevelopment in the three following stages and includes affect, which I proposed leads to maladaptive behaviors. The cognitive development theory examines sensorimotor and affective behavior (maladaptive behavior) and thus aligns with the research questions. More details of the theory will be discussed in Chapter 2.

Nature of the Study

The nature of this study was a quantitative archived data study that examined the relationship between sensorimotor deficits and maladaptive behavior (externalizing behavior, internalizing behavior, adaptive skills, and behavioral and emotional risk index (BERI) score) in special education students aged 8 to 12 years old in New Zealand via archived data. The relationship among variables was examined using standard multiple regression analysis. Multiple regression was chosen because the continuous measures for the sensorimotor deficits was be assessed individually with each of the maladaptive behaviors (externalizing behavior, internalizing behavior, adaptive skills, and behavioral and emotional risk index (BERI) score); therefore, multiple regression was appropriate

for this study as it analyzed a predictor variable with one continuous criterion variable. The archived data was obtained through *Frontiers of Hope* in New Zealand through their *School Pay It Forward* project.

Definitions

Accommodation: When a person accommodates information, they re-organize it to fit into an already defined category that they possess within their understanding of the world (Piaget, 1952).

Adaptive processes: Adaptive processes include (dis)equilibrium, assimilation, and accommodation (Piaget, 1952).

Adaptive skills: Adaptive skills include the ability to adapt to daily living situations without externalizing and internalizing behaviors, possess functional communication, adequate social skills to exhibit prosocial behavior with peers, and sufficient study skills to function in the classroom. Students with poor adaptive abilities often need additional support within the classroom (Reynolds & Kamphaus, 2015).

Affective development: Children develop both physically and in their affect. Affect, within this domain, refers to emotional development that parallels physical and cognitive development (Piaget, 1981).

Assimilate: To assimilate information means to take in new knowledge and understand it thoroughly for the purpose of adding to a person's understanding of the world (Piaget, 1952).

Balance and Motion: Balance and motion refer to equilibrium and the vestibular system. Perception in this area may be over-and under-reactive to body sensations (Purham et al., 2021).

Body Awareness: Body awareness may also be referred to as proprioception and includes the ability to sense body position and changes in body position (Purham et al., 2021).

Disequilibrium: Disequilibrium refers to a state the child will experience when encountering new information that does not match their current understanding (Piaget, 1952).

Externalizing maladaptive behaviors: Externalizing behaviors incorporate hyperactivity, aggression, and conduct problems (Reynolds & Kamphaus, 2015), such as disrupting other students' work, physical and verbal aggression, and stealing (Oldfield et al., 2016). Other behaviors that may be seen include sustaining attention (Hyseni et al., 2019), inability to shift attention (Ibrahim et al., 2016), and self-regulation (Biotteau et al., 2019; Kwan et al., 2013; Lai et al., 2019; Robles et al., 2011). Any behavior classified as disruptive to peers and adults falls under externalizing behavior. These children are often not easily redirected by adults and characteristically have more problems with peer relationships (Reynolds & Kamphaus, 2015).

Internalizing maladaptive behaviors: Internalizing behaviors include anxiety, depression, somatization (Bartoli et al., 2011; Reynolds & Kamphaus, 2015), and withdrawal from social situations, which can be viewed as an internal disruption (Hoff et al., 2017).

Hearing: References to "hearing" include the measure for auditory processing of over-and under-reactivity; behaviors can include auditory-seeking and perceptual problems (Purham et al., 2021).

Positive behavior intervention support framework: As a means to work with special education students, the positive behavior intervention support framework was developed. It follows a tier system that includes: (a) Tier 1 is the primary approach to difficulties in the classroom that includes schoolwide or class-wide universal prevention programs referred to as a universal program, (b) Tier 2 focuses on students at risk of challenging behavior, and (c) Tier 3 incorporates individualized interventions, concentrating on students with severe problems (Kowalewica & Coffee, 2014).

Sensory Total: The sensory total refers to the combination of vision, hearing, touch, taste and smell, body awareness, and balance and motion. The combination represents the ability to process sensory inputs (Purham et al., 2021).

Schema: Students use the schema as thought patterns to explain their experiences and environment (Piaget, 1952).

Special education student: In the broader definition, a special education student may include any student with difficulties internalizing behavior, externalizing behavior, or poor adaptive skills. Additional inclusion covers students diagnosed with ADHD, ASD, Conduct Disorder, Oppositional Defiance Disorder, Neurodiversity, Neurodevelopmental Disorder, Developmental Coordination Disorder, or any other behaviorally based diagnosis. Students classified as having a physical disability are also included in this category, for example, deaf or hard of hearing, blind or visually impaired,

and motor disabilities including multiple sclerosis, cerebral palsy, or muscular dystrophy (Reynolds & Kamphaus, 2015).

Taste and Smell: Over- and under-reactivity for taste and smell can be seen in the active seeking or avoiding of taste and small activities with perception in these areas falling out of normal ranges (Purham et al., 2021).

Touch: Tactile perception can include over- and under-reactivity to touch with tactile seeking behavior (Purham et al., 2021).

Vision: The definition of "vision" refers to a range of visual processing abilities that include over- and under-reactivity to visual stimuli, undue seeking for visual input, and difficulties that can include perception and ocular-motor function (Purham et al., 2021).

Assumptions

The primary assumption was that teachers that had completed the psychometric test as part of the Pay It Forward project had a working knowledge of the student to be able to answer questions with a degree of accuracy. This required teachers to have sufficient time to interact with the student, thus accurately assessing the student's sensorimotor issues and behavior in the classroom. Secondly, the teacher completing the psychometric test based their responses on one special education student who may have been diagnosed with ADHD, ASD, Conduct Disorder, Oppositional Defiance Disorder, Neurodiversity, Neurodevelopmental Disorder, Developmental Coordination Disorder, or any other behaviorally based diagnosis, etc. Finally, it is assumed that teachers did their best to answer the questions in the psychometric tests.

Scope and Definitions

The scope of this study was limited to how sensorimotor deficits can influence each of the maladaptive behavior categories of externalizing behavior, internalizing behavior, adaptive skills, and overall BERI score. Ultimately, the goal was to explore solutions for disruptive classroom behavior by examining the origins of maladaptive behavior. Research focused on the origins of maladaptive behavior allows for new strategies and solutions to be developed with the potential to address disruptive classroom behavior.

High internal validity is required to demonstrate a causal link between two variables. Low internal validity is a characteristic of correlational research as variables are not manipulated or controlled (Frankfort-Nachmias et al., 2014). Internal validity is calculated through outcomes via the predictor variables. This is not the focus of correlational research, so internal validity is rendered irrelevant. My research included a data set obtained in New Zealand using elementary school teachers currently teaching or have taught special education students within the last six months. High external validity is more characteristic of correlational research. That is, correlational studies typically have low internal validity because nothing is manipulated or control, but they often have high external validity**.** Since nothing was manipulated or controlled by the experimenter the results are more likely to reflect relationships that exist in the real-world. Teachers that had been included in the Pay It Forward project had taught a special education student for a minimum of half a term; this satisfies sufficient experience with the student to answer the questions (Sawyer et al., 2009). Teachers in the Pay It Forward

project all had two years of teaching experience. The project was not limited to ASD students or a narrow definition of special education students, there is good potential for generalizability.

Limitations

This study's limitations included the use of a correlational statistical method, limiting my ability to infer causation. Teachers might also have been biased towards the student they chose to use to answer the survey. The bias might have been positive or negative and dependent on variables including the amount of disruptive behavior, the level of the teacher's frustration with the student, teacher burnout, and the teacher's stress level at the time of the survey completion. In addition, no independent objective assessments were provided to verify that students were classified in the special education category. I was not be able to verify if the teacher had completed the assessment on a special education student, if the student was on medication, if there were additional supports for the student in the classroom, or if the teacher had been adequately trained in classroom management to help the student with the maladaptive behavior. This research did not cross-reference any formal diagnoses and relied on the accuracy of the teacher's assessment of the student within the Pay It Forward project. The measures chosen in the research had been validated for teachers teaching this population.

Significance

The results from this study have the potential for positive social change by altering how special education students with maladaptive behaviors are viewed. Students with maladaptive behavior are often viewed through their diagnosis and not because of

having sensorimotor deficits (e.g., Kulkarni, Sullivan, & Kim, 2021). This new perspective may lead to the development of new interventions and programs for these students, in turn impacting which special education professionals are added to the team. If maladaptive behaviors decrease, then classroom management will become easier for the teacher. Ideally, this research will encourage using assessment tools such as the SPM-2 and BESS as screeners to inform the individual educational plan or as part of routine formative testing for primary and elementary school special education students. With a different view, different solutions are possible, and ultimately a reduction in maladaptive behaviors in the classroom. There is also potential to advance policymaking for special education students within the educational system. If the sensorimotor deficit is related to the behavior, then both behavioral and sensorimotor supports should be provided to the student. Another significant contribution is the realization that screeners like the BESS for behavior and the SPM-2 for sensorimotor deficits could save millions of dollars paying for in-classroom support, in addition to helping the individual student navigate the classroom and life without the burden and consequences of their maladaptive behaviors. There is potential for positive social change for the student, family unit, teacher, school, and classmates affected by maladaptive behavior in the classroom.

Summary

In most cases, the current solution for student maladaptive behavior in the classroom is a universal program that teachers and schools can implement for all students. Sensorimotor deficits are not considered the possible origins of the maladaptive behavior which, if identified, could be remedied. Maladaptive behavior in the classroom

can take up a large amount of the teacher's time. Although there is much research on ASD students with adaptive behavioral problems related to sensorimotor deficits, there is scant research on all students that fall within the special education category who exhibit maladaptive behavior in the classroom. In Chapter 2, I will explain the literature search strategy and the theoretical framework. The literature review sections will include maladaptive classroom behavior among special education students, classroom strategies to address maladaptive behaviors, and maladaptive behaviors related to sensorimotor deficits.

Chapter 2: Literature Review

Introduction

Within the education field, sensorimotor deficits are not considered a contributing factor to maladaptive behavior for students in the classroom. However, sensorimotor deficits should be examined to determine the extent to which they are associated with maladaptive behaviors such as withdrawal (Hoff et al., 2017), disrupting other students doing their work, physical and verbal aggression, stealing (Oldfield et al., 2016), hyperactivity, agitation (Kamphaus et al., 2014), problems with social communication (Hannant, 2016), anxiety, depression, and somatization (Bartoli et al., 2011), sustaining attention (Hyseni et al., 2019), inability to shift attention (Ibrahim et al., 2016), and self-regulation (Biotteau et al., 2019; Kwan et al., 2013; Lai et al., 2019; Robles et al., 2011). Identifying the specific sensorimotor deficit across the entire spectrum is complicated, but failure to address a potential underlying sensorimotor problem can lead to behavioral maladaptation (Gieysztor et al., 2018).

Studies suggest that fundamental sensory problems such as light sensitivity or oversensitive hearing are related to restlessness in the classroom (Gilberg & Kadesjo, 2003; Hyseni et al., 2019; Ibrahim et al., 2016., Lai et al., 2019; Moscani & Sweeney, 2015; Robles et al., 2011; Shafer et al., 2017). There is also evidence that motor coordination is related to social skills (Gilberg & Kadesjo, 2003; Hassant et al., 2016; Hyseni et al., 2019; Ibrahim et al., 2016; Moscani & Sweeney, 2015; Robles et al., 2011) and an underlying visuospatial deficit is related to attention problems (Bartoli et al., 2011; Hyseni et al., 2019; Kamphaus et al., 2014).

Suppose a sensorimotor deficit is not identified early in the student's life. In that case, the student is at risk for the behavioral difficulties listed above and academic problems ranging from learning difficulties, concentration issues, language impairments, and problems with reading and writing (Gilberg & Kadesjo, 2003; Hannant et al., 2016; Mosconi & Sweeney, 2015; Niklasson et al., 2017). Therefore, there is a need to identify sensorimotor deficits so that proper interventions can be used to remediate those issues. In addition, identifying sensorimotor deficits could lead to a full-spectrum examination of said deficits to determine the extent of the problem and how it relates to maladaptive behavior affecting the student's academic success (Shafer et al., 2017).

Purpose

This non-experimental quantitative study will use data gathered from teachers in New Zealand to determine the extent to which commonly measured sensorimotor deficits predict maladaptive behavior in special education students ages 8 to 12. The predictor and criterion variables will include measurements from the Sensory Processing Measure, second edition (SPM-2; Purham et al. (2021) and the Behavioral and Emotional Screening System (BESS) that is part of the Behavior Assessment System for Children, Third Edition (BASC-3) family of assessments (Sink & Carlisle, 2022). The seven predictor variables will include six sensorimotor deficit measures from the SPM-2 (vision, hearing, touch, taste and smell, body awareness, and balance and motion). The criterion variables will include (1) externalizing risk index, (2) internalizing risk index, (3) adaptive skills risk index, and (4) overall behavioral and emotional risk index, as measured by the Behavioral and Emotional Screening System (BESS). The conjectured

relationship between the predictor and criterion variables is positive for the externalizing and internalizing problems but negative for adaptive functioning.

Relevance of the Problem

Students lacking cognitive and social skills can disrupt the classroom and undermine learning (Linca, 2018); in the 2017-2018 school year, 13.7% of the student population carried the special needs designation (Education Week, 2019). Inclusive education (i.e., classrooms that include both general and special needs students) encourages the 'mainstreaming' of special education students, putting more pressure on teachers to develop complicated learning solutions and deal with behavioral issues (Linca, 2018; Winzer & Mazurek, 2011). Sixty-one percent of students with special needs are mainstreamed and often exhibit poor self-regulation, reduced attention span, low energy level, anxious temperaments, and impulsive actions (Hui et al., 2016). The recognition that students with sensorimotor issues can cause classroom disruptions is insufficient to solve the problem (Evans et al., 2014). To reduce maladaptive behavior and ultimately increase learning, sensorimotor deficits must be diagnosed and treated to help students concentrate (Hui et al., 2016).

Many studies acknowledge the presence of underlying sensorimotor deficits and examine the resulting behavior (Linca, 2018). Research studies should identify the link between sensorimotor deficits and maladaptive behavior to inform classroom management strategies (Linca, 2018). The basic self-regulation treatment suggestions detailed in current interventions provided to teachers do not sufficiently modulate classroom behavior; therefore, new sensorimotor therapies need to be developed (Hui et

al., 2016). Unless the sensorimotor/behavioral relationship is identified, interventions that address disruptive behavior cannot be developed.

This chapter begins by describing the literature search strategy and the theoretical foundation delving into Piaget's cognitive development theory, focusing on sensorimotor development and research that points to the connections with maladaptive behavior in the classroom. The review begins with studies discussing maladaptive classroom behaviors among special education students, then progresses to the classroom strategies used to address maladaptive behavior. The literature review ends with maladaptive behavior related to specific types of sensorimotor deficits. The final section will include a summary and conclusion of the current research findings.

Literature Search Strategy

Walden University Library was the primary avenue to search for empirical articles for this research. The search began using all databases. Google Scholar was also used to capture articles not included in the Walden University databases. In addition, Alerts Google Scholar was utilized to provide current articles under the search categories of *maladaptive behavior, sensorimotor, and Piaget. The key terms used were cognitive development theory, Piaget, maladaptive behavior, behavioral, developmental pediatrics, developmental pediatrics, sensorimotor, sensorimotor deficits, and sensorimotor stage. Searches in Google Scholar were inclusive of the French language. Using Walden University account information, subscriptions to additional databases, such as JSTOR, Elsevier Services, and ScienceDirect, were attained.* Most articles are dated from 2011 to 2021 except for seminal work by key researchers and articles containing necessary

theoretical information. Source materials in books and articles written by Piaget were also used.

Theoretical Foundation

Cognitive Development Theory

Piaget's (1952) cognitive development theory comprises three essential components: schemas, adaptative processes (equilibrium, assimilation, and accommodation), and stages of cognitive development; each will be discussed in turn. Piaget (1973, 1981) parallels affective with cognitive development. The two are inter-related; emotional development goes through the same adaptation as cognitive development.

Schemas

Piaget (1952) described *schemas* as thought patterns that students use to explain their experiences and environment. The child begins with an idea and then builds on it based on experience, adding to the original thought. For example, a student first learns the alphabet and then learns the sounds associated with the letters, allowing for a phonetic sounding out of words. A child cannot learn the names of letters before learning how to talk; therefore, they must be cognitively ready before another schematic layer can be added to their cognitive development. Schemas progress as the child's cognitive development advances. For example, behavior develops incrementally by acquiring new cognitive knowledge based on previous learning. Students who cannot control their classroom behavior may not have developed the requisite maturity or have not been taught the necessary self-regulation. Developmentally speaking, a two-year-old cannot sit

as long as a six-year-old student. By this logic, a 6-year-old student who cannot sit with classmates for any length of time likely lacks maturity or has not experienced being taught self-regulation. According to Piaget (1936), the lack of maturity may be because the student has not experienced the uncomfortable feeling of restraining their impulses (i.e., a sensory experience) or restraining the desire for movement (i.e., a motor experience).

Lacking the experience of impulse restraint required, for example, to sit still, impedes the child's ability to make sense of the environment that requires these constraints. Classified as maladaptive behavior, the student's lack of experience in the lower schema (e.g., impulse restraint) precludes progression to a more developed schema (e.g., self-regulation). These maladaptive behaviors can manifest in ways that reflect a lack of schema development. Underdevelopment could include withdrawing, disrupting other students' work, physical and verbal aggression, stealing, bullying, hyperactivity, agitation, social communication problems, anxiety, depression, somatization, and inability to self-regulate or shift and sustain attention. These are examples where the child relies on inappropriate schemas given the situation.

Adaptative Processes

Adaptive processes include equilibrium, assimilation, and accommodation. Disequilibrium refers to a state the child will experience when encountering new information that does not match their current understanding. There is a progression from assimilation, equilibrium, and then accommodation. The student must first describe or *assimilate* the new information informed by the current schema. They then re-organize

the information to facilitate *accommodation*, which modifies the existing schema, forming a new schema. For example, to shelve a library book, one must find its correct location; assimilation is likened to identifying a French cuisine book under *cooking*, while accommodation would categorize the book precisely as French cuisine. A new schema (i.e., French cuisine) emerges from the old schema (i.e., cooking). In the future, all French cuisine cookbooks will have a new location. Finally, the child adapts or adjusts the existing knowledge or schema to create a more sophisticated thought configuration; this new schema develops by combining the adaptive processes of assimilation, equilibrium, and accommodation.

Students in disequilibrium will exhibit deregulatory behaviors in two areas: cognitively and emotionally (Piaget, 1936, 1981). These students appear very disorganized; they typically have messy desks that reflect cognitive disorganization. Cognitively speaking, the messy desk originates in the failure to assimilate the interrelatedness of objects. In Piagetian terms, they lack understanding of object concepts, i.e., which objects belong together and which do not. A disorganized emotional brain can lead the student to externalizing behavior, such as disrupting other students' work in the classroom. The externalizing behavior demonstrates a lack of assimilation of *acting* when they leave the playground; instead, they use the old schema of being outside on the playground. In Piagetian terms, students fail to assimilate the *secondary schemas*. Failing to realize that the classroom is a secondary schema and adapt their behavior to that situation, they will instead use playground rules (i.e., primary schema) in the classroom (i.e., secondary schema).

Piaget (1936) stated that before a child can act out or externalize their behavior, they need to process the information internally. Failure to internally process the information can lead to maladaptive behavior. Information input into the student's brain must be changed internally before the external output becomes something new. If it is not changed internally, then the output remains the same. Assimilation occurs when new information is informed by one's current understanding and a necessary element to *accommodate* the new information. For example, the student whose schema development has stalled understands playground rules but does not recognize that the rules have changed inside the classroom. Anxiety may develop if the child's processing does not internalize the new situation successfully. For instance, if the child uses the old schema of the playground rules, the child does not recognize rough play indoors because they have not recognized the classroom as new information. They do not recognize internally that their playground behavior is attached to the playground; therefore, their externalized behavior remains playground appropriate. They have not adapted to their new surroundings.

The lack of adaptative skills can be pervasive across multiple settings. The externalizing behaviors, seen as immature, manifest as a lack of self-regulation and low sustained attention. The specific sensorimotor deficits associated with this maladaptive behavior include fine motor skills and a hyper-sensitive sensory system. For example, the student cannot settle down at their desk and complete a handwriting lesson requiring fine motor skills because their system has remained in playground mode. In addition, the new constraints of sitting at the desk cause internalized anxiety, resulting in externalized

hyperactivity whereby the student leaves their seat multiple times because they have not adapted to the new surroundings.

Cognitive Development Theory

Comprised of four progressive stages, cognitive development theory (Piaget, 1936, 1952, 1981) explains how students learn: sensorimotor (ages 0-2), preoperational (ages 2-4), concrete operations (ages 7-11), and formal operations (ages 11-15) (p. 18). Cognitive development is dependent on four factors: maturation, active experience, social interaction, and equilibration (Piaget, 1981). Miller (2007) explained that sensorimotor development is the basis of all behavior. Piaget's (1952) premise was that higher mental functions follow progressively from established sensorimotor functioning at the initial cognitive developmental stage. Brain maturation progresses hierarchically. Impairment at the lower levels will impede development at the higher levels (Miller, 2007); in other words, the child will not fully advance to the second, third, or fourth cognitive developmental stages if the first sensorimotor stage is at a deficit. Learning information at a higher stage without first mastering a lower stage would result in an incomplete understanding of concepts at the higher stage. Piaget believed the cognitive developmental stages are universal but that the length of time taken to progress through the stages would vary individually. One deficit associated with failure to master the sensorimotor stage is understanding the causality of actions. Students who have not fully grasped the relationship between cause and effect will argue that their actions did not influence other students. Because they have not fully progressed from the sensorimotor to the preoperational stage, their actions can appear to be insensitive to those around them.

Piaget included affective development as part of cognitive development (Piaget, 1981). Affect includes values, feelings, and interests; they are developed similarly to cognitive development. Piaget (1981) viewed affective structures as developing as cognitive structures expand. He identified three kinds of knowledge, including physical (i.e., mastered through experience with objects), logical-mathematical (i.e., attained from actions on objects), and social knowledge (i.e., occurs within the child's social world). All three begin in the sensorimotor stage. Children's expressions of joy, sorrow, pleasure, and contentment are all evidence of affective behavior during the sensorimotor stage. Children before two years old have feelings of success and failure and invest affection in others. A child's construction of sensorimotor relationships develops from actions but is driven by affect (Piaget, 1981).

Students who do not progress fully from the sensorimotor stage to the preoperational stage will likely have language and behavioral difficulties, manifesting in difficulties with grammar, syntax, and thought coordination. The sixth sensorimotor substage includes the child's ability to visualize objects that are not physically present as they construct object concepts (Piaget, 1952). Piaget describes the process as internal trial and error when a child searches for a solution using their mental faculties before trying the problem in the physical world. It demonstrates an awareness of causality. The child can identify similarities and differences in an object design, such as blocks, and words, or recognize a partially visible object. During affective development, there is an awareness of self as an object and others as objects which is the prerequisite to social interchange. The child can then invest affect in other people and build relationships (Piaget, 1981).

Older children can visualize words, which are the basic units of language. A diminished ability to visualize and move the words around in the brain would make writing or creating sentences very difficult. The inability to move words around in the brain signifies a deficiency in visuospatial ability, possibly due to a lack of experience. According to Piaget (1999), during the fifth stage of sensorimotor development, object concepts are developed through a process he calls spatial relations. The child uses trial and error to move objects to desired locations implementing and strengthening their visual motor integration. The learning process allows the child to see objects from a different perspective through the child's visual interpretation of the spatial principles. The child learns through the interaction with objects and carries out the affective desire for an object using their motor system. If the spatial ability is not fully developed, a student would need the target words written on separate pieces of paper and then move the target words around to create cohesive sentences manually. Students who have not had sufficient experience in this area will have difficulty moving words around in their heads. As evidenced by anxiety, disequilibrium can occur through internalizing linguistic difficulty, while externalizing can occur through hyperactivity. Adapting and finding equilibrium to the situation requires some behavioral change; however, resistance to change reflects a lack of adaptable skills. As a result, their expressive language will suffer, leading to internalizing behavior, externalizing behavior, and poor adaptive skills.

In a quantitative study, Plotka (2016) examined the difference between mixed (i.e., 3 & 4-year-olds) or same-age classrooms (i.e., 3-year-olds), comparing Vygotsky's and Piaget's theories, respectively. Whereas Piaget encouraged students to be grouped

with same-age peers whose problem-solving skills and construct knowledge would be similar, Vygotsky believed that students of different ages could support each other in different learning approaches. Surveys were collected from 308 teachers in a Head Start preschool program (mixed=119, same=95) to determine if there were differences in (a) the quality of peer interaction, (b) teacher-student interaction, and (c) classroom teachers' experience of maladaptive behavior. These three areas are foundational to developing sensorimotor abilities and examining how increased peer interactions may reduce maladaptive behavior.

The study's findings included positive and negative results for each classroom type. For example, supporting Vygotsky, diverse classrooms helped students learn prosocial and empathy-based behavior, helped regulate students' emotions, develop social skills, reduce negative teacher/student interactions, lower conflict, and challenging behavior levels, decrease competition and comparisons, and reduce conflict conflict maladaptive behaviors behavior overall. Supporting Piaget, same-age classrooms encouraged problem-solving skills. Unlike in mixed classrooms, where teachers view students more as individuals, teachers approach learning as a collective whole in same-age classrooms. Plotka's (2016) findings inform the proposed study by demonstrating the importance of classroom behavioral patterns. Piaget argued that experience is critical to advancing through the sensorimotor stage. The study points to providing experience in a same-age classroom to facilitate adaptive skills.

Csizmadia et al. (2019) used a Piagetian lens for describing students learning through hands-on activities. They examined the learners' autonomy by measuring the

degree of choice students ages 5-11 make at each stage of a computer science project. The researchers used a matrix to identify, categorize, and evaluate student activities based on computer science concepts (CS, i.e., skills used to solve a problem), computational thinking concepts (CT, i.e., a process used to solve a problem), and levels of abstraction, which measures autonomy (i.e., problem-solving process) for 21 different projects. First, they assumed that students' autonomy would be low for defining a problem and developing their projects. Secondly, they postulated that the students would have greater autonomy when constructing hands-on projects instead of online activities, making autonomy less dependent on computer science or computational thinking. The results demonstrated that autonomy was higher for hands-on activities than for online projects. The researchers concluded that autonomy, more so than CS or CT concepts, contributed principally to the level of interest the students were exhibiting. This study provides direction by pointing to the Piagetian belief that the child actively creates knowledge through interaction with the world. Therefore, for computer science classes, activities designed for students should include a hands-on element. Relative to the proposed research and Piaget's belief, learning occurs through experiences and is essential for children to figure out how to produce positive externalizing behavior. Integrating a deep understanding of the social world is done via practice. If children do not have the opportunity to learn in their sensorimotor world, then there is a chance that they will not know how to interact with their environment.

Lones et al. (2016) investigated the relationship between environmental opportunities for sensorimotor activity and the development of advanced cognitive

abilities among autonomous robots. The robots were tested in different environments with varying physical and social opportunities, including a standard or "normal" environment with opportunities for stimulation, a novel environment with many opportunities, and, finally, a sensory-deprived environment. In addition, after their initial training with caregivers, the robots had to manage conflicting needs, keep track of how much fuel they had consumed, and balance their energy. Finally, the robots had to adapt to their environment using sensorimotor skills. The purpose was to determine if abilities gained through sensorimotor development increased learning in adaptive autonomous skills such that the more enriched the environment, the more the robot will develop. The study was conducted using a medium-sized Koala II robot by K-Team. The robot was permitted to develop in the three environments with a single run time of 60 minutes for each. The results showed that cognitive abilities are influenced by the richness of the sensorimotor experiences in autonomous robots. Furthermore, the findings demonstrated the importance of sensorimotor experiences to solidify object concepts that facilitate cognitive development. This study also presents evidence linking internalization, externalization, and adaptation to sensorimotor deficits, with the critical side note of internalizing being the first level. In students who grow up in a sensory-deprived environment, sensorimotor deficits would be expected, and increased externalizing and internalizing behaviors with poor adaptive skills (maladaptive behavior) should be the norm.

Interested in testing the Piagetian belief that play facilitates cognitive development, in a quantitative survey study, Ahmad et al. (2016) investigated the

relationship between the duration of playtime and cognitive development (i.e., memorization, exploration, understanding, and problem-solving abilities). Following the Piagetian belief that experience in the sensorimotor realm enhances cognitive development, the authors hypothesized a positive relationship between the duration of play and cognitive development, such that more time spent playing would increase memorization, exploration, understanding, problem-solving abilities, and sharing compared to children whose play periods were shorter (Piaget, 1962). The study included 300 students ages 8 to 15 from the private and public sector schools in Lahore City, Pakistan. The impact of how long the child interacts with their environment through play was measured using three objectives that included how the length of time playing impacted cognitive development, the child's perspective of their cognitive development, and the effect of play on sharing skills. Students were tested based on memorization, exploration, understanding, and problem-solving abilities taking note of the average daily playtime. Students who played longer experienced enhanced cognitive abilities across all measures. Furthermore, teacher reports demonstrated that students who spent more time playing were more open to interacting with other students and more optimistic about their cognitive abilities. In addition, Ahmad et al. (2016) suggested that students who have sensorimotor deficits might not play for long enough periods. These parameters are valuable markers for students to attain sensorimotor precision leading to adaptive behavior.

The primary purpose of the quantitative descriptive study completed by Razza et al. (2016) was to identify the relationship between motor control and behaviors in the

classroom. The authors examined motor control, low birth weight, approaches to learning, attention problems, and behavioral problems, hypothesizing that students with low birth weight would have difficulties with learning, attention, and behavior. Using 751 archived data cases from an existing study called Fragile Families and Child-Wellbeing, the researchers had access to a convenient source for their research. Motor control was measured using an in-home walk-a-line test. The questionnaire provided to the kindergarten teachers measured approaches to learning, attention problems, and behavioral problems; also of interest was the potential for low birth weight to moderate the relationship between motor control and behavioral problems. Low birth weight was not shown to be a significant factor for approaches to learning, marginally significant for attention problems, but was statistically significant for motor control. Low birth weight did not predict behavioral issues in the classroom, nor did it moderate the relationship between motor control and behavioral problems. Independent of birth weight, motor control predicted classroom behavior problems for all students. These findings are relevant to the proposed study as they demonstrate the relationship between deficits in motor control and maladaptive classroom behavior.

Piaget's cognitive development theory explains the need for interaction between the student and the environment to facilitate cognitive and affective development. The proposed study will examine how a lack of attaining the milestones within the sensorimotor stage as an infant may lead to difficulty adapting in a future classroom. In the same vein, incorrectly assimilating information can lead to the internalization of maladaptive behavior. A child might also not efficiently accommodate outgoing

information resulting in the externalization of maladaptive behavior. Thus, the theory explains the breakdown in the sensorimotor adaptation of a child's adaptive behavior having maladaptive behavior in the form of externalization and internalization. The proposed study will measure the three types of knowledge Piaget discussed in his theory. Knowledge includes the physical (i.e., mastered through experience with objects, including their bodies-sensory), logical-mathematical (i.e., attained from actions on objects-motor), and social knowledge (i.e., occurs within the child's social world).

Literature Review Related to Key Variables

Maladaptive Classroom Behavior Among Special Education Students

Based on studies to date, teachers report that classroom management is the most challenging part of teaching; unfortunately, there is little training in this area (Floress et al., 2018; Gilmour, 2018; Hopman et al., 2018; Scherzinger & Wettstein, 2018: Sinclair et al., 2021). In an international survey, one in four teachers reported losing at least 30% of lesson time due to classroom disruptions and administrative tasks (TALIS; OECD 2014 as reported in Scherzinger & Wettstein, 2019). Sixty percent of special education students spend 80% of their time in the mainstream (inclusive) classroom. Special education students have a higher rate of disruptive behaviors when compared to the average student; therefore, special education students' classrooms tend to have a much higher rate of disruptive behavior than the inclusive classroom (Abry et al., 2017; Aelterman et al., 2018; Aspiranti et al., 2018; Bradshaw et al., 2019; Flores et al., 2018; Gilmour, 2018; Kowalewica & Coffee, 2014).

Examining the natural occurrence of externalizing behavior in general education, special education, and at-risk classrooms was the purpose of the Flores et al. (2018) quantitative study. These classrooms were non-inclusive, meaning students were divided based on behavior; the at-risk and special education students were separated from the general education population and given classrooms. The sample included 77 students from six preschool classrooms. Disruptive behavior was divided into off-task and disruptive behavior. Off-task was defined as "child is looking away from desk work or looking away from the teacher at the front of the class, or looking away from teacher instruction" (e.g., SmartBoard; Flores et al., 2018, p. 282). Disruptive behavior included whining, crying, aggressive behavior, demanding attention, destructive behavior, negativism, self-stimulation, inappropriate behavior, talking out of turn, being out of the area, cheating, and noncompliance. Trainer observers used the preschool student observation form to measure the variables. An ANOVA was conducted for each independent measure of off-task behavior in each classroom. There was no statistical difference between the classrooms for off-tasks behaviors, but the special education classrooms had the highest percentage of off-task behaviors. This means that off-task behavior was relatively the same in general education, at-risk, and special education classrooms. The at-risk classroom had a lower average of off-task behavior than the general education and special education classrooms. There were also statistical differences across the three classrooms for disruptive behavior. Using multiple t-tests and Bonferroni correction, statistically significant differences were identified between the special education classrooms and the other two classrooms. The authors concluded that

special education students need more proactive and preventive programming to help with disruptive behavior (Flores et al., 2018).

While disruptive classroom behavior exhibited by special education students impedes the learning process for the students themselves, few studies have examined how these disruptive behaviors affect special education students and their classmates (Gilmour, 2018). To that end, Yoder et al. (2017) conducted an exploratory quantitative study to examine peer engagement in 428 preschoolers who had been identified as exhibiting externalizing disruptive behavior (e.g., hyperactivity, inattention, and oppositional acts) with the intent to determine if disruptive behavior predicted positive and negative peer engagement. Positive peer engagement activities included *peer sociability* (i.e., proximity seeking, shared positive affect, cooperation, popularity), *peer communication* (i.e., initiates communication, sustains conversations, varies purposes of speech), and *peer assertiveness* (i.e., initiation and leadership) throughout the preschool year. Negative peer engagement included *peer conflict/aggression*, *negative affect* (i.e., emotion), *attention-seeking*, and *confrontation*. The authors hypothesized that (a) positive peer engagement would be low and negative peer engagement would be high, (b) positive peer engagement quality would increase as they practice social engagement over the school year, (c) positive peer engagement would increase during free play, (d) teacher involvement would increase peer engagement quality, and (e) an increase in all categories of disruptive behavior would negatively affect peer engagement, with oppositional behavior having the most significant impact.

The preschool students were enrolled in a Head Start program in the Midatlantic states of the United States of America (Yoder et al., 2017). At the beginning of the school year, teachers completed the ADHD Rating Scale-IV and the ODD Rating Scale. When combined, it provided an overall value for three subscales (i.e., hyperactivity, inattention, and oppositionality) to identify students with the most severe disruptive behaviors. Peer interaction was measured four times during the year using the Individualized Classroom Assessment Scoring System (inCLASS), a child-level observational measure; only the peer interaction subtest was used to measure peer sociability, peer communication, peer interaction assertiveness, and peer conflict. The observational reports collected four times during the year were analyzed using the inCLASS. Data were analyzed by examining positive and negative peer engagement. A two-tailed correlational analysis demonstrated that sociability, communication, and assertiveness were positively correlated and aggregated to form one positive peer engagement variable.

Negative peer engagement was classified as peer conflict. Consistent with the hypothesis, total disruptive behavior scores were significantly and negatively related to positive peer engagement. Although overall disruptive behavior was significantly and negatively related to positive peer engagement, results indicated that disruptive behavior and peer engagement depended on the specific type of disruption. For example, oppositional disruptions were not significantly related to positive peer engagement. Still, children rated higher on hyperactivity had more positive peer engagements, while children with inattention had fewer positive peer engagements. Therefore, inattention was negatively related and hyperactivity was positively related to positive peer interaction.

Hyperactive students were seen as exciting, drawing positive peer interactions. The negative relationship between inattention and positive peer engagement was attributed to students' inability to initiate and sustain an interaction with a peer. Inattentive students would wander off, miss social cues, or lose track of the interaction. Negative peer engagement had statistical significance for overall disruptive behaviors and oppositionality scores but was not statistically significant for hyperactivity and inattention. Yoder et al. (2019) hypotheses concerning peer engagement and disruptive behavior were not supported because they made a general statement and did not consider the different disruptive behavior components. The authors assumed that inattention, hyperactivity, and oppositionality would demonstrate poor peer interactions; they did not anticipate hyperactivity having a positive relationship with disruptive behavior, which skewed the overall totals to a positive relationship instead of an anticipated negative relationship. Therefore, none of Yoder et al. (2017) hypotheses was supported, questioning if peer engagement contributes to disruptive behavior in the classroom. This study demonstrated that research has not fully discovered contributing factors for disruptive behavior (maladaptive behavior). More research is needed, primarily since disruptive behavior produces more disruptive behavior (Muller et al., 2018; Shin & Ryan, 2016).

Using a longitudinal quantitative survey design, Shin and Ryan (2016) investigated disruptive behavior and the influence of friends among 5th and 6th grade students (N = 870) in low versus high levels of emotionally supportive classrooms. This study did not identify special education students in the demographics. The disruptive

behaviors measured included talking out of turn, leaving one's seat, or disrespecting others. The authors defined emotionally supportive classrooms as driven by teachers and students who exhibit positive relationships and mutual respect (Kaplan & Maeher, 1999, as cited in Shin & Ryan, 2016). The classroom environment was considered by measuring how teachers' emotional support buffered negative peer influence on disruptive behavior. At the start of the school year, the Classroom Assessment Scoring System (CLASS) was used to measure teachers' emotional support, including teacher-student interaction, positive climate (i.e., relationships, affect, respect, and communication), negative climate (i.e., punitiveness, sarcasm/disrespect, and negativity), sensitivity (i.e., awareness, responsiveness, action to address problem, and comfort), and regard for adolescent perspectives (i.e., flexibility, support for autonomy, connections to current life, and meaningful peer interactions). CLASS established which classrooms were deemed as having either low or high emotional support. Students' friends' network was measured by asking students who they hung out with the most in the classroom. Students completed a survey listing other students they viewed as friends and self-reporting disruptive behavior in the fall and spring of the 2011-2012 school year. Results indicated that emotional teacher support was not related to student disruptive behavior across classrooms at the start of the year. In comparison, when the second set of data was taken approximately six months later, student disruptive behavior was significantly higher in classrooms where teachers provided low emotional support. Shin and Ryan (2016) discovered that classrooms with high teacher emotional support had significantly

less disruptive behavior by the end of the year, concluding that teachers play an essential role in mitigating disruptive behavior by shaping peer relationships.

As a follow-up study to Shin and Ryan (2017), Muller et al. (2018) replicated the previous study on disruptive behavior while expanding teacher variables to include educational needs as opposed to only emotional needs, as reported by Shin and Ryan (2017). This non-experimental quantitative study examined individual disruptive behavior and average classroom disruptive behavior with teacher variables as a moderating factor. Gender and academic track were analyzed to determine if either contributed to disruptive behavior. Disruptive behavior was defined as excessive talking during instruction, throwing items around, or walking around in the classroom at inappropriate times. Teacher variables included teacher support, interesting instruction, and academic ability differentiation. Academic ability differentiation divides students by their academic ability placing them in groups and assigning appropriate tasks within each classroom. The study divided academic tracks into two categories: low and high. The low track included designated classrooms for basic education and special education, while the high track was reserved for classrooms identified as general or advanced education.

The Mueller et al. (2018) study was part of a larger longitudinal research project called the Fribourg Study on Peer Influence in Schools. All the students in the study (N = 701) stayed with the same teacher for all three grades (grades 7-9), increasing the likelihood of students' accuracy in reporting teacher variables. Individual disruptive behavior was measured six times (T1-T6) during the study using the Fribourg Self-Report Scale -School Problem Behavior (FSP-S). The behaviors measured included heckling

during class lessons, talking back to the teacher, cheating on tests, standing up in the classroom without permission, throwing items around, or engaging in non-academic activities during lessons. Overall, classroom disruptive behavior was calculated using an average of the individual scores from the FSP-S for each of T1-T6. Teacher variables were calculated during T5 while students were in the 8th grade. The three teachers' instructional variables of supportive instruction (Motivation and Supportive Assistance scale), interesting instruction (Interestingness scale), and ability differentiation (Differentiation scale) were recorded using scales from Dalton and Merz (2000, as cited in Muller et al., 2018). Classroom disruptive behavior and individual student reports mentioned previously were deemed the students' characteristics. The researchers hypothesized that increased emotional support would reduce disruptive behavior. Classrooms where teachers offered low emotional support significantly increased disruptive behavior during the T5 sampling. Thus, the teacher's emotional support was negatively and significantly correlated with disruptive behavior.

Abry et al. (2017) conducted a quantitative study that examined concurrent and longitudinal classroom-level adversity and its effect on students' internalizing and externalizing behaviors; the study did not differentiate between special education students and those on an average track in this inclusive classroom. Data were collected from 823 students when the students were in 1st, 3rd, and 5th grade. To define classroom-level adversity, the researchers examined how many adversity-related factors (home/family life, parent cooperation/support, child health, inadequate nutrition, low intelligence, cultural differences, English proficiency, nonstandard English, special learning problems,

behavioral problems [disruptive], inadequate supplies, student/teacher ratio, student mobility, student not ready socially, student not ready academically, students having attention problems, and student tardiness/absenteeism) influenced behavior in the classroom. The variables of classroom-level adversity, internalizing, and externalizing behavior were measured by extracting longitudinal data from the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development of U. S. students and their families from birth to adolescence. Classroom-level adversity was measured by teachers completing an adapted version of the Schools and Staffing Survey (National Center for Education Statistics, 1993, as cited in Abry et al., 2017). In addition, internalizing and externalizing behaviors were assessed via the parent form on the Child Behavior Checklist (Achenbach, 1991, as cited in Arby et al., 2017). The authors hypothesized that students from lower socioeconomic status would be in classrooms characterized by higher classroom-level adversity. In addition, the authors expected classroom-level adversity would be related to higher levels of internalizing and externalizing behaviors concurrently and longitudinally. Finally, the authors explored the differences between girls and boys, taking note of previous research pointing to girls as exhibiting more internalizing and boys' more externalizing behaviors related to classroom-level adversity. Using bivariate correlations, results showed a significant positive relationship between the teacher-reported classroom-level adversity influences and externalizing behaviors across both grades and sexes (Abry et al., 2017). Internalizing behavior was evident in Grade One girls in classrooms with higher classroom-level adversity. There were no significant results between classroom-level

adversity and internalizing or externalizing behavior as a function of income-to-needs at any grade level for boys or girls. Due to the concurrent relationship between classroom-level adversity and externalizing behavior across the grades, the authors concluded that classroom-level adversity had an indirect association and lasting effects on maladjustment outside the classroom.

Inclusive classrooms help special education students' overall functioning (Gilmour, 2018). Kulawiak et al. (2020) suggested that providing clear definitions of maladaptive behavior would aid in finding solutions for classroom disruption and to that end examined three different definitions of special education student internalized behavior, considering these students' social difficulties in the classroom. The authors noted contradictory results found in previous research and included four different sociometric status methods to determine if the distinct methods could explain the previous results. Internalized behavior can be the result of broadband and narrowband behavior; hence, the variable categories included narrowband (anxious-depressive behavior), narrowband (social withdrawal), and broadband (combination of the two narrow bands). The German version of the Integrated Teacher Report Form (for Internalizing Behavior) measured the students' internalization. The first sociometry method used CD1, a classification procedure by Cole and Dodge (1983, as cited in Kulawiak et al., 2020). The second method, CD2, adjusted CD1 by changing the cutoff values (Boivin et al., 1994; Hubbard, 2001, as cited in Kulawiak et al., 2020). (French & Wass, 1985, as cited in Kulawiak et al., 2020), Finally, Method 3 (Schaughency et al., 1992, as cited in Kulawiak et al., 2020) changed criteria based on the class median

(Schanghency et al., 1992, as cited in Kulawiak et al., 2020). The researchers analyzed possible differences in the different methodological procedures produced. Each method divided the students into socially average, popular, rejected, neglected, or controversial classifications. The participants included 2334 students from 112 classes in grades one to four in Mettmann County, Federal State of North Rhine-Westphalia, Germany. Results showed that across all methodologies, students who were rejected by their peers exhibited significantly more internalized behavior, rejected students became significantly more socially withdrawn, and students who experienced neglect showed significantly higher levels of fear towards future social interaction, exhibiting social anxiety. The results also indicated that methodological styles led to conflicting results (Kulawiak et al., 2020).

In further attempts to define variables, Scherzinger and Wettstein (2019) examined classroom disruption among middle school students defined through three different lenses. First, the study included all students and did not differentiate between special education students and those in the average category. This non-experimental quantitative study aimed to evaluate the efficacy of information obtained from teacher checklists, student self-reports, and external observers. The dependent variables included classroom disruptions, classroom management, and teacher-student relationships. Classroom disruptions were defined as interruptions in the teaching-learning process and can emanate from the student, teacher, or external sources. Disruptions were further divided into nonaggressive (agitation or talking over the teacher) and aggressive (threatening, shaming, or ridiculing). Classroom management included how the teacher establishes a supportive environment that facilitates academic and social-emotional

learning. Finally, appropriate teacher-student relationships incorporated high teacher influence and proximity to the students. It was hypothesized that reports of disruptions, classroom management, and teacher relationships would have greater congruency between students and an outside observer compared to the other groups.

Variables were measured using researcher-developed questionnaires and a GoPro camera and Dictaphone for the video observations (Scherzinger & Wettstein, 2019). Questionnaires measured classroom disruptions, teacher-student relationships, and classroom management. Observers, who oversaw the videography, were scientific assistants trained to measure five categories of behavior, including nonaggressive disruptions by students, aggressive disruptions by students, nonaggressive disruptions by teachers, aggressive disruptions by teachers, and methodological-didactic setting disruptions. The sample included 1290 5th and 6th grade German-speaking Swiss students who completed the questionnaires. Two hundred and seventy-two students in eighteen classrooms with 17 teachers took part in the videography recordings. Although significant correlations with shared perceptions of teacher-student relationship and classroom management were not congruent among teachers, students, or observers, there were significant correlations of shared classroom perception between students and teachers in defining and labeling disruptive behavior. The other categories measured (teacher-student relationship and classroom management) did not show statistical significance among the observers. Thus, teachers and students shared similar definitions for disruptive classroom behavior.

Using a quantitative research design, Mccaslin et al. (2016) examined special education students in an inclusive classroom and their emotional adaptation in three different learning environments, taking school socioeconomic level into consideration. The sample included students from grades four to six who attended schools in the Southwest United States. Four hundred thirteen students completed the first set of measures and 472 participated in the second. The variables included emotional adaptation, school socioeconomic status, classroom social/instructional context, and personal readiness and learning. Emotional adaptation was measured using the School Situation Inventory adapted from the Test for Self-Conscious Affect (Tangney, Burggraf, & Wagner, 1995; Tangney & Dearing, 2002; Tanguey, Dearing, Wagner, & Gramzow, 2000, as cited in Mccaslin et al., 2016). The School Situation Inventory identified the frequency of five different patterns of handling discord that included distance and displace, regret and repair, inadequate and exposed, proud and modest, and minimize and move one. The researchers used school socioeconomic status instead of the student family's level because achievement has been linked to the school level. School socioeconomic level was calculated based on the number of students receiving full or partial lunches. Classroom social/instructional context was divided into three learning environments: private (one-on-one teaching), small groups, and whole class. Personal readiness and learning were calculated using a Mathematics Achievement Test. The School Situation Inventory and the Mathematics Achievement Test were given to the students twice in a single school year.

The only method the authors identified as intrapersonally and interpersonally productive was regret and repair, where students would admit their failings and seek to find a solution. Students scoring higher in personal readiness and learning scored significantly higher in emotional adaptation in varied classroom social/instructional contexts. School socioeconomic levels did not affect the emotional adaption profiles for this sample of special education students. The researchers concluded that the most successful students saw intelligence as incremental instead of success and failure per task. Having a malleable viewpoint instead of needing to fix the situation meant that these students had better emotional adaptation such that controllable learning and incremental intelligence results in higher levels of emotional adaptation (Mccaslin et al., 2016).

The studies in the section just reviewed establish the continued struggle with student maladaptive behavior in the classroom, illustrating that many students identified as special education are in inclusive classrooms. Several studies have shown that externalizing behavior is higher with special education students than in other populations and that management is the most challenging part of teaching. Therefore, disruptive behavior (maladaptive behavior) is an important area of research (e.g., Floress et al., 2018; Hopman et al., 2018; Scherzinger & Wettstein, 2018: Sinclair et al., 2021). Some research focuses on solutions. For example, disruptive behavior could be reduced by identifying contributing factors. Other research has identified potential solutions to classroom disruptive behavior that can be ruled out. For example, Yoder et al. (2017) did not find that disruptive behavior in the classroom could be reduced by peer engagement.

Although none of the articles reviewed in this section considered possible developmental origins for disruptive behavior, Mccaslin et al. (2016) did identify a positive relationship between personal readiness and emotional adaptation. Therefore, the study I propose will classify emotional adaptation simply as "adaptation" and is one category included in maladaptive behavior.

Classroom Strategies to Address Maladaptive Behaviors

Many schools in the United States and New Zealand use a *positive behavior intervention support* framework, including the following Tiers: (a) Tier 1 is the primary approach to difficulties in the classroom that includes schoolwide or class-wide universal prevention programs referred to as a universal program, (b) Tier 2 focuses on students at risk of challenging behavior, and (c) Tier 3 incorporates individualized interventions, concentrating on students with severe problems (Kowalewica & Coffee, 2014). Special education students can be assigned to any Tier or to a separate special education classroom based on the child's needs and program availability in the school or district. An individualized educational plan team makes the decision but generally does not consider the effects on teachers and classmates. For example, which classroom a special education student is placed in may adversely affect peers and general education teachers (Gilmour, 2018). Although not all special education students are offered Tier 3 or separate special education services, the overall classroom environment is essential as disruptive behavior affects subsequent disruptive behavior and can significantly influence special education students. For instance, inclusive classrooms can offer in-class support, resource room material for the general-education teachers (i.e., teachers with no training

in special education), or repeated student removal from class for exceptional one-on-one help (Gilmour, 2018; Muller et al., 2018).

According to the current research, students will disrupt a classroom due to the lack of the teacher's emotional connection with the student and quality of instruction (Aspiranti et al., 2018; Hopman et al., 2018; Kirkhaug et al., 2016; Muller et al., 2018; Scherzinger et al., 2019; Sinclair et al., 2021), peer influences (Muller et al., 2018; Berg et al., 2018; Shin & Ryan, 2016), and student personality (Abry et al., 2017; Aelterman et al., 2018; Bossenbroek et al., 2020; Bradshaw et al., 2019; Farmer et al., 2018; Flores et al., 2018; Hopman et al., 2018; Kulawiak et al., 2020; Mazon et al., 2019; Mccaslin et al., 2016; Muller et al., 2018). Maladaptive classroom behavior is dealt with primarily using a Tier 1 universal program (Bossenbroak et al., 2020; Bradshaw et al., 2021; Kowalewica & Coffee, 2014; Malboeuf-Hurtubise et al., 2018).

According to Canada's Teacher's Federation (2010, as cited in Malboeuf-Hurtubise, 2018), 20% of students in Canada suffer from a mental health concern that causes significant dysfunction in cognitive, emotional, behavioral, and social aspects of their lives. They exhibit a range of externalizing problems (i.e., hyperactivity, aggression, and conduct problems) and internalizing problems (i.e., anxiety, depression, and somatization; Kamphaus et al., 2014). The Tier 1 approach allows schools to implement a schoolwide or class-wide program; its goal is to create a universal program that helps many students.

Malboeuf-Hurtubise's (2018) quantitative study evaluated a Tier 1 mindfulness-based intervention (Mission Mediation) for special education students exhibiting

internalizing and externalizing symptoms. The Mission Meditation (MM) was used for an 8-week intervention with 45–60-minute weekly sessions led by a school psychologist who had expertise in mindfulness and was trained in MM. The weekly sessions included teaching students how to be aware of their thoughts, emotions, and physical sensations. In addition, students were instructed to practice the mindfulness theory (as described below) through mindful eating, mindfulness through the senses, body scan, sitting quietly, and breathing meditation.) Malboeuf-Hurtubise (2018) assessed internalized (i.e., anxiety, depression, inattention) and externalized (i.e., hyperactivity and aggressiveness) behaviors. The study included two special education classrooms with six boys in the first classroom and seven boys in the second. The authors measured internalized and externalized behaviors 10 times during the study, including three pre-interventions, four during the intervention, and three follow-ups. The authors hypothesized that there would be a significant decrease in internalizing and externalizing behaviors, outcomes that would persist at follow-up. The study found a negligible effect size for anxiety symptoms and inattention only in the group engaged in more frequent mindfulness mediation. There was no benefit of the MM program for students completing weekly sessions in the second classroom.

Another universal Tier 1 study (Kowalewicz & Coffee, 2014) used a classroom behavioral intervention program called the mystery motivator. This study aimed to evaluate the efficacy of the interdependent classroom-wide program in reducing disruptive classroom behaviors within a general education elementary school classroom. The primary predictor variable was disruptive behavior, while the criterion variable was

replacement behavior. Each teacher chose the definition of disruptive behavior and replacement behaviors for their classroom. The classroom teacher also chose how many disruptive behaviors to target and what replacement behavior would be used as the reward. Replacement behaviors included tangible items such as erasers, candy, pencils, and the like. Intangible rewards included five minutes of free time, special theme days (hat day or pajama day), and extended recess. The study also examined the teacher's perspective on implementing the program. The intervention began with teachers defining disruptive behaviors and replacement behaviors in their classrooms. A mystery motivator chart was placed in a prominent location in the classroom and showed days of the week per week or month. Teachers chose which days or class periods students could earn replacement behaviors by demonstrating behavior previously defined as disruptive. The teacher placed an "M" in invisible ink or covered each letter with a piece of paper. Disruptive behaviors were recorded via a numeric clicker that the teacher carried during the day. When a student violated the behavioral parameters, the teacher pointed the clicker at the student and clicked it, adding to the total disruptive behaviors. At the end of the defined period, the letter was revealed when total disruptive behaviors were low enough to meet behavioral goals. A student was asked to reveal the square to see if replacement behaviors would be earned. If an "M" was present, the teachers chose a reward known to the teacher but unknown to the students. Students were praised for their success and reminded that they had another opportunity the next day. The result of the intervention demonstrated a significant reduction in disruptive behaviors.

Kowalewicz and Coffee (2014) expected to replicate previous studies showing that mystery motivators facilitate behavioral change in individual students and classrooms. Numerous previous studies that examined mystery motivators used an individual reward system that targeted behavior per student as opposed to class-wide (DeMartini-Scully et al., 2000; Kehle et al., 1998; LeBlanc, 1998; Madaus et al., 2003; Matovic, 2010; Kehle et al., 2003; Matovic, 2010; Moore et al., 1994; Mottram et al., 2002; Musser at al., 2001; Robinson & Sheridan, 2000, as cited in Kowalewica & Coffee, 2014). However, the individualized reward system was too time intensive for the teacher; it was inefficient and complicated to implement. Four previous studies to the Kowalewicz and Coffee (2014) examined the effects of mystery motivators on classroom disruptive behavior with interventions implemented between 2 to 4 weeks (Hoah, 2006; Kraemer et al., 2012; Murphy et al., 2007; Schanding & Sterling-Turner, 2010, as cited in Kowalewicz & Coffee, 2014). The use of the mystery motivator significantly reduced disruptive behavior in the classroom. Kowalewicz and Coffee (2014) expanded on the previous studies by first demonstrating that the mystery motivator is best carried out in the elementary classroom. The mystery motivator was also structured interdependently, meaning that all behavior was calculated as classroom behavior rather than individual student behavior. Lastly, the intervention was increased to eight weeks, with a follow-up measure scheduled to assess maintenance. Again, significant reductions in disruptive behavior were found in all the classrooms. Once the intervention was ceased, disruptive behaviors did not return to the same level seen before the intervention. Lower disruptive behavior rates were maintained during the follow-up maintenance assessment. A follow-

up completed 6-12 months after the intervention confirmed its long-term effectiveness. This study found mystery motivator was an effective intervention that could reduce disruptive behavior in elementary classrooms (Kowalewicz & Coffee, 2014).

Aspiranti et al. (2018) used a quantitative design to examine the efficacy of a universal program on inappropriate behavior in an inclusive classroom, taking note of the teachers' motivation to use the program. The Tier 1 class-wide behavioral program called the color wheel system had three colors, red, yellow, and green representing the number of student classroom activities (i.e., red referred to full attention to the teacher, yellow referred to individual work, and green referred to group work). Two classrooms participated in the intervention, including a second-grade classroom with two autistic students and a third-grade classroom with four autistic students. The variables of interest were talking out of turn or making noise, named *inappropriate vocalizations* by the teachers, each of whom determined the rules accompanying red, yellow, and green colors. Inappropriate vocalizations were defined differently depending on which wheel color the teacher chose. For example, if the teacher chose "red" then the students were expected to have full attention on the teacher and all vocalizations would be deemed inappropriate. In contrast, when "green" was chosen, vocalizations within the group would be appropriate, but calling out to other students or raising voices would be defined as inappropriate. Posters with the color wheel system rules included three visual directions for the students. Students had a visual traffic light and posters specifying the rules to help them understand the classroom expectations. The first stage of the study included observing classroom behavior before the color wheel system was implemented,

using the results as baseline behaviors. Inappropriate vocalizations were calculated using 20-second intervals between 9:00-10:00 am. Next, researchers aided the teachers in implementing their individualized color wheel system in their classroom; this was termed the intervention stage. Teachers were also provided with feedback to help them improve their efficiency in program implementation. Both teachers continued to use the program after the first week and researchers returned twice per week for the next month to record their observations of *inappropriate vocalizations*, using the same method as the baseline phase. There was a significant decrease in inappropriate vocalizations from 28%-48% at baseline to 0%-6% as recorded for maintenance. The color wheel system showed significant reductions in classroom disruption in both classes, with students enjoying the program. The authors noted that the less rigid set of rules after the intervention compared to before was easier for special education students to understand and manage their behavior, which translated into the students feeling liberty of some movement and the security of knowing what was expected of them. However, the color wheel system program needed to be an ongoing intervention and did not eliminate the root cause of the disruptive behavior.

Using a quantitative randomized controlled-trial research design, Sinclair et al. (2021) assessed behavioral and academic outcomes for at-risk students who received behavioral support compared to students who did not receive behavioral support. CHAMPS's inclusive classroom program provided behavioral support (Conservation, Help, Activity, Movement, Participation, and Success). The goals of CHAMPS include reducing off-task behavior, promoting prosocial behavior, and increasing academic

opportunities. In addition, CHAMPS helps teachers develop classroom management skills that encourage proactive, positive, and instructional modalities. CHAMPS efficacy was measured using the STOIC (Structure for success, Teacher expectations, Observe systematically, Interact positively, and Correct calmly) rating scale (Sprick, 2013, as cited in Sinclair et al., 2021) three times during the school year. In addition, the Classroom Assessment Scoring System-Secondary predicted student achievement and social outcomes. The variables of interest included behavioral variables (concentration problems, prosocial behavior, emotional regulation, and disruptive behavior), academic variables (reading comprehension, problem-solving, communication arts, and mathematics), and at-risk/average students (moderator variable); teachers were asked to classify students as either at-risk (needing behavioral support) or average (no need for behavioral support). The researchers recruited 102 teachers and 1405 students in grades 6 to 8 English language and mathematics classrooms of urban schools in the U.S. Midwest. Researchers hypothesized that students identified as at-risk in CHAMP classrooms would improve by decreasing disruptive behavior, improving prosocial behavior, improving emotional regulation, increasing concentration, and improving academic outcomes. Although concentration and communication skills improved, the results were non-significant. In addition, poor self-regulation was a significant barrier to changing disruptive behavior (Sinclair et al., 2021).

In another quasi-experimental, pre-post, quantitative study, Kirkhaug et al. (2016) implemented the Incredible Years Teacher Classroom Management program to determine if its use as a stand-alone program would influence social competence, internalizing and

externalizing problems, academic performances, and student-teacher relationships. The focus of the program was on severe child externalizing problems. This classroom management program teaches teachers to promote students' school readiness and prosocial behaviors. Teacher training included six full-day workshops across 3-4 weeks. Workshops covered six themes: building positive relationships between students and the proactive teacher; teacher attention, coaching, encouragement, and praise; motivating students through incentives; decreasing inappropriate behavior by ignoring and redirecting; decreasing inappropriate behavior - by following through with consequences; and emotional regulation, social skills, and problem-solving. In addition, teachers were provided manual and verbal or written feedback/guidance while implementing skills in-between workshops. The authors hypothesized that the program would decrease externalizing behavior, increase student social competency, decrease internalizing behavior, increase academic performance, and increase teacher-student relationships. The study included 21 intervention schools and 22 control schools.

The children were 1st to 3rd grade, with 85 students exhibiting severe externalizing behaviors. The dependent variables were social competence, internalizing and externalizing problems, academic performances, and student-teacher relationships. Externalizing behaviors were measured using the Sutter-Eyberg Student Behavior Inventory-Revised. Internalizing behaviors and academic performance used the Teacher Report Form, a part of the Achenbach System of Empirically Based Assessment. Social skills were assessed using the Social Skills Rating System, while student-teacher relationships were measured using the Student-Teacher Relationship Scale. Results

indicated no significant improvement in externalizing, internalizing, social skills, and closeness to the teacher after the intervention was used. However, student-teacher conflicts decreased and academic performance significantly increased. The researchers found the improvements encouraging, but students with more significant needs required a more comprehensive approach to tailoring interventions to their specific needs, possibly in Tier 2 or Tier 3 programs (Kirkhaug et al., 2016).

Another area explored by the research for origins of disruptive behavior in the classroom includes peer relationships and, more specifically, peer interactions (Muller et al., 2018; Shin & Ryan, 2017; Yoder et al., 2017). For example, to determine the influence of seating plans on student behavior, van den Berg and Stoltz (2018) used a randomized controlled trial to investigate the effect of positive peer seat-buddies on the externalizing behavior of targeted students. The study included 64 classrooms with 221 4th- to 6th-grade students in inclusive classrooms from the Netherlands. Teachers identified students with externalizing behavior and students exhibiting prosocial behavior. Two groups were created for the intervention. One group included seating a prosocial buddy with an externalizing student and the other group randomly seated the externalizing child in the classroom. First, teachers completed a short questionnaire and a map of the seating arrangement. Next, the students were given a computerized questionnaire to measure the likeability of each classmate. Finally, student externalizing behavior was measured using teacher questionnaires. Immediately after the pre-test, students were provided with a new seating plan. Upon teacher approval, students sat in their new locations until post-test, lasting between eight to thirteen weeks. Teachers and

students completed post-test questionnaires including social status and behavior for both the externalizing child and the buddy. The authors wanted to know if the externalizing student became better liked, less aggressive, and more prosocial and whether the buddy became less liked, more aggressive, and less prosocial by sitting beside an externalizing student. Seating a prosocial buddy beside an externalizing student resulted in a significant decrease in externalizing behavior, but the buddy lost prosocial status by being beside the externalizing student. Results indicated that the students who had exhibited disruptive behavior demonstrated prosocial behavior as a function of sitting beside a prosocial buddy.

Maggin et al. (2017) conducted a meta-analysis of research examining peer relationships and disruptive students. This study reviewed the efficacy of using contingency interventions for students with maladaptive behavior within the classroom. Contingency interventions include group behavior, during which a designated reward can be earned if every member of the group follows the set parameters. The method is based on operant conditioning. It is the most widely used research method for classroom management (Simonsen et al., 2008, cited in Maggin et al., 2017). The researchers determined strong evidence supporting group contingencies in the general education classroom. However, they also pointed out that there is still a strong need for more research, especially identifying the disruptive student's functional level.

In summary, current classroom strategies to address maladaptive behavior are successful for the Tier 1 universal classrooms. First, Kirkhaug et al. (2016) and Sinclair et al. (2021) examined classroom management programs that did not significantly reduce

maladaptive behavior. These two classroom management programs were also labor-intensive for the teacher. Second, Malboeuf-Hurtubise (2018) examined a teacher-led mindfulness program that did not provide significant findings for reducing disruptive behavior. Third, Van der Berg and Stoltz (2018) demonstrated that using social buddies helped minimize externalizing behavior for special education students. Unfortunately, it came at the cost of the social buddy losing social status. Finally, Kowalewicz and Coffee (2014) and Aspiranti et al. (2018) demonstrated that using visual cues by posting classroom rules and teacher support resulted in significantly lower disruptive behaviors in the classroom. These two programs were less labor-intensive for the teacher and did not cause negative results for any students. In addition, both teachers and students enjoyed the methods. This research suggests that managing children with maladaptive behavior overall requires a method involving the whole classroom using visual and verbal support.

Maladaptive Behaviors Related to Sensorimotor Deficits

The limited research examining sensorimotor deficits and maladaptive behaviors points to a possible connection among children with autism spectrum disorder (ASD). In this section, I review studies that link sensorimotor deficits to maladaptive behavior, including problems related to sensory processing (Dellapiazza et al., 2020; Lane et al., 2010), motor deficits (Gieysztor et al., 2018; Pusponegoro et al., 2016), and the biological origins of adaptive and maladaptive behavior in ASD students (Ebishima et al., 2019). The children in all the studies, except Gieysztor et al. (2018), carry the diagnosis of ASD. While the current study will focus on special education students, research on the

connection between sensorimotor deficits and maladaptive behavior among ASD students is relevant.

In one of the first studies reviewing sensory processing and maladaptive behaviors, Lane et al. (2010) analyzed the sensory profiles of ASD students using archival data showing sensory processing patterns. The authors' goal was to find specific sensory processing patterns and the association with adaptive behavior in students with ASD, linking the importance of everyday life skills to specific patterns of sensorimotor functioning and emotional regulation (adaptive skills) in ASD students. The participants included 54 ASD students (aged 2.75 to 9.58) and their caregivers in Australia. The archived datasets used the Short Sensory Profile, which measures seven sensory domains: tactile, taste/smell, movement and visual/auditory sensitivity, under-responsiveness/seeks sensations, auditory filtering, and low energy/weak. An overall sensory processing score was also provided. The authors discovered significant variations in sensory processing and adaptive skills (emotional regulation, social relationships, and activity participation) for ASD students. First, a significant difference was found in the auditory filtering domain showing 92% of ASD students had difficulties in this area, indicating that ASD students have co-existing sensory under- and over-responsiveness. Secondly, a model-based cluster analysis established three subtypes within the sensory processing psychometric scores: sensory-based inattentive seeking, sensory modulation with movement sensitivity, and sensory modulation with taste/smell sensitivity. Next, the authors pointed out that auditory filtering, taste/smell sensitivity, and low energy/weakness could be a template for understanding sensory processing in ASD

students. Finally, the authors pointed out a significant negative relationship between sensory integration and adaptive functioning, noting the increased sensorimotor deficits and poor adaptive functioning rates and called for additional early interventions.

In a more recent quantitative study, Dellapiazza et al. (2020) investigated the frequency and type of sensory-processing difficulties in a sample of 197 ASD students. The authors explored the impact sensory processing had on adaptive functioning and maladaptive behavior. The ASD students were divided into two groups based on typical and atypical sensory processing functioning per quadrant score provided by the Sensory Profile Test. The Sensory Profile is a questionnaire completed by parents that assesses seeking stimulation, avoiding stimulation, sensitivity to surroundings, and registration of cues (missing cues around them). The results were also reported based on each sensory domain (auditory, visual, vestibular, oral, touch, and multisensory). Adaptive functioning was measured using the Vineland Adaptive Behavior Scale second edition, while maladaptive behavior calculations used the Aberrant Behavior Checklist (ABC). The ABC includes five factors: (1) irritability, agitation, and crying; (2) lethargy, social withdrawal; (3) stereotypic behavior; (4) hyperactivity, noncompliance; and (5) inappropriate speech. The researchers also measured the degree of severity of ASD through the Autism Diagnostic Observation Schedule second edition (ADOS-2). Participants were obtained from a larger multicenter, longitudinal, prospective ELENA study in France.

Dellapiazza et al. (2020) found that children with ASD had sensory processing atypicality for every quadrant and sensory section except for visual processing. The

prevalence was found in the sensation-avoiding and sensory-seeking quadrants. A high percentage (86.8%) of the participants showed atypical sensory processing in at least one quadrant of the Sensory Profile. Only the Vineland Adaptive Behavior Scale (VABS) communication domain showed statistical significance for the sensory-avoiding quadrant. Children with difficulties with atypical tactile processing had significantly lower socialization scores. Children with atypical oral processing had significantly lower scores in each VABS domain (communication, autonomy, and socialization).

Regarding sensory modalities, the highest rates of sensory processing difficulties were for oral, tactile, auditory, and vestibular. At the same time, the most sensory processing struggles occurred in the multisensory domain, with 58.3% reported in the sample population. The authors concluded that multisensory disturbances point to a lack of integration of multimodal information (Dellapiazza et al., 2020). According to the sensory-processing scores, students exhibiting sensory-seeking behavior had statistically lower adaptive skills and displayed significantly more maladaptive behaviors. The authors linked their results to sensory-processing and socialization skills, with early sensory-processing difficulties predictive of poor high school socialization (Dellapiazza et al., 2020). The authors called for early intervention and adaptations in the child's environment.

Another recent study examined the possible biological underpinnings (related to basic sensory processing) of adaptive and maladaptive behavior using acoustic startle response (ASR)-as a measure of the biological marker (Ebishima et al., 2019). The ASR and its modulation are stable biological markers linked to children with ASD. It was

hypothesized that this biological marker would be linked to sensory processing abnormalities and result in higher levels of maladaptive behavior. Students' ASR was measured using the Startle Eyeblink Reflex Analysis System Map 1155SYS, a computerized human startle-response measuring machine. Adaptive and maladaptive behavior was assessed using the Vineland Adaptive Behavior Scales. Participants included 11 ASD students and 18 students with typical development from Japan. ASD students took significantly longer to respond to the startle cue than the typically developing students. There was a statistically significant negative correlation between ASR latency and adaptive behavior but a significant positive relationship with maladaptive behavior. When the researchers adjusted for multiple comparison calculations, there were no significant relationships between ARS and the Vineland Adaptive Behavior Scales scores.

Pusponegoro et al. (2016) used a cross-sectional design to compare ASD and non-ASD children for motor deficits and socialization difficulties. Forty age-matched ASD children were compared to their counterparts in an Indonesian study using the Vineland Adaptive Behavior Scales, 2nd edition. The authors used only the gross motor subdomain and socialization domain. They found statistically significant gross motor impairment in only 20% of the ASD participants. The ASD children with gross motor impairment showed significantly lower socialization scores than ASD children without gross motor impairment. The authors suggested that children with ASD be tested for gross motor deficits.

Gieysztor et al. (2018) supported the previous study by examining the occurrence of retained primitive reflexes on psychomotor development. Primitive reflexes are stem reflexes that naturally transfer to cortically controlled responses as the child matures and explores their world. When a primitive reflex is still present past normal development, psychomotor development can be affected. The authors stated that retained primitive reflexes could interfere with social and educational development, stressing that those behavioral difficulties can be experienced in school-aged children. Children with poor balance can have difficulty re-establishing emotional and physical equilibrium. Participants included 35 children aged 4-6 years in an inclusive classroom. Using primitive reflex tests by Sally Goddard for Children, results indicated that 65% retained primitive reflexes, with 11% having no retained primitive reflexes. The Motor Proficiency Test provided a measure for psychomotor development. The results included altered development (9%), delayed development (29%), normal (59%), and very good development (3%). The authors suggested early testing for survived primitive reflexes since over half of the study sample had retained primitive reflexes. There was also mention of the possibility that the rates were so high due to delayed maturity.

The literature review section provides evidence of the connection between sensorimotor deficits and maladaptive behaviors in children. Lane et al. (2010) found a relationship between higher sensory deficits and lower adaptive functioning, noting a continued increase of problems in the ASD population. The most crucial finding included difficulties in auditory filtering in 92% of the sample population. Dellapiazza et al. (2020) noted sensory deficits were related to a significant increase in maladaptive

behaviors and lower adaptive skills. In particular, 86.8% of the children tested demonstrated atypical sensory processing in at least one quadrant of the Sensory Profile and significantly lower scores in communication, autonomy, and socialization. Ebishima et al. (2019) found similar results to Lane et al. (2010) but used the auditory startle response as a sensory measure. Pusponegoro et al. (2016) found a negative relationship between gross motor impairment and socialization, a subcategory of adaptive skills. Furthermore, Gieysztor et al. (2018) demonstrated that survived primitive reflexes adversely affected psychomotor development, that may to behavioral difficulties. The culmination of these studies points to a relationship between maladaptive behavior and sensorimotor deficits.

Summary and Conclusions

The major themes in the literature included the evidence of a relationship between maladaptive behavior and sensorimotor deficits. The literature is clear on the ASD population; however, few studies examine the special education population's sensorimotor deficits and maladaptive behavior. Maladaptive behavior in the classroom is apparent, but studies examine the inclusive classroom and often do not separate the special education population as a demographic measure. Of the studies that separate special education students, externalizing behavior is higher than in other populations. Classroom management is the most challenging part of teaching—solutions for addressing the maladaptive behavior provide mixed results, with teacher-led classroom management showing no statistical significance. There is some promise for classroom contingency programs. This research suggests that managing children with maladaptive

behavior requires a method involving the whole classroom with intensive visual and verbal support. However, classroom management programs do not provide the underlying reason for the child's behavior. The current study will fill a research gap in understanding the root cause of maladaptive behavior among special education students in the classroom. The extension of knowledge for special education students will be demonstrated by determining the extent of the relationship between sensorimotor deficits and maladaptive behaviors in the special education population.

Chapter 3: Research Method

Introduction

Within the education field, sensorimotor deficits are not considered a contributing factor to maladaptive behavior for students in the classroom. This quantitative archived data study examined the relationship between sensorimotor deficits and maladaptive behavior (1) externalizing risk index, (2) internalizing risk index, (3) adaptive skills risk index, and (4) overall behavioral and emotional risk index, as measured by the Behavioral and Emotional Screening System (BESS) in special education students aged 8 to 12 years old through an archived data set obtained in New Zealand. This age range was used to avoid confusion between sensorimotor development and sensorimotor deficits. The SPM-2 children's version was developed and standardized using this age range (Purham et al, 2021). Children younger than 8 years of age may still have significant sensorimotor development. Findings indicated the extent to which sensorimotor deficits are associated with maladaptive behavior among special education students and addressed a gap in the educational psychology literature. The major sections of this chapter will include research design and rationale, methodology, population, sampling and sampling procedures, recruitment, participation and data collection, instrumentation and operationalization of constructs, threats to validity, and ethical procedures.

Research Design and Rationale

This non-experimental correlational design study used archived data that relied on two established psychometric assessments. The archived data contained results obtained from teachers that had completed subtests in the Sensory Processing Measure, second

edition (SPM-2) and the Behavior Assessment System for Children, third edition Behavioral and Emotional Screening System (BESS). The seven predictor variables included six sensorimotor deficit measures from the SPM-2 (vision, hearing, touch, taste and smell, body awareness, and balance and motion), in addition to the sensory total. The criterion variables included (1) externalizing risk index, (2) internalizing risk index, (3) adaptive skills risk index, and (4) overall behavioral and emotional risk index, as measured by the Behavioral and Emotional Screening System (BESS). The internalized maladaptive risk score measures anxiety, depression, somatization, and withdrawal from social situations, with higher scores indicating higher internalized maladaptive risk. The externalized maladaptive risk score measures hyperactivity, aggression, and conduct problems, with higher scores indicating higher externalized maladaptive risk. The adaptive skills risk index score measures the ability to adapt to daily living situations without externalizing and internalizing behaviors, possess functional communication, adequate social skills, and sufficient study skills to function in the classroom. Higher scores on the adaptive risk index indicate higher levels of adaptive skills and improved functioning in the classroom.

I used an archived data set that obtained information from participants from a single point in time. Standard multiple regression analysis was conducted to determine the relative strength of sensorimotor deficit scores in predicting maladaptive behavior.

Methodology

Population

The archived data contained a target population of primary school teachers who taught special education children aged 8 to 12 in public primary schools in New Zealand. According to the 2018 census, there were 33,519 primary school teachers working in New Zealand in 2018 (Stats NZ, '2018 Census Data', 2019). Approximately 77% of teachers are female, and 23% are male.

Sampling and Sampling Procedures

The sampling method was a purposive sample. Teachers completing the survey contained in the archived data were currently teaching special education students. The strength of the sampling method allowed for the collection of data from teachers who work with students identified as special education students struggling in the classroom. The archived data was obtained in New Zealand. Teachers had taught for a minimum of two years.

A medium effect size was used in studies reviewed in this dissertation. For example, Dellapiazza (2020) examined various adaptive functions in comparison to sensory quadrants. Using an ANCOVA analysis method, values for the R^2 were found to be significant in at least one quadrant for irritability (0.16), lethargy (0.24), stereotypy (0.39), and hyperactivity (0.35) for an average medium effect size of 0.29. Since this study has a medium effect size, I used a medium effect size in the power analysis to determine the recommended sample size for multiple regression. Power analysis was calculated using G*Power software for seven predictor variables using a medium effect

size of 0.15, an alpha level of .05, and the power level of 0.80 (Faul et al., 2009). The power analysis resulted in a recommended sample size of 109. The G*Power calculation graph has been provided in Appendix A. The archived data sample size of 108 satisfied the recommendation that sample size for multiple regression should include a minimum of 100 cases (Tabachnick & Fidell, 2013).

Procedures for Recruitment, Participation, and Data Collection

No recruitment was necessary as archived data was used from a mental health organization called *Frontiers of Hope.* The archived data contained age and gender demographics for the students, but none for the teachers. As part of the inclusion criteria within the archived data, the teachers were asked to choose one student (aged 8-12 years) they were currently.

Instrumentation and Operationalization of Constructs

Sensory Processing Measure, Second Edition

The Sensory Processing Measure, second edition (SPM-2), was used to measure teacher assessment of student sensory processing and motor abilities (Purham et al., 2021). The SPM-2 provides the option of a home form and a school form. The archived data used the SPM-2 school form. The SPM-2 was designed for teachers to assess a student's vision, hearing, touch, taste and smell, body awareness, balance and motion, planning and ideas, and social participation and included a sensory total score (Purham et al., 2021). Since my research required an overall sensory processing ability, I used the total sensory processing score and the other subscale scores included in the sensory total. This score did not include planning and ideas or social participation; only vision, hearing,

touch, taste and smell, body awareness, and finally, balance and motion were used. The sensory total is a composite score valuable as an overall sensory integration and processing measure (Purham et al., 2021).

The SPM-2 is published by Western Psychological Services and is available for purchase through research permission through Western Psychological Services (WPS). The SPM-2 was published in 2021, with the original SPM published in 2007 (Purham et al., 2021). Each sensory subscale used has ten items for a total of 60 items. Scores are calculated on a 4-point Likert scale, and response choices include “never, occasionally, frequently, or always.” Examples from the hearing and vision subscales included “Becomes distressed when others clap or sing,” and “Is distracted by visual objects or people,” respectively. A statement for the touch subscale was “Fails to respond to being touched,” while the body awareness subscale statement included “Plays too roughly with peers.” Next, taste and smell were verified using statements such as “Refuses to try new foods or snacks,” and finally balance and motion were quantified using statements like “Has poor balance.” The archived data provided a t-score obtained from the raw score for the sensory processing total score (Purham et al., 2021).

The SPM was reviewed by Miller-Kuhaneck et al. (2007) when it was first published. In discussing the development of the school form, they stated that internal consistency as measured by Cronbach's alphas ranged from .93 to .99 in the first pilot study and .70 to .99 in the second pilot study. The authors determined that the tool was reliable and valid for discriminating between children with sensory processing issues and those without (Miller-Kuhaneck et al., 2007). Watson and Woodin (2010) also reviewed

the SPM. The total sample coefficient alpha estimates returned at or about .75. Watson and Woodin (2010) found a median test-retest reliability result of .97. The standard errors ranged between 1.29 to 4.40 points. Purham et al. (2021), reviewing the newer SPM-2 school form, found Cronbach's alpha internal consistency for the sensory total .96 (5-8 years old) and .97 (9-12 years old), vision .83 (5-8 years old) and .87 (9-12 years old), hearing .84 (5-8 years old) and .88 (9-12 years old), touch .75 (5-8 years old) and .87 (9-12 years old), taste and smell .85 (5-8 years old) and .87 (9-12 years old), and body awareness .90 (5-8 years old) and .90 (9-12 years old). The sensory scores retained their internal consistency for individuals with different diagnoses (Purham et al., 2021). The test-retest reliability for the school form demonstrated stability above $r = .94$. The standard errors for the measurement and confidence intervals were calculated at 95% and deemed acceptable (Cruse, 2010). In test-retest, correlations for the school form for children (aged 5 to 12 years) were above .80, deeming the instrument reliable (Purham et al., 2021).

The SPM/SPM-2 has strong content validity and is based on Ayres Sensory Integration Theory. Items in each form correspond to sensory integration and processing for multiple content facets (Cruse, 2010; Purham et al., 2021). Watson and Woodin (2010) completed factor analysis to test construct validity and support the instrument's structure. There were high correlations between BOD (proprioception) and BAL (vestibular) scales.

Convergent validity was explored by comparing the SPM with the Sensory Profile (Dunn, 1999), resulting in adequate overlap in areas with similar content (Cruse, 2010).

However, the Sensory Profile does not have a school form, so no convergent validity was available to compare school forms. Following the 2010 reviews, Brown et al. (2011) completed a study to investigate the reliability (internal consistency and inter-rater reliability) between the Sensory Profile (SP) and the Sensory Processing Measure (SPM). They discovered that the internal consistency Cronbach alpha coefficients scores for the overall Sensory Profile, PSCS, SPM-Home From, and the SPM-Main classroom (renamed School Form in the SPM-2) were 0.97, 0.94, and 0.86, respectively. The overall Sensory Profile and SPM-Home Form's inter-rater reliability intra-class correlation coefficients were 0.48 (p=.05) and 0.63(p=.05). The authors concluded that both measures had adequate levels of internal consistency and were reliable for cross-cultural use.

Convergent validity comparing the SPM-2 and the Sensory Profile 2 (SP-2; Dunn, 2014) was also compared by Purham et al. (2021). Correlations were significant to p<.01 level, with the school form Pearson r values ranging from .60 to .70. The authors concluded that convergence validity contained expected patterns between the two measures. Cruse (2010) found that the instrument could distinguish a clinical group from a typical sample for criterion-related validity. Therefore, the author concluded that the instrument is usable and structural sound when attempting to identify sensory problems in children (Cruse, 2010). Purham et al. (2021) concluded that the SPM-2 showed a convergent relationship with the SP-2 within the sensory domain levels.

Watson and Woodin (2010) determined that discriminant validity was found due to a clinically meaningful effect size between the normative sample and the clinic-

referred children. The authors concluded that the SPM had an adequate normative base with adequate to moderate evidence in reliability, validity, factor structure, and discriminant validity, concluding that the estimates of reliability, validity, and construct structure fall within adequate to strong. The authors suggested that the instrument be restricted to research due to the lack of data in identifying effective treatments.

The above review demonstrates, at minimum, adequate reliability and validity for the SPM/SPM-2. Use of the SPM and SPM-2 have been included in an inclusive educational setting (Miller Kuhaneck & Henry, 2009), a pilot study for clinical use for children with somatodyspraxia (Chu, 2020), and the SPM-2 for a research study with ASD and typically developing students sample population (Narzisi, 2022). In particular, Narzisi (2022) used the SPM-2 and compared sensorimotor profiles of two groups of ASD children (high functioning and low functioning) and typically developing students finding different processing patterns per group. In addition, the author evaluated the cognitive level and sensory symptoms as explained by the SPM-2. ASD functioning was determined using previous ADOS-2 scores, and cognitive functioning was determined with previous WISC-V results. Participants included 105 autistic children and 70 typically developing children. ASD children were found to have significantly higher SPM-2 scores than the typically developing children. High and low functioning ASD children had different sensory patterns. High functioning ASD children had more difficulties with vision, touch, body awareness, and balance, while low functioning had greater difficulty with social participation, and planning and ideas. Hearing scores were comparable between the two groups. Both groups had clinically significant scores in

social participation and planning & ideas. The high functioning ASD students had clinically significant scores in their sensory total scores, but the low functioning ASD student did not. The results indicated that ADOS-2 scores and cognitive levels of ASD children did not interact with the sensory profiles provided by the SPM-2 (Narzisi, 2022). The SPM-2 demonstrated discriminant validity between the typically developing and ASD children (Narzisi, 2022).

Behavior Assessment System for Children, Third Edition; Behavioral and Emotional Screening System (BESS)

The Behavioral and Emotional Screening System (BESS) is a psychometric test available for purchase. The Behavioral and Emotional Screening System measured the criterion variables (externalizing risk index, internalizing risk index, adaptive skills risk index, and overall behavioral and emotional risk index, as measured by the BESS). The BESS is a part of the Behavior Assessment System for Children, Third Edition (BASC-3) family of assessments available to measure children's behavior (Sink & Carlisle, 2022). The BESS was developed alongside the other BASC-3 measures via serial principal component analysis attained from the complete BASC-3 form. Selection for the BESS questions was based on unique content, highest loading for composite scores, and the maintenance of similar psychometric properties in the corresponding form (complete BASC-3 teacher form and the BESS teacher form) (Carlson et al., 2017; Kamphaus & Reynolds, 2015; Sink & Carlisle, 2022). The BESS can be used solely or in combination with the other BASC-3 measures (Carlson et al., 2017; Kamphaus & Reynolds, 2015).

The BESS contains 20 questions that can quickly assess if there are problems with maladaptive and adaptive behaviors (Kamphaus & Reynolds, 2015). As a screening system, the BESS can provide insight into the overall behavioral and emotional risk index (BERI) score the student is exhibiting in the classroom. The BESS provides an overall behavioral and emotional risk index (BERI) value of functioning with a total of 20 questions, in addition to an externalizing risk index, internalizing risk index, and an adaptive risk index. It takes approximately five minutes to complete. The BESS is not a diagnostic assessment and lacks the level of comprehensive questions found in the complete BASC-3 assessments. Instead, the BESS assesses the risk level for developing emotional and behavioral problems, thus determining if the student exhibits maladaptive behaviors. The BESS uses a Likert scale that includes "not at all" (0), "sometimes" (1), "often" (2), and "always" (3). The BERI *T*-scores are available to classify normal scores within one standard deviation of the mean; scores falling within two standard deviations are elevated risk, while scores spanning three standard deviations are classified as extremely elevated risk. NCS Pearson originally published the BASC in 1992, the BASC-2 in 2004, and finally the BASC-3 in 2015.

The BESS provides three scoring validity scales. An *f*-index score is provided to safeguard the level of negativity teachers may present in their responses. The values range from acceptable, caution, to extreme caution categories. The consistency index measures inconsistent teacher responses by pairing similar items, while the response pattern index analyzes the patterns associated with those responses. High scores in any

scoring validity scale led to a cautionary note for interpreting the scores (Carlson et al., 2017; Kamphaus & Reynolds, 2015; Sink & Carlisle, 2022).

The BERI total score internal consistency coefficients (Spearman-Brown corrected split-half) ranged from *r*= .91 to .98, with a median value of *r*= .95. The alpha coefficients for subscale scores included a .72 to .93 range with a .88 median for the teacher's form. The BERI test-retest reliability coefficients, which were adjusted for variability, ranged from *r*= .87 to .93 and included a median of *r*= .91. Subscale score test-retest adjusted coefficients had parameters ranging from *r*= .76 to .92 and included a median of *r*= .87. Interrater reliability between the parent and teacher forms ranged from *r*=.67 to .83 (median .77) (Carlson et al., 2017; Kamphaus & Reynolds, 2015; Sink & Carlisle, 2022).

Convergent validity was explored by comparing the relationship between BASC-3 BESS scores with the Achenbach System of Empirically Based Assessment (ASEBA) (*r*=.50 to .70), Autism Spectrum Rating Scales (ASRS) (*r*=.23 to .58), the Children's Depression Inventory 2 (*r*=.50 to .60), and the Revised Children's Manifest Anxiety Scale, Second Edition (*r*=.30 to .50) and Conners 3 (*r*=.40 to .60) (Carlson et al., 2017; Kamphaus & Reynolds, 2015; Sink, 2022). Specific correlations between the BERI and subscores ranged from *r*=.68 to .88. Correlations between the BERI and BASC-3 behavior symptom index ranged from *r*=.90 to .92. In contrast, BESS subindex scores and BASC-3 composite scores ranged from *r*=.86 to .92 (Kamphaus & Reynolds, 2015; Sink & Carlisle, 2022).

The BESS is deemed an effective screening instrument when utilizing the BERI score (Carlson et al., 2017). In addition, sink and Carlisle (2022) viewed the BESS as a quality screening instrument to assess behavioral and emotional difficulties. Therefore, they are further identifying the use of the BESS in school, clinical, and research settings (Sink & Carlisle, 2022).

Data Analysis Plan

Data was analyzed using the Statistics Program for Social Sciences (SPSS), version 28. Standard multiple regression was used to measure the strength of the relationship between specific areas of sensorimotor deficits and externalized maladaptive risk index, internalized maladaptive risk index, adaptive skills index, and overall behavioral and emotional risk index (BERI) score.

Research Questions and Hypotheses

RQ1- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's internalized maladaptive risk index scores, as measured by the BESS, among special education students?

H_{O1} Sensorimotor deficits are not a significant predictor of internalized maladaptive risk index scores.

H_1 Sensorimotor deficits are a significant predictor of internalized maladaptive risk index scores.

RQ2- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's externalized maladaptive risk index scores, as measured by the BESS, among special education students?

H_{O2} Sensorimotor deficits are not a significant predictor of externalized maladaptive risk index scores.

H_2 Sensorimotor deficits are a significant predictor of externalized maladaptive behavior.

RQ3- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's adaptive skills risk index scores, as measured by the BESS, among special education students?

H_{O3} Sensorimotor deficits are not a significant predictor of adaptive behavior skills risk index scores.

H_3 Sensorimotor deficits are a significant predictor of adaptive behavior skills risk index scores.

RQ4- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's overall behavioral and emotional risk index (BERI) scores, as measured by the BERI score on the BESS, among special education students?

H_{O4} Sensorimotor deficits are not a significant predictor of overall behavioral and emotional risk index (BERI) scores.

H_4 Sensorimotor deficits are a significant predictor of overall behavioral and emotional risk index (BERI) scores.

Screening of the data also included determining if the data set satisfied the assumptions for multiple regression, which include: (a) normal distribution, (b) little to no multicollinearity, (c) linear relationship between the predictor and criterion variables, (d) homoscedasticity is present, and (d) independence of observation (Hatcher, 2013).

Multiple methods will be implemented to test for the four assumptions. First, normality, skewness, and kurtosis used normal probability or the Q-plot method. Second, linearity was tested using a scatterplot or histogram. Third, multicollinearity was ascertained using a bivariate correlation matrix. Fourth, the absence of autocorrelation was examined through a Durbin-Watson's *d* test. Fifthly, homoscedasticity was explored using a scatterplot of residuals versus predicted values.

Threats to Validity

High internal validity is required to demonstrate a causal link between two variables. Because variables are not manipulated or controlled, internal validity is low in correlational research (Frankfort-Nachmias et al., 2014). Threats to validity linked to correlational research include historical/temporal threats and instrumentational problems. However, temporal validity might be a consideration based on the time of year the research is conducted. For example, if teachers are asked to complete a questions on a student early in the term, they may not have had enough experience with the student to assess the student accurately. Therefore, data collection is best done after the middle of the first term (Sawyer et al., 2009).

Statistical conclusion validity can contribute to the internal validity by drawing incorrect conclusions about the relationship between the predictor and criterion variables (Garcia-Perez, 2012). Safeguarding against statistical conclusion validity begins by determining whether the statistical tests match the research design, study aims, and data characteristics well. For example, standard multiple regression matches the research design investigating a relationship between sensorimotor deficits and children's

maladaptive behavior. The data obtained from the archived were continuous values, except for gender and age.

An additional threat to validity is that no independent objective assessments were provided to verify that students are classified in the special education category. As the data was obtained via archived data, I could not verify any student diagnosis, if the student was on medication, or if there were additional supports/treatment inside or outside the school environment. The measures used in the archived data for sensorimotor deficits and maladaptive behavior were validated to minimize threats to validity.

Ethical Procedures

The archived data was provided to me via USB transfer, therefore there was no possibility of IP address tracking, guaranteeing truly anonymous research and prevented respondent-tracking or follow-ups. Treatment of data was and will continue to be safeguarded using data storage procedures. Access to data will only include the myself and the committee members. Data will be kept for five years, as outlined in the Research Ethics Approval Checklist document and APA guidelines (American Psychological Association, 2010). Data dissemination will not contain information that could identify participants.

Summary

The quantitative research study used a nonexperimental archived data design. The seven predictor variables included six measures from the SPM-2 (vision, hearing, touch, taste and smell, body awareness, and balance and motion) plus the sensory total. The criterion variables included (1) externalizing risk index, (2) internalizing risk index, (3)

adaptive skills risk index, and (4) overall behavioral and emotional risk index, as measured by the Behavioral and Emotional Screening System (BESS). The archived data was completed by teachers with a minimum of two years of experience teaching special education students aged 8-12. The archived data contained values for the SPM-2, BESS, and demographic information. In addition, standard multiple regression was used to determine the relative strength of sensorimotor deficits in predicting maladaptive behavior. Chapter 4 provides the data collection and analysis and present descriptive and inferential statistics from the multiple regression analyses.

Chapter 4: Results

Introduction

Using an archived dataset, this non-experimental quantitative study examined the relationship between sensorimotor deficits and maladaptive behavior in New Zealand special education students aged 8 to 12. Data included six sensorimotor deficit areas (vision, hearing, touch, taste and smell, body awareness, and balance and motion) and an overall sensory total score for the predictor variables. The criterion variables under the category of maladaptive behavior were divided into (1) externalizing risk index, (2) internalizing risk index, (3) adaptive skills risk index, and (4) overall behavioral and emotional risk index, as measured by the Behavioral and Emotional Screening System (BESS). The behavioral and emotional score was measured using the Behavioral and Emotional Risk Index (BERI). In this study, I analyzed an archival dataset provided by *Frontiers of Hope*. *Frontiers of Hope* is a mental health organization researching to find root causes of behavior. The *School Pay It Forward* project included teachers who completed two psychometric tests based on their experience with and knowledge of a special education student they taught within the last six months. Using these archived data, I examined four research questions using standard multiple regression. The research questions and hypotheses are restated below. Data collection, screening procedures, descriptive statistics, and evaluation of statistical assumptions are also provided. Chapter 4 concludes with a summary of the main findings from the standard multiple regression analyses.

Research Questions

RQ1- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's internalized maladaptive risk index scores, as measured by the BESS, among special education students?

H_{O1} Sensorimotor deficits are not a significant predictor of internalized maladaptive risk index scores.

H_1 Sensorimotor deficits are a significant predictor of internalized maladaptive risk index scores.

RQ2- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's externalized maladaptive risk index scores, as measured by the BESS, among special education students?

H_{O2} Sensorimotor deficits are not a significant predictor of externalized maladaptive risk index scores.

H_2 Sensorimotor deficits are a significant predictor of externalized maladaptive behavior.

RQ3- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's adaptive skills risk index scores, as measured by the BESS, among special education students?

H_{O3} Sensorimotor deficits are not a significant predictor of adaptive behavior skills risk index scores.

H_3 Sensorimotor deficits are a significant predictor of adaptive behavior skills risk index scores.

RQ4- To what extent do sensorimotor deficits, as measured by the SPM-2, predict children's overall behavioral and emotional risk index (BERI) scores, as measured by the BERI score on the BESS, among special education students?

H_{O4} Sensorimotor deficits are not a significant predictor of overall behavioral and emotional risk index (BERI) scores.

H_4 Sensorimotor deficits are a significant predictor of overall behavioral and emotional risk index (BERI) scores.

The remaining sections of Chapter 4 will include a description of the data collection, evaluations of statistical assumptions, results from the standard multiple regression analyses, and summary.

Data Collection

I used an archived data set from an organization named *Frontiers of Hope,* located in New Zealand. The *School Pay It Forward* project included public primary school teachers in New Zealand. Based on student age, primary schools in New Zealand are equivalent to elementary schools in the United States. I received permission from the organization to use their archival data in November 2022, which contained 105 participants. The archival dataset did not provide the number of teachers invited to participate in the research; therefore, I cannot calculate the response rate for the study. Teachers who participated in the project had taught for a minimum of two years and had taught a special education student aged 8-12 for a minimum of six months during the 2022 New Zealand school year. Teachers identified one special education student in their classroom and completed two online instruments to assess the student's sensorimotor

deficits (SPM-2) and maladaptive behavior (BESS). Teachers were provided with a link to complete the forms choosing a special education student. It was not based on a specific observation period but on their previous classroom interaction with the student. The Walden IRB approved the study on December 16, 2022, providing the following approval number: 12-16-22-0129185.

Demographic data were included in the archived data for the teachers only if they met the inclusion criteria. Demographic student data (age and gender) were included in the archival data set and a summary is displayed in Table 1. Most of the students were male (*N*= 60, 55.6%) compared to females (*N*= 48, 44.4%). The students varied by age as follows: 8-year-olds (*N*= 25 (23.1%), 9-year-olds (*N*= 27 (25.0%), *N*= 25 (23.1%), 10-year-olds (*N*= 12,11.1%), and 12-year-olds (*N*= 19, 17.6%). Table 1 provides a summary of the age and gender of the students.

Table 1 Age and Gender of Students

Age	Male	Female	*N*
8-year-olds	10	13	23
9-year-olds	16	11	27
10-year-olds	13	11	24
11-year-olds	8	4	12
12-year-olds	9	10	19
Total	56	49	105

There may be limits in generalizing the results to all special education students in New Zealand, as no specific diagnoses of the special education students were collected. In addition, the archival data set did not include a random sample, as teachers volunteered to participate.

Research

Descriptive Statistics

One hundred and five participant teachers were included in the archived data. Means and standard deviations were calculated for the seven predictor variables related to sensorimotor deficits: vision (M = 68.1, SD = 10.86), hearing (M = 70.72, SD = 10.77), touch (M = 63.80, SD = 14.04), taste and smell (M = 59.44, SD = 14.56), body awareness (M = 64.65, SD = 13.92), balance and motion (M = 63.19, SD = 12.48) and sensory total (M = 68.21, SD = 11.63). Table 2 provides the means and standard deviations for the predictor variables.

Table 2: Means and Standard Deviations for the Predictor Variables Related to Sensorimotor Deficits

Sensorimotor Deficit Subscale	*M*	*SD*
Vision	68.10	10.86
Hearing	70.72	10.77
Touch	63.80	14.04
Taste and Smell	59.44	14.56
Body Awareness	64.65	13.92
Balance and Motion	63.19	12.48

Sensory Total	68.21	7.53

Means and standard deviations were also calculated for the four outcome variables related to maladaptive behavior: externalizing risk index (*M* = 34.93, *SD* = 9.67), internalizing risk index (*M* = 35.93, *SD* = 9.67), adaptive skills risk index (*M* = 66.52, *SD* = 16.43), and overall behavioral and emotional risk index (BERI) (*M* = 59.20, *SD* = 7.54). Table 3 provides the means and standard deviations for the outcome variables.

Table 3: Means and Standard Deviations for the Outcome Variables Related to Maladaptive Behavior

Maladaptive Behavior Variables	*M*	*SD*
Internalizing	35.93	9.67
Externalizing	34.29	14.16
Adaptive Skills	66.52	16.43
Overall BERI	59.20	7.54

Evaluations of Statistical Assumptions

Assumptions for standard multiple regression were tested (i.e., multicollinearity, normality, homoscedasticity, and independence of residuals). First, the linearity between independent and dependent variables was examined using scatterplots (as shown in

Appendix B). The linearity assumption was met for the data. Next, multicollinearity was assessed by examining the Variance Inflation Factor (VIF). Table 4 displays the VIF values for the predictor variables. All of the sensorimotor deficit subscale VIF values were below ten, and tolerance scores were not lower than 0.1. The total sensory deficit score, with a VIF score of 50.645 and a tolerance score of .0202, did not meet the multicollinearity assumption. However, the multicollinearity assumption was met for the six sensorimotor deficit subscale variables. Finally, normality was tested using a normal P-P Plot of the regression standardized residuals, showing a reasonably straight line for all the criterion variables of externalizing, internalizing, adaptive skills, and the BERI. The scatterplots for all variables demonstrate that all data points are close to or on the line for each variable (see Appendix B).

Table 4: Collinearity Diagnostics for Predictor Variables

Predictor Variable	Tolerance	VIF
Vision	.263	3.806
Hearing	.107	9.342
Touch	.145	6.879
Taste and Smell	.385	2.601
Body Awareness	.162	6.172
Balance and Motion	.209	4.776
Sensory Total	.0202	50.645

Normality was tested using the Kolmogorov-Smirnov test of normality and skewness and kurtosis tests. The sensory processing and adaptive scores were not normally disturbed; they were skewed toward the higher values. Williams et al. (2013) suggested that some variables within multiple regression need not be normally distributed if there are normally distributed errors. Therefore, the assumption of normality of residuals was met.

Table 5: Normality Testing for Study Variables

Variables	Statistic[al]	*df*	*p*	Skewness	Kurtosis
Vision	.16	105	<.001	-.74	-.48
Hearing	.21	105	<.001	-1.04	.01
Touch	.15	105	<.001	-.23	-1.50
Taste and Smell	.22	105	<.001	.24	-1.60
Body Awareness	.16	105	<.001	-.32	-1.40
Balance and Motion	.13	105	<.001	-.12	-1.30
Sensory Total	.18	105	<.001	-.62	-.79
Internalizing	.11	105	.007	-.86	2.16
Externalizing	.09	105	.057	-.70	.62
Adaptive	.18	105	<.001	-.47	-1.00
BERI	.09	105	.267	-.28	.51

[a] Kolmogorov-Smirnov test of normality

Homoscedasticity was examined using scatterplots of the standardized residual and standardized predicted values for the four regressions (Appendix B). Examination of the scatterplots indicated that the variance of residuals was constant for all regressions. Therefore, the assumption of homoscedasticity was met.

After the assumptions for standard multiple regression were tested, instrument reliability (internal consistency) was calculated using Cronbach's alpha (Table 6). Cronbach's alpha scores for each scale and subscale were above 0.70, showing acceptable internal consistency ranging from .795 for the BESS BERI Total to .976 for the SPM-2 Sensory Total.

Table 6: Cronbach's Alpha for the SPM-2 and BESS

Variable	Cronbach's Alpha
Vision	.880
Hearing	.898
Touch	.904
Taste and Smell	.930
Body Awareness	.930
Balance and Motion	.907
Sensory Total	.976
Internalizing	.862
Externalizing	.925
Adaptive Skills	.824
BERI	.795

Standard Multiple Regression Analyses

Four different standard (enter method) multiple regressions were conducted for each criterion variable: internalizing risk index, externalizing risk index, adaptive skills risk index, and overall behavioral and emotional risk index assessing the relative strength of the seven predictor variables related to sensory processing deficits.

As noted in Chapter 3, higher scores on the sensory processing deficit subscales of the SPM-2 indicate higher levels of the specific sensory deficit (i.e., vision, hearing, touch, taste and smell, body awareness, balance and motion, and the total sensory deficit). Higher scores on the measures of maladaptive behavior on the BESS indicate higher levels of the specific type of maladaptive behavior risk. The internalized maladaptive risk score measures anxiety, depression, somatization, and withdrawal from social situations, with higher scores indicating higher internalized maladaptive risk. The externalized maladaptive risk score measures hyperactivity, aggression, and conduct problems, with higher scores indicating higher externalized maladaptive risk. The adaptive skills risk index score measures the ability to adapt to daily living situations without externalizing and internalizing behaviors, possess functional communication, adequate social skills, and sufficient study skills to function in the classroom. Higher scores on the adaptive risk index indicate higher levels of adaptive skills and improved functioning in the classroom.

Internalizing Risk Index

The first research question explored the extent to which sensorimotor deficits, as measured by the SPM-2, predict children's internalized maladaptive risk index scores, as measured by the BESS, among special education students. The results showed that the overall regression model was significant, $F(7, 104) = 3.262$, $p < .004$, $R^2 = .191$ (see Table 7). Therefore, the null hypothesis was rejected. The sensory deficit subscale for touch was statistically significant and positive in predicting internalizing risk scores ($b = .335$, $\beta = .487$, $p = .001$). The higher the sensory deficit score for touch, the higher the maladaptive behavior specific to internalizing risk score. On average, for every one-unit increase in the sensory deficit score for touch, there was a .335 increase in the internalizing risk score.

The sensory deficit subscale for balance and motion was also statistically significant and positive in predicting internalizing risk scores ($b = .320$, $\beta = .414$, $p = .041$). The higher the sensory deficit score for balance and motion, the higher the maladaptive behavior specific to internalizing risk score. On average, for every one-unit increase in the sensory deficit score for balance and motion, there was a .320 increase in the internalizing risk score. No other sensorimotor deficit subscale significantly predicted internalized risk. The standard and unstandardized regression coefficients for all the predictors are shown in Table 8.

Table 7: ANOVA Results for Internalizing Risk Index

	SS	*df*	*MS*	*F*	*R*	R^2	*p*

Regression	1851.026	7	264.432	3.262	.437	.191	<.004
Residual	7863.508	97	91.067				
Total	9714.533	104					

Table 8: Standard and Unstandardized Regression Coefficients for Independent Variables Predicting Internalizing Risk Scores

Variable	*B*	*SE*	β	*t*	*p*
Vision	.175	.159	.196	1.102	.273
Hearing	.254	.251	.283	1.015	.313
Touch	.335	.165	.487	2.032	.045
Taste and Smell	.069	.098	.104	.709	.480
Body Awareness	.096	.158	.139	.612	.542
Balance and Motion	.320	.155	.414	2.073	.041
Sensory Total	-.855	.540	-1.028	-1.581	.117

Externalizing Risk Index

The second research question explored the extent to which sensorimotor deficits, as measured by the SPM-2, predict children's externalized maladaptive risk index scores, as measured by the BESS, among special education students. The results showed that the

overall regression model was significant, $F(7, 104) = 14.302$, $p < .001$, R^2=.508 (see Table 9). Therefore, the null hypothesis was rejected. The sensory deficit subscale for body awareness was statistically significant and positive in predicting externalizing risk scores ($b = .377$, $\beta = .370$, $p = .039$). The higher the sensory deficit score for body awareness, the higher the maladaptive behavior specific to externalizing risk score. On average, for every one-unit increase in the sensory deficit score for body awareness, there was a .377 increase in the externalizing risk score. No other sensorimotor deficit subscale score was a predictor of externalized risk. The standard and unstandardized regression coefficients for all the predictors are shown in Table 10.

Table 9: ANOVA Results for Externalizing Risk Index

	SS	*df*	*MS*	*F*	*R*	R^2	*p*
Regression	10582.966	7	1511.852	14.301	.713	.508	<.001
Residual	10254.463	97	105.716				
Total	20837.429	104					

Table 10: Standard and Unstandardized Regression Coefficients for Independent Variables Predicting Externalizing Risk Scores

Variable	*B*	*SE*	β	*t*	*p*
Vision	.139	.181	.107	.768	.445
Hearing	.318	.286	.242	1.111	.270

Touch	.078	.188	.077	.413	.681
Taste and Smell	-.217	.112	-.223	-1.945	.055
Body Awareness	.337	.180	.370	2.092	.039
Balance and Motion	.232	.177	.205	1.316	.191
Sensory Total	-.054	.617	-.044	-.087	.931

Adaptive Skills Risk Index

The third research question explored how sensorimotor deficits, as measured by the SPM-2, predict children's adaptive skills risk index scores, as measured by the BESS, among special education students. The results showed that the overall regression model was significant, $F(7, 104) = 6.983$, $p < .001$, R^2=.335 (see Table 11). Therefore, the null hypothesis was rejected. The sensory deficit subscale for taste and smell was statistically significant and negative in predicting adaptive skills risk scores (b = -.334, β = -.296, p = .029). The higher the sensory deficit score for taste and smell, the lower the adaptive risk score. On average, for every one-unit increase in the sensory deficit score for taste and smell, there was a .334 decrease in the adaptive skills risk score. No other sensorimotor deficit subscale score significantly predicted adaptive skills risk. The standard and unstandardized regression coefficients for all the predictors are shown in Table 12.

Table 11: ANOVA Results for Adaptive Skills Risk Index

	SS	*df*	*MS*	*F*	*R*	R^2	*p*
Regression	9403.780	7	1343.398	6.983	.579	.335	<.001
Residual	18660.405	97	192.375				
Total	28064.190	104					

Table 12: Standard and Unstandardized Regression Coefficients for Independent Variables Predicting Adaptive Risk Scores

Variable	*B*	*SE*	β	*t*	*p*
Vision	-.313	.244	-.207	-1.279	.204
Hearing	.483	.386	.316	1.250	.214
Touch	.054	.254	.046	.211	.833
Taste & Smell	-.334	.151	-.296	-2.216	.029
Body Awareness	.118	.243	.100	.487	.628
Balance and Motion	.053	.238	.040	.221	.826
Sensory Total	.619	.832	.438	.743	.459

Overall Behavioral and Emotional Risk Index

The fourth research question explored how sensorimotor deficits, measured by the SPM-2, predict children's overall behavioral risk index scores (BERI), measured by the

BESS, among special education students. The results showed that the overall regression model was significant, $F(7, 104) = 10.044$, $p < .001$, $R^2 = .420$ (see Table 13). Therefore, the null hypothesis was rejected. The sensory deficit subscale for balance and motion was statistically significant and positive in predicting BERI risk scores ($b = .232$, $\beta = .384$, $p = .025$). The higher the sensory deficit score for balance and motion, the higher the maladaptive behavior specific to the overall BERI risk score. On average, for every one-unit increase in the sensory deficit score for balance and motion, there was a .384 increase in the overall BERI risk score.

The sensory deficit subscale for body awareness was statistically significant and positive in predicting the overall BERI risk scores ($b = .215$, $\beta = .396$, $p = .042$). The higher the sensory deficit score for body awareness, the higher the maladaptive behavior specific to the overall BERI risk score. On average, for every one-unit increase in the sensory deficit score for body awareness, there was a .215 increase in the BERI risk score.

Finally, the sensory deficit subscale for vision was statistically significant and positive in predicting BERI risk scores ($b = .230$, $\beta = .331$, $p = .031$). The higher the sensory deficit score for vision, the higher the maladaptive behavior specific to the overall BERI risk score. On average, for every one-unit increase in the sensory deficit score for body awareness, there was a .230 increase in the overall BERI risk score. No other sensorimotor deficit subscale score significantly predicted overall BERI risk. The standard and unstandardized regression coefficients for all the predictors are shown in Table 14.

Table 13: ANOVA Results for BERI Risk Index

	SS	*df*	*MS*	*F*	*R*	R^2	*p*
Regression	2482.183	7	354.598	10.044	.648	.420	<.001
Residual	3424.617	97	35.305				
Total	5906.800	104					

Table 14: Standard and Unstandardized Regression Coefficients for Independent Variables Predicting BERI Risk Scores

Variable	*B*	*SE*	β	*t*	*p*
Vision	.230	.105	.331	2.195	.031
Hearing	.247	.165	.352	1.491	.139
Touch	.192	.109	.358	1.767	.080
Taste and Smell	-.040	.065	-.078	-.627	.532
Body Awareness	.215	.104	.396	2.063	.042
Balance and Motion	.232	.102	.384	2.276	.025
Sensory Total	-.594	.357	-.917	-1.666	.099

Summary

The results from the multiple regression analyses demonstrated that specific sensorimotor deficits (vision, touch, taste and smell, body awareness, balance and motion) significantly predicted different types of maladaptive behavior (internalizing risk index, externalizing risk index, adaptive risk index, and overall BERI risk index). Greater sensory deficits specific to touch and balance and motion positively predicted internalizing risk index scores. Greater sensory deficits specific to body awareness positively predicted externalized risk index scores. Greater sensory deficits specific to taste and smell negatively predicted the adaptive risk index. Greater sensory deficits specific to balance and motion, body awareness, and vision positively predicted the overall BERI risk index. In Chapter 5, I interpret the findings in the context of Piaget's

theory of cognitive development, discuss the study's limitations, provide recommendations, and provide the implications for positive social change.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

This quantitative study examined the relationship between sensorimotor deficits and maladaptive behavior in special education students aged 8 to 12 in New Zealand via teachers' responses from an archived data set. Data analysis included six sensorimotor deficit areas and an overall sensory total score for the predictor variables measured by the Sensory Processing Measure, 2nd edition (SPM-2). The criterion variables under the category of maladaptive behavior were divided into (1) externalizing risk index, (2) internalizing risk index, (3) adaptive skills risk index, and (4) overall behavioral and emotional risk index, as measured by the Behavioral and Emotional Screening System (BESS). The behavioral and emotional score was measured using the Behavioral and Emotional Risk Index (BERI). In this study, I evaluated the data through the archived data provided by *Frontiers of Hope* in New Zealand. The archived data contained psychometric tests that teachers completed based on their experience with and knowledge of a special education student they had taught for a minimum of six months.

Little research has been conducted examining the relationship between sensorimotor deficits and maladaptive behavior in the classroom among special education students. Thus, this research was conducted to fill this gap in the literature. The current study also evaluated the research questions based on Piaget's theory of cognitive and affective development, which states that through the development of senses and motor abilities, infants gain a basic understanding of the world around them (Piaget, 1981). As children continue to interact with their environment using these senses and motor

abilities, they build awareness of themselves and their surroundings. According to the theory, failure to complete the sensorimotor stage results in difficulties interpreting and reacting normally to the environment (Piaget, 1981). Thus, I tested the assumptions of Piaget's theory to determine the relative strength of specific sensorimotor deficits in predicting maladaptive behavior among special education students.

Interpretation of Findings

Chapter 2 began by explaining how Piaget's cognitive development theory informs the research examining sensorimotor deficits and maladaptive behavior in the classroom. Next, I examined key variables in the literature that included maladaptive classroom behavior among special education students, classroom strategies to address maladaptive behaviors, and maladaptive behaviors related to sensorimotor deficits. The first key variable established the societal problem of maladaptive classroom behavior among special education students. However, most of the research on maladaptive classroom behavior has focused on the special education student's diagnosis (e.g., Kulkarni et al., 2021), the impact of maladaptive behavior on academic achievement (e.g., Kessles & Hayder, 2020), and the effectiveness of teacher classroom management strategies to reduce maladaptive behaviors (e.g., Sinclair et al., 2021). Therefore, my research adds to the understanding of the role of sensory deficits in predicting maladaptive behavior among this population of students.

Sensory Deficits as Predictors of Internalized Maladaptive Behavior

The internalized maladaptive risk score measures anxiety, depression, somatization, and withdrawal from social situations (Kamphaus & Reynolds, 2015). The

results from the current study demonstrated that higher levels of sensory deficits related to touch and balance and motion significantly predicted higher levels of internalized maladaptive behavior.

In my literature review, I found only one study that examined the relationship between sensory deficits and internalized maladaptive behavior. Dellapiazza et al. (2020) investigated the frequency and type of sensory-processing difficulties and associations with specific areas of internalized maladaptive behavior using parental behavioral checklists. The Sensory Profile test was used to measure sensory deficits. Internalized maladaptive behavior was assessed using the Aberrant Behavior Checklist (ABC) and includes five maladaptive behavior factors: (I) irritability, agitation, crying; (II) lethargy, and social withdrawal; (III) stereotypic behavior; (IV) hyperactivity, noncompliance; and (V) inappropriate speech.

Dellapiazza et al. (2020) reported results based on sensory domains including touch, and balance and motion. The researchers defined withdrawal in the same category as lethargy, while my research using the Behavioral and Emotional Screening System (BESS) includes withdrawal as an element of internalized maladaptive behavior. Dellapiazza et al. (2020) first examined the sensory profile results of all the participants (ASD students); they then created two groups defined by typical or atypical sensory profiles. Next, the ABC results were reviewed based on typical and atypical sensory profiles. Consistently, the ASD students with atypical sensory profiles had significantly higher scores in both sensorimotor deficits and internalized maladaptive behavior than ASD students with typical sensory profiles on the ABC, which means that ASD students

with higher atypical sensory profiles displayed more internalized maladaptive behaviors. Dellapiazza et al. (2020) also reported that higher sensory deficits related to tactile, auditory, oral, and multisensory (sensory total) processing higher lethargy (withdrawal) scores. They also found that ASD students with higher sensory deficits in auditory, visual, touch, and multisensory (sensory total) processing had higher levels of oral irritability.

Taken together, results from the current study and results reported by Dellapiazza et al. (2020) are consistent in identifying specific areas of sensory deficits that are associated with internalized maladaptive behavior. For example, both studies found that sensory deficits related to touch were associated with increased internalized maladaptive behavior, despite using different (but valid) methods to assess sensory deficits and maladaptive behavior and with different populations (ASD students versus general special education students). However, Dellapiazza et al. (2020) did not find an association between deficits in vestibular processing (balance and motion) and internalized maladaptive behavior (lethargy/withdrawal and irritability). In contrast, my research showed that more significant sensory deficits related to balance and motion did significantly predict higher levels of internalized maladaptive behavior. The two studies used different sources for their information, as I used teachers and Dellapiazza et al. (2020) used parents. My research extends knowledge by demonstrating that the general special education population may also have sensorimotor deficits that predict internalized maladaptive behavior in the classroom.

Sensory Deficits as Predictors of Externalized Maladaptive Behavior

The externalized maladaptive risk index (BESS) score measures hyperactivity, aggression, and conduct problems (Kamphaus & Reynolds, 2015). The results from the current study demonstrated that higher levels of sensory deficits related to body awareness significantly predicted higher levels of externalized maladaptive behavior. There is a plethora of research looking at externalized maladaptive behavior among special education students; however, few studies have examined the possibility that externalized maladaptive behavior may result from sensory processing deficits (Abry et al., 2017; Aelterman et al., 2018; Aspiranti et al., 2018; Bradshaw et al., 2019; Flores et al., 2018; Gilmour, 2018; Kowalewica & Coffee, 2014).

Dellapiazza et al. (2020) was again the only study in the literature review that specifically assessed the relationship between sensory deficits and externalizing maladaptive behavior. Hyperactivity, an externalizing behavior, is one of the behaviors the ABC measures used in the Dellapiazza study. The researchers found a positive correlation between hyperactivity (externalizing maladaptive behavior) and deficits in vestibular reactions (balance and motion), oral (taste), touch, auditory, and multisensory (sensory total). Dellapiazza et al. (2020) and the current study found similar results related to deficits in taste (oral). My research also found that sensory deficits related to body awareness (proprioception) were also a significant predictor of externalizing maladaptive behavior. Both studies discovered a link between deficits in sensory modalities and maladaptive behavior. As noted previously, the current study used a general special education population (with specific diagnoses not reported in the archival

dataset), while Dellapiazza et al. (2020) sampled ASD students exclusively. It is possible that the different populations used in both studies may have had different sensorimotor profiles due to differences in diagnoses. However, identifying sensory deficit profiles based on diagnosis type was beyond the scope of this study. My research extends knowledge by demonstrating that it is likely that special education students with a variety of diagnoses within the special education designation may also have sensorimotor deficits that lead to externalizing maladaptive behavior in the classroom.

Sensory Deficits as Predictors of Adaptive Skills Behavior

The adaptive skills risk index (BESS) score measures the ability to adapt to daily living situations without externalizing and internalizing behaviors, possess functional communication, adequate social skills, and sufficient study skills to function in the classroom (Kamphaus & Reynolds, 2015). The results from the current study demonstrated that higher levels of sensory deficits related to taste and smell significantly predicted lower levels of adaptive skills. Dellapiazza et al. (2020) also found a significant relationship between adaptive skills and taste (oral) and multisensory processing (sensory total) in the ASD population. Higher levels of sensory deficits were associated with lower adaptive skills specific to communication and social skills. As oral and multisensory scores increased, so did the adaptive skill deficits.

Adaptive skills were also tested by Ebishima et al. (2019) using the VABS and compared to the acoustic startle response (ASR) as a sensory measure of ASD students and students with typical development. They used the VABS to assess three adaptive behavior domains that included: communication (conceptual), socialization (social), and

daily living (practical) adaptive skills. They also assessed a fourth domain under maladaptive behavior (see below). Results demonstrated that the ASD students took significantly longer to respond to the startle cue (indicating a sensory processing deficit) than the typically developing students. There was also a statistically significant negative correlation between ASR latency and adaptive behavior, which meant that as the ASR latency scores increased, the ASD students demonstrated fewer adaptive skills. The results from my research did not show a statistically significant relationship between deficits in hearing and adaptive skills. However, it should be noted that Ebishima et al. (2019) used a direct assessment of auditory processing (ASR). Sensory deficits in the current study were based on teacher observations of students in the classroom. Therefore, it is also possible that the ASD population may have a unique auditory sensory profile compared to the general special education students used in my research.

Lane et al. (2010) analyzed the sensory profiles of ASD students using archival data (measures completed by parents). The authors aimed to find specific sensory processing patterns and their association with adaptive behavior in students with ASD. The archived datasets used the Short Sensory Profile, which measures seven sensory domains: tactile, taste/smell, movement, visual/auditory sensitivity, under-responsiveness/seeks sensations, auditory filtering, and low energy/weak, in addition to an overall sensory processing score. The authors discovered significant variations in sensory processing (auditory, movement, taste/smell) and adaptive skills (emotional regulation, social relationships, and activity participation) for ASD students. Sensory deficits in auditory, movement, and taste/smell were negatively related to adaptive skills.

This demonstrated that higher deficits in auditory, movement, and taste/smell resulted in less proficient adaptive skills among ASD students. The results from my study also found a relationship between sensory deficits in taste/smell and difficulty with adaptive skills.

Pusponegoro et al. (2016) used a cross-sectional design to compare ASD and non-ASD children for motor deficits and socialization (adaptive skills) difficulties. Forty age-matched ASD children were compared to their counterparts in an Indonesian study using the Vineland Adaptive Behavior Scales, 2nd edition parent form. The authors used only the gross motor subdomain and socialization domain. They found statistically significant gross motor impairment in only 20% of the ASD participants. The ASD children with gross motor impairment showed significantly lower socialization scores than ASD children without gross motor impairment. The authors suggested that children with ASD be tested for gross motor deficits. Gross motor ability is closely related to proprioception and vestibular abilities, as these three senses are all components of the somatosensory system. Proprioception, which is the ability to sense the position and movement of one's body, and vestibular ability, which is the ability to sense the position of one's head concerning the force of gravity and head movements, both play a role in the development of gross motor skills (Chiarandini et al., 2014). This same study found that children with gross motor delays had significantly lower scores on balance, posture, and coordination tests, which suggests that proprioception and vestibular abilities are related to gross motor ability. The results from the current study did not find a relationship between sensory deficits in movement and adaptive skills. It is important to note that the Pusonegoro study used parents to assess sensory deficits and adaptive skills, while my

study was based on teacher assessments. My research extends knowledge by demonstrating that the general special education population may also have problems with adaptive skills that stem from specific sensorimotor deficits related to taste and smell.

Sensory Deficits as Predictors of Overall Behavioral and Emotional Risk

Overall behavioral and emotional risk index (BESS) includes the behavioral difficulties found in internalized maladaptive risk (anxiety, depression, somatization, and withdrawal from social situations), externalizing maladaptive risk (hyperactivity, aggression, and conduct problems), and adaptive skills risk index (ability to adapt to daily living situations without externalizing and internalizing behaviors, possess functional communication, adequate social skills, and sufficient study skills to function in the classroom; Kamphaus & Reynolds, 2015). The results from the current study demonstrated that higher levels of sensory deficits related to balance and motion, body awareness, and vision significantly predicted higher levels of overall maladaptive skills. Dellapiazza et al. (2020) found that multisensory deficits (sensory total) were positively correlated with overall maladaptive behavior. The researchers determined that higher multisensory deficits were associated with more maladaptive irritability, lethargy, stereotypy, and hyperactivity behaviors.

Maladaptive behaviors were tested by Ebishima et al. (2019) and comprised three domains (internalizing problems, externalizing problems, and others) which are closely related to the BERI measure used in my research. ASD students took significantly longer to respond to the startle cue than the typically developing students. There was also a statistically significant positive relationship with maladaptive behavior. ASD students

who took longer to respond to the startle stimulus had higher scores in maladaptive behavior. My research extends knowledge by demonstrating that the general special education population may also have maladaptive behaviors stemming from overall sensorimotor deficits.

Interpretation of Findings in the Context of Piaget's Theory

Piaget (1952) described a lack of object concepts as a child not understanding how their bodies work with their environment. He explained that infants first see their appendages as objects independent of themselves and, in normal development, separate their bodies from other objects, thus facilitating an understanding of how their bodies work in conjunction with other objects and their environment. Infants learn about objects in the sensorimotor stage via their sensorimotor systems using the processes of assimilation, accommodation, and organization. These processes are essential in each stage of development to acquire physical, logical-mathematical, and social knowledge as they provide a framework for learning and understanding new information. Assimilation is taking in new information and making sense of it by relating it to existing knowledge and beliefs. Accommodation is changing existing knowledge and beliefs to make sense of new information. Finally, organization arranges and integrates new information into existing knowledge structures (Ayres, 2005). Piaget (1952, 1981) explained how the interrelated cognitive and affective development schemas were the basis for the three types of knowledge, including physical (i.e., mastered through experience with objects), logical-mathematical (i.e., attained from actions on objects), and social knowledge (i.e., occurs within the child's social world). Physical knowledge is acquired through

experience with objects, such as body awareness, balance and motion, taste and smell, and touch. Logical-mathematical knowledge is attained from a child's engagement in activities with objects or things in their environment and specific sensory modalities, such as hearing and vision, are needed for deductive reasoning. Hearing and vision assist in the interpretation of the child's surroundings (Ayres, 2005).

Externalizing, internalizing, and adaptive skills also align with Piaget's three different types of knowledge in the following ways. First, physical knowledge is mastered through experience with objects. It is related to externalizing and adaptive skills, such as physical coordination, used to facilitate motor skills development or explore the environment. Second, logical-mathematical knowledge is attained from interacting with objects and is related to internalizing skills such as problem-solving and abstract thinking (Garcia-Lopez et al., 2019). Finally, social knowledge occurs within the child's social world and is related to adaptive skills such as empathy and social problem-solving (Garcia-Lopez et al., 2019). These skills are necessary for children to interact effectively with others, build meaningful relationships, and regulate their emotions.

Piaget (1981) links sensory and motor development to affective growth. My results demonstrated that sensorimotor development (sensory deficits) was associated with maladaptive classroom behavior. More specifically, my results found that deficits in touch and balance and motion were associated with higher levels of internalized maladaptive classroom behavior. Deficits in body awareness and taste and smell were associated with higher levels of externalized maladaptive classroom behavior, while deficits in taste and smell were also associated with lower levels of adaptive skills.

Overall, maladaptive classroom behavior was associated with deficits in balance and motion, body awareness, and vision. Piaget assumed that sensorimotor deficits would lead to behavioral difficulties. Piaget also stated that disruptions in sensorimotor development would interrupt the progress of the different types of knowledge. My research findings support and extend Piaget's premise that sensorimotor deficits lead to difficulties in different forms of behavior.

Piaget (1952) explained that knowledge is gained in each area as the child progresses through each cognitive and affective development stage. Piaget uses the term "affective" (i.e., a type of behavior driven by emotion or emotional states), involving emotional expression, emotional regulation, and emotion-related decision-making (externalizing maladaptive behavior; Brumbaugh & Fraley, 2016; Gross & Thompson, 2007). Affective behavior has been linked to various psychological processes, such as emotional intelligence, self-regulation, and interpersonal skills (adaptive skills; Mayer, Salovey, & Caruso, 2016). Affective behavior has also been linked to health outcomes such as stress, anxiety, and depression (internalizing maladaptive behavior; Lim & Zeltzer, 2014). Piaget stated that a lack of mastery in the sensorimotor stage would cause difficulties in later development that would be reflected in affective behavior. The consequences of not completing the sensorimotor stage are reflected in the results of my study through the demonstration of specific sensorimotor deficits being predictive of higher levels of maladaptive behavior in the classroom.

Limitations

The present study was limited to a New Zealand archived data source. In addition, the primary school teachers who gathered the data had taught for a minimum of two years and had a special education student they could use to answer the psychometric tests, limits the generalizability of the results beyond this population. This study used a correlational design, which limited my ability to infer causation between sensory deficits and maladaptive behavior. In addition, no independent objective assessments were provided to verify that students were classified in the special education category. I was not able to verify if the teacher had completed the assessment on a special education student, if the student was on medication, if there were additional supports for the student in the classroom, or if the teacher had been adequately trained in classroom management to help the student with the maladaptive behavior. The archival dataset did not include any formal medical or psychological diagnosis information. All of the data regarding possible sensory deficits and types of maladaptive/adaptive behavior was based on the teacher's assessment of the student in the classroom. However, the measures used to assess sensory deficits and maladaptive behavior have been validated for teachers.

Recommendations

I recommend additional research on sensorimotor deficits and maladaptive classroom behavior, using the same measures with the addition of two variables. First, comparing special education students based on specific diagnoses may identify different sensory deficit profiles among different groups. While my results were consistent with the literature, the few studies that did examine sensory processing and maladaptive

behavior almost exclusively used an ASD population. Therefore, it is likely that different sensory profiles may be associated with various types of maladaptive behavior. For example, the current study found sensory deficits related to touch and balance and motion predicted higher levels of internalized maladaptive classroom behavior among special education students. However, Dellapiazza et al. (2020) found that sensorimotor deficits related to touch, audition, taste, and multisensory processing were related to internalized maladaptive behavior among ASD students. This indicates that ASD students may have a broader sensorimotor deficit profile compared to the general population of special education students. Secondly, using all the subscales on the SPM-2 is recommended. For example, adding planning and ideas and social participation subscales would have added to understanding Piaget's three types of knowledge. The category of planning and ideas is aligned with logical-mathematical knowledge as it involves organizing data and forming logical conclusions (Ayres, 2005). Social participation is aligned with social knowledge as it involves communication and interaction with other people (Ayres, 2005). If the three types of knowledge were tested including all the subtests from the SPM-2, it would increase the robustness of the results.

Although the BESS and SPM-2 have good reliability and validity as psychometric tests, they are classified as indirect measures because they are behavioral checklists and do not directly involve the child at the moment of testing. Direct measures of psychometric testing include cognitive ability tests, achievement tests, and personality inventories (Tucker, 2017), directly assessing the individual's knowledge, skills, abilities, or traits relevant to the determined criteria (Cabello, 2017). In comparison, indirect

measures include psychometric tests to assess characteristics that are not easily accessible through direct observation or self-report. Indirect measures are usually based on questionnaires on individuals' thoughts and feelings to gain insight into personality structures, emotional functioning, or cognitive processes (Fang & Bae, 2016). Although the SPM-2 is a valid assessment tool based on teacher observations, a direct measure for each sensory modality would provide more detailed information. The Dean Woodcock Sensory Motor Battery (DWSMB) was a direct measure tool for sensorimotor assessments. The DWSMB included assessments that measured simple sensory, motor and complex sensory skills, and subcortical motor skills and auditory/visual acuity deficits. Other sensorimotor measures are available, but none include a full battery of tests (Miller & Maricle, 2019). No publishers sold the battery when I started my research; therefore, I used an indirect measure (SPM-2).

Direct measures for internalizing, externalizing, and adaptive skills could also be used. An example of one direct measure for internalizing is the Anxiety Control Questionnaire for Children that uses questions on how children attempt to control different scenarios presented to them in story form. The questionnaire measures the level of anxiety a child exhibits; it enables the student to be interviewed directly, gauging how they react to specific scenarios (Hogendoorn, 2008).

Implications

The current study filled a research gap in understanding one of the possible root causes of maladaptive classroom behavior among special education students. The current study extended previous knowledge by determining the extent to which specific

sensorimotor deficits predicted components of maladaptive behavior among special education students. Identifying possible sensorimotor deficits among special education students may improve the referral and treatment process. Basic sensory processing assessments may also lead to improved classroom management strategies. In addition, students who are provided the opportunity to receive the treatment or therapy that addresses the root cause of the maladaptive behavior will, according to Piagetian theory, exhibit less maladaptive behavior because they will receive the opportunity needed to progress through their sensorimotor stage (Piaget, 1981).

The recommendations for using sensorimotor testing within the primary grades have far-reaching social change implications for the classroom, student, and family. For example, Tsilidis et al. (2020) found that reducing maladaptive behaviors in the classroom can lead to improved academic achievement, self-esteem, and social skills. The study also found that reducing maladaptive classroom behaviors could lead to improved behavior in other areas of life, including relationships and physical health. In addition, reduced maladaptive classroom behaviors have been linked to an array of positive outcomes for students. For example, reducing externalizing behaviors (e.g., disruptive behavior) can lead to increased academic success, improved relationships with teachers and peers, and enhanced self-efficacy for students in grades 1 through 6 (Li et al. 2017).

Similarly, reducing internalizing behaviors (e.g., withdrawal and anxiety) in students in grades 1 through 4 can lead to improved academic performance, reduced problem behaviors, and better social skills (Petersen et al., 2020). Adaptive skills (e.g.,

problem-solving skills) can also increase for students in grades 1 through 5, resulting in improved academic performance, greater social competence, and better behavior in the classroom (Kapoor et al., 2019). Reduced maladaptive classroom behavior can benefit the family of the student struggling with these behaviors in many ways. Improved classroom performance can lead to better grades, less likelihood of being held back, less need for tutoring, and improved relationships with school personnel (Lai, Tseng, & Lan, 2020). With improvements in classroom performance, students may also be less likely to be placed in special education programs (Oberle & Leadbeater, 2014). These improvements can lead to improved self-esteem, which can positively affect the family environment (Gonzalez et al., 2017). Improved social skills and fewer behavioral issues can also lead to improved parent-child relationships (Minne et al., 2016).

Conclusion

My results confirm and extend the literature on the role of sensory processing deficits and special education students' maladaptive classroom behavior. My research supports Piaget's theory, which describes interruptions during the sensorimotor stage of development as a critical factor that can cause behavior difficulties in other similar environments. Identifying those factors that lead to maladaptive behavior means improved interventions and treatments for those students, providing them the opportunities to progress through their sensorimotor stage. Maladaptive classroom behavior is a current social problem. As classroom management is the most challenging part of teaching, reducing the maladaptive behavior in the classroom decreases interruptions, decreases the amount of time teachers must devote to managing the

maladaptive behavior, decreases classroom disruptions that can provide more time for instruction, improves academic performance for all students in the classroom, and reduces teacher burnout. For the special education student, reducing maladaptive behavior results in improved learning, social skills, health and wellbeing, familial relationships, and less need for special education services. The current research provides direction for considering assessments that include sensorimotor deficits. Implementing the recommendation to assess all students with sensorimotor assessments in the primary grades will reduce maladaptive behavior in the classroom.

References

Abrahamson, D., (2015). Eye-tracking piaget: Capturing the emergence of attentional anchors in the coordination of proportional action. *Human Development,* 58(4-5), 218-244.

Abry, T., Bryce, C. I., Swanson, J., Bradley, R. H., Fabes, R. A., 2017, Classroom-level adversity: Associations with children's internalizing and externalizing behaviors across elementary school. *Developmental Psychology*, 53(3), 497-510.

Aelterman, N., Vansteenkiste, M., & Haerens, L., 2019. Correlates of students' internalization and defiance of classroom rules: A self-determination theory perspective. *British Journal of Educational Psychology*, 89, 22-40.

Ahmad, S., Ch, A. H., Batool, A., Sittar, K., & Malik, M. (2016). Play and Cognitive Development: Formal operational perspective of Piaget's theory. *Journal of Education and practice*, 7(28), 1-8.

Ahn, S.N., (2018). Differences in body awareness and its effects on balance function and independence in activities of daily living for stroke. *Journal of Physical Therapy Science,* 30(11),1386-1389.

Aspiranti, K. B., Bebech, A., & Osiniak, K., (2018). Incorporating a class-wide behavioral system to decrease disruptive behaviors in the inclusive classroom. *Journal of Catholic Education,* 21(2), 205-214.

Ayres, A. J. (2005). *Sensory integration and the child*. Los Angeles, CA: Western Psychological Services.

Baron, I. S., (2004) *Neuropsychological Evaluation of the Child.* Oxford University Press, New York, New York.

Bartoli, E., Battaglia, M., Oglian, & Baud-Bovy, (2011). *Sensorimotor testing in children.* IEEE World Haptics Conference 2011. Istanbul, Turkey.

Berb, Y. H. M., & Stoltz, S., (2018). Enhancing social inclusion of children with externalizing problems through classroom seating arrangements: A randomized controlled trial. *Journal of Emotional Behavioral Disorder,* 26(1), 31-41.

Bhadauria, U. S., Mathur, R. V., Agarwal, A., Skukia, R., Godha, S., & Maheshwari, R., (2020). Impact of counseling and reinforcement by school teachers on behavior change in children: A one-year follow-up study. *Journal of Education and Health Promotion,* (9), 1-5.

Biotteau, M., Danna, J., Baudou, E., Puyjarient, F., Velay, J. L., Albaret, J. M. & Chaix, J., (2019). Developmental coordination disorder and dysgraphia: Signs and symptoms, diagnosis, and rehabilitation. *Neuropsychiatric Disease Treatment*, *15*, 1873-1885.

Bradshaw, C. P, & Kush, J. M., (2019). Teacher observation of classroom adaptation-checklist: Measuring children's social, emotional, and behavioral functioning. *Children and Schools*, 42(1), 29-40.

Broitman, J. M., (2011). *Nonverbal learning disabilities in children: Bridging the gap between science and practice.* Springer Science + Business Media. New York, NY, US, 128.

Bossenbroak, R., Wols, A., Weerdmeester, J., Lichtwarch-Aschoff, A., Granic, I., & van Rooij, M. M. J. W., (2020). Efficacy of virtual reality biofeedback game (DEEP) to reduce anxiety and disruptive classroom behavior: Single-case study. *Journal of Medical Internet Research, 7(3), 1-23.*

Caligiore, D., Tommasino, P., Sperati, V., & Baldassarre, G., 2014). Modular and hierarchial brain organization to understand assimilation, accommodation, and their relation to autism in reaching tasks: a developmental robotics hypothesis. *Adaptive Behavior,* 22(5), 304-329.

Chiarandini, J. M., Lopes, A. P., de Oliveira, T. R., de Jesus, J. C., & de Oliveira, F. (2014). Proprioception, Vestibular and Gross Motor Skills in Children With Gross Motor Delay. *Frontiers in Human Neuroscience,* 8(321), 1-7.

Csizmadia, A., Bernhard, S., & Waite, J., (2019). Integrating the constructional learning theory with computational thinking classroom activities. *Informatics in Education,* 18 (1), 41-67.

Cruce, M. K. and Watson, T. S. (2010). Sensory Processing Measure. *The Eighteenth Mental Measurements Yearbook.*

Davis, A. S., Finch, W. H., Dean, R. S., Woodcock, R. W., 2007). Cortical and subcortical constructs of the dean-woodcock sensory motor battery: A construct validity study. *International Journal of Neuroscience,*116(10), 1157-1171.

Delafield-Butt, J. T. & Gangopadhyay, N., (2013). Sensorimotor intentionality: The origins of intentionality in prospective agent action. *Development Review,* 33, 399-425.

Davis, A. S., Finch, H. W., Dean, R. S., & Woodcock, R. W. (2006). Cortical and subcortical constructs of the Dean-Woodcock Sensory Motor Battery: A construct validity study. *International Journal of Neuroscience, 116*, 1157-1171.

Dellapiazza, F., Michelon, C., Oreve, M., Robel, L., Schoenberger, M., Chatel, C., Verperini, S., Maffre, T., Schmidt, R., Blanc, N., Vernhet, C., Picot, M., & Baghdadli, A., (2020). The impact of atypical sensory processing on adaptive functioning and maladaptive behaviors in autism spectrum disorder during childhood: Results from the ELENA cohort. *Journal of Autism and Developmental Disorders,* 3(19), 1-11.

Dice, J. L. and Dove, M. K., (2011). A Piagetian approach to infant referential behaviors. *Infant Behavior and Development,* (34), 481-486.

DiPaolo, E. A., Barandiaran, X. E., Beaton, M., and Buhmann, (2014). Learning to perceive in the sensorimotor approach: Piaget's theory of equilibration interpreted dynamically. *Frontiers in Human Neuroscience,* 8(155), 1-16.

Dunn, W. (1999). *Sensory profile*. San Antonio, TX. Psychological Corporation.

Dunn, W., (2007). Supporting Children to Participate Successfully in Everyday Life by Using Sensory Processing Knowledge. *Infants & Young Children,* 20(2), 84–101.

Dunn, W., (2014). *Sensory Profile 2.* Bloomington, MN. Pearson Clinical. Ebishima, K., Takahashi, H., Stickley, A., Nakahacki, T., Sumiyoshi, T., & Kamio, Y., (2019). Relationship of the acoustic startle response and its modulation to adaptive and maladaptive behaviors in typically developing children and those with autism spectrum disorders: A pilot study. *Frontiers in Human Neuroscience,* 13 (5), 1-6.

Elridge, S. (1996). The Invisible Race. *Jewel Among Jewels: Adoption News*.

Evans, S. W., Owens, J. S., & Bunford, N., (2014). Evidence-based psychosocial treatments for children and adolescents with attention-deficit/hyperactivity disorder. *Journal of Clinical Child & Adolescent Psychology,* 43(4), 527-551.

Fang, T., & Bae, J. (2016). The effect of a game-based intervention on math achievement and motivation among middle school students. *Computers & Education*, 97, 1-13.

Farmer, T. W., Dawers, M., Hamm, J. V., Lee, D., Mehtaji, M., Hoffman, A. S., & Brooks, D. S., (2018). Classroom social dynamics management: Why the invisible hand of the teacher matters for special education. *Hammill Institute on Disabilities*, 39(3), 177-192.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39,* 175-191.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*, 1149-1160.

Flores, M. T., Rader, R. A., Berlinghor, J. R., & Fanok. P. C., (2018). Externalizing behaviors within general, at-risk, and special education preschool classrooms: A preliminary investigation. *Preventing School Failure*, 62(4), 279-288.

Garcia-Lopez, E., Lopez-Perez, B., & Perez-Garcia, M. (2019). Externalizing, Internalizing and Adaptive Skills: An Integrative Review of the Literature.

International Journal of Developmental and Educational Psychology, 1(2), 231–239.

Garcia-Perez, M. A., (2012). Statisical conclusion on validity: Some common threats and simple remedies. *Frontiers in Psychology,* 3(325), 1-11.

Gardner, H., 2017. Reflections of artful scribbles: The significance of children's drawings. *Studies in Art Education,* 58(2), 155-158.

Geysztor, E. Z., Choinska, A. M., & Paprocka-Borowica, M., (2018). Persistence of primitive reflexes and associated motor problems in healthy preschool children. *Archives of Medical Science,* 14(1), 1-6.

Gilberg, C. & Kadesjo, B., (2003). Why bother about clumsiness? The implications of having developmental coordination disorder. *Neural Plasticity,* 10(2), 59-68.

Gilmour, A. F. (2018). Has inclusion gone too far? *Education Next*, 21(4), 9-16.

Glasersfeld, (1996). Learning and adaptation in the theory of constructivism. *Journal for Research in Mathematics Education. Monograph,* 4, 19-29.

Goldstein, G. & Beers, S. R., (2004). *Comprehensive Handbook of Psychological Assessment, Volume1: Intellectual and Neuropsychological Assessment.* John Wiley & Sons, Inc. New Jersey, New York.

Gottfried, A. W. & Brody, N., (1975). Interrelationships between and correlates of psychometric and Piagetian scales of sensorimotor intelligence. *Developmental Psychology,* 11(3), 379-387.

Grigg, T. M., Fox-Turnbull, W., & Culpan, I., 2018. Retained primitive reflexes: Perceptions of parents who have used rhythmic movement training with their children. *Journal of Child Health Care*, 22(3), 406-418.

Gonzalez, R. M., De La Cruz, A., Pardo, A., & Guerrero, R. (2017). The role of resilience in the relationship between poverty and academic achievement: A mixed-methods study. *International Journal of Educational Psychology*, 6(3), 58-71.

Grzywniak, C., (2017). Integration exercise programme for children with learning difficulties who have preserved vestigial primitive reflexes. *Acta Neuropsychologica*. 15(3), 549-560.

Guenole, F., Speranza, M., Louis, J., Fournet, P., Revol, O., & Baleyte, J., (2015). Wechsler profiles in referred children with intellectual giftedness: Associations with trait-anxiety, emotional dysregulation, and heterogeneity of Piaget-like reasoning processes. *European Journal of Paediatric Neurology Society,* (19), 402-410.

Hammond, S. I., (2014). Children's early helping in action: Piagetian developmental theory and early prosocial behavior. *Frontiers in Psychology,* 5(759), 1-7.

Hannant, P., Tavassoli, T., and Cassidey, S., (2014). The role of sensorimotor difficulties in autism spectrum conditions. *Frontiers in Neurology,* 7(124), 1-11.

Hesse, P., (1987). Piaget's model of emotional development. *Seventeenth Annual Symposium of the Jean Piaget Society,* Philadelphia, Pennsylvania, May 1987.

Hoff, A. L., Kendall, P. C., Langley, A., Ginsburg, G., Keeton, C., Compton, S., Sherrill, J., Walkup, J., Birmaher, B., Albano, A. M., Suveg, C., & Piacentini, J., (2017). Differences Developmental differences in functioning in youth with social phobia. *Journal of Clinical Child & Adolescent Psychology,* 46(5), 686-694.

Hogendoorn SM, Wolters LH, Vervoort L, Prins PJ, Boer F, de Haan E., (2008). An indirect and direct measure of anxiety-related perceived control in children: the Implicit Association Procedure (IAP) and Anxiety Control Questionnaire for Children (ACQ-C). *Journal of Behavioral Therapy and Experimental Psychiatry*. 39(4):436-450.

Hopman, J. A. B., van Lier, P. A. C., van der Ende, J., Struiksma, C., Wubbels, T., Verhulst, F. C., Maras, A., Breeman, L. D., & Tick, N. T., 2018[1]). Impact of the good behavior game on special education teachers. *Teachers and Teaching, Theory and Practice, 24(4), 350-368.*

Hopman, J. A. B., Tick, N. T., van der Ende, J., Wubbels, T., Verhulst, F. C., Maras, A., Breeman, L. D., & van Lier, P. A. C., (2018[2]). Special education teachers' relationships with students and self-efficacy moderate associations between classroom-level disruptive behaviors and emotional exhaustion. *Teaching and Teacher Education*, 75, 21-30.

Hui, C., Snider, L., & Couture, M., (2016). Self-regulation workshop and occupational performance coaching with teachers: A pilot study. *Canadian Journal of Occupational Therapy,* 83(2), 115-125.

Hyseni, F., Blanken, L. M. E., Muetzel, R., Verhulst, F. C., Tiemier, H., & White, T., (2019). Autistic traits and neuropsychological performance in 6- to-10-year-old children: a population-based study. *Child Neuropsychology,* 25(3), 352-369.

Iannacone, A., Savarese, G., and Manzi, (2018). Object use in children with autism: Building with blocks from a piagetian perspective. *Frontiers in Education,* 3(12), 1-9.

Ibrahim, G. M., Morgan, B. R., Vogan, V. M., Leung, R. C., Anagnostou, E., & Taylor, M. J., 2016). Mapping the network of neuropsychological impairment in children with autism spectrum disorder: A graph theoretical analysis. *Journal of Autism Developmental Disorder,* 46, 3770-3777.

Kamphaus, R. W., Reynolds, C. R., & Dever, B. V. (2014). Behavioral and mental health screening. In R. J. Kettler, T. A. Glover, C. A. Albers, & K. A. Feeney-Kettler (Eds.), *Universal screening in educational settings: Evidence-based decision making for schools,* 249–273.

Kapoor, S., Shultz, C., & Green, J. (2019). The impact of digital media on adolescent mental health. *Current Opinion in Psychology*, 28, 81-87.

Kessels, U. & Heyder, A., (2020) Not stupid, buy lazy? Psychological benefits of disruptive classroom behavior from an attributional perspective. *Social Psychology of Education,* 23, 583-613.

Kirkhaug, B., Drugli, M. B., Handegard, B. H., Lydersen, S., Asheim, M., & Fossum, S., 2016. Does the incredible years teacher classroom management training programme has positive effects for young children exhibiting severe externalizing

problems in school?: A quasi-experimental pre-post study. *BioMedical Central Psychiatry*, 16, 362-373.

Kowalewica, E. A. & Coffee, G., (2014). Mystery motivator: A tier 1 classroom behavioral intervention. *School Psychology Quarterly*, 29(2), 138-156.

Kozulin, A., Lebeer, J., Madella-Noja, A., Gonzales, F., Jeffery, I., Rosenthal, N., Koslowsky, M., (2010). Cognitive modifiability of children with developmental disabilities: A multicentre study using feuerstein's instrumental enrichment – basic program. *Research in Developmental Disabilities*, 31, 551-559.

Kulawiak, P. R., Urton, K., Krull, J., Hennemann, & Wilbert, J., (2020), Internalizing behavior of sociometrically neglected students in inclusive primary classrooms - A methodological issue? *Frontiers in Education*, 5(32), 1-12.

Kulkarni, T., Sullivan, A. L., & Kim, J., (2021). Externalizing behavior problems and low academic achievement: Does a causal relation exist? *Educational Psychology Review*, 33, 915-936.

Kuwato, M., and Hirano, Y., (2020). Sense of coherence, occupational stressors, and mental health among Japanese high school teachers in Nagasaki prefecture: a multiple regression analysis. *BioMedical Central Public Health* 20, 1355.

Kwan, M. Y. W., Cairney, J., Hay, J. A., & Fought, B. E., (2013). Understanding physical activity and motivations for children with developmental coordination disorder: An investigation using the theory of planned behavior. *Research in Developmental Disabilities,* (34), 3691-3698.

Laakso, A., (2011). Embodiment and development in cognitive science. *Cognition, Brain and, Behavior,* 15(4), 409-425.

Lai, C., Tseng, V., & Lan, T. (2020). Exploring the Paradoxical Relationships of Service Quality, Customer Satisfaction and Customer Loyalty in the Elderly Care Service Industry. *Journal of Service Science and Management,* 13(3), 66-75.

Lai, C. Y. Y., Yung, T. W. K., Gomez, I. N. B., & Siu, A. M. H., (2019). Psychometric properties of sensory processing and self-regulation checklist (SPSRC). *Occupational Therapy International, 5*(1), 1-9.

Lane, S. J., Mailloux, Z., Schoen, S., Bundy, A., May-Benson, T. A., Parham, L. D., Smith Roley, S., & Schaaf, R. C., (2019). Neural foundations of ayres sensory integration. *Brain Sciences, 9, 153-167.*

Lane A.E., Dennis S.J., Geraghty M.E., (2010). Brief report: Further evidence of sensory subtypes in autism. *Journal of Autism Developmental Disorders*. 41(6), 826-831.

Larson, R. B. (2019). Controlling social desirability bias. *International Journal of Market Research*, 61(5), 534–547.

Lezak, M. D., Howieson, D. B., Loring, D. W., & Fischer, J. S. (2004). *Neuropsychological assessment*. Oxford University Press, USA.

Li, S., Zhang, M., Li, G., & Li, X. (2017). An analysis of the current research in the field of artificial intelligence. *International Journal of Computer Science & Information Technology*, 9(3), 1-7.

Linca, F. L., (2018). Solutions for improving the symptomatology of the child with attention deficit/hyperactivity disorder (ADHD). *Romanian Journal of Cognitive Behavioral Therapy and Hypnosis*, 5(3-4), 1-23.

Lones, M., Lewis, M., & Canamero, L., (2016). From sensorimotor experiences to cognitive development: Investigating the influence of experiential diversity on the development of an epigenetic robot. *Frontiers in Robotics and AI*, (3), 44, 1-23.

Longo, M. R., (2009). What's embodied and how can we tell? *European Journal of Social Psychology*, 39, 1207-1209.

Lovakov, A. & Agadullina, E.R., (2021). Empirically derived guidelines for effect size interpretation in social psychology. *European Journal of Social Psychology*, 51, 485– 504.

Maggin, D. M., Pustejovsky, J. E., & Johnson, A. H., (2017). A meta-analysis of school-based group contingency interventions for students with challenging behavior: An update. *Remedial and Special Educati*on, 38(6), 353-370.

Malboeuf-Hurtubise, C., Taylor, G., Paquette, L., & Lacourse, E., (2018). A mindfulness-based intervention for students with psychiatric disorders in a special education curriculum: A series of n-of-1 trials on internalized and externalized symptoms. *Frontiers in Education*, 3(66), 1-22.

Mazon, C., Fage, C., Consel, C., Amestoy, A., Hesling, I., Bouvard, M., Etchegoychen, K., & Sauzeon, H., (2019). Cognitive mediators of school-related socio-adaptive behaviors in ASD and intellectual disability pre- and adolescents: A pilot-study in French special education classrooms. *Brain Sciences*, 9, 334-354.

Mazurek, K. & Winzer, M., (2011). Teacher attitudes toward inclusive schooling: Themes from the international literature. *Education and Society*, 29(1), 5-25.

Mccaslin, M., Vriesema, C. C., & Burggraf, S., (2016). Making mistakes: Emotional adaptation and classroom learning. *Teachers College Record*, 118, 1-46.

Minne, C., Raes, M., De Bourdeaudhuij, I., & Deforche, B. (2016). The impact of the socio-ecological environment on physical activity in adolescents: Gender differences. *BioMedical Central Public Health*, 16(1), 1-11.

Mosconi, M. W., & Sweeney, J. A., (2015). Sensorimotor dysfunctions as primary features of autism spectrum disorders. *Life Sciences*, 58(10), 1016-1023.

Miller, D. C. (2007). *Essentials of school neuropsychological assessment.* Hoboken, NJ: Wiley.

Muller, C. M., Hofmann, V., Bergert, T., & Cillessen, A. H. N., (2018). Peer influence on disruptive classroom behavior depends on teachers' instructional practice. *Journal of Applied Developmental Psychology*, 56, 99-108.

National Center for Education Statistics., (2022). Characteristics of Public School Teachers. *Condition of Education.* U.S. Department of Education, Institute of Education Sciences.

National Center for Education Statistics. (2022). Students With Disabilities. *Condition of Education*. U.S. Department of Education, Institute of Education Sciences.

Niklasson, M., Norlander, T., Niklasson, I., Rasmussen, R., (2017). Catching-up: Children with developmental coordination disorder compared to healthy children before and after sensorimotor therapy. *PLos ONE*, 12(10), 1-21.

Oberle, E., & Leadbeater, B. J. (2014). Civic Engagement, Social Cohesion, and Social Support in Adolescence. *Applied Developmental Science*, 18(3), 135-147.

Oldfield, J., Humphrey, N., & Hebron, J., (2016). The role of parental and peer attachment relationships and school connectedness in predicting adolescent mental health outcomes. *Child and Adolescent Mental Health*, 21(1), 21-29.

Pallini, S. and Barcaccia, B., (2014). A meeting of the minds: John bowlby encounters jean piaget. *Review of General Psychology*, 18(4), 287-292.

Pandolfi, V and Magyor, C. I., (2021). Vineland-3 structural validity and interpretability of domain scores: Implications for practitioners assessing adolescents with developmental conditions. *American Journal on Intellectual and Developmental Disabilities*, 126(3), 216–229.

Pepperdine, C.R. and McCrimmon, A.W., (2018). Test Review: Vineland adaptive behavior scales, Third Edition (Vineland-3). *Canadian Journal of School Psychology*. 33(2):157-163.

Petersen, M. J., Heiligenstein, E., Swain-Bradway, J., & Skinner, E. A. (2020). The effect of mindfulness-based interventions on adolescent stress and anxiety: A systematic review. *The Journal of Positive Psychology*, 15(5), 539-556.

Piaget, J. (1936). *La naissance de l'intelligence chez l'enfant.* Genève, Suisse. Fondation Jean Piaget.

Piaget, J. (1937). *La constuction du Réel chez l'enfant*. Delachaux de Niestle, Geneva.

Piaget**,** J. (1952). *The origins of intelligence in children*. New York, NY. W W. Norton & Co., 357-419.

Piaget, J. (1962). *Play, dreams, and imitation in childhood*. New York: Norton.

Piaget, J. (1981). "Creativity." In *The Learning Theory of Piaget and Inhelder*, edited by J. Gallagher and K. Reid, pp. 221-229. Monterey, California: Brooks-Cole, 1981.

Plotka, R. (2016). Comparing peer-interactions, teacher-child interactions, and challenging behaviors in same-age and mixed-age preschool classrooms. *The International Journal of Early Childhood Learning*, 23(3), 21-33.

Purham, L. D., Ecker, C. L., Kuhaneck, H., Henry, D. A., & Glennon, T. J., (2021). *Sensory Processing Measure, Second Edition (SPM-2) [Manual]*. Torrance, CA. Western Psychological Services.

Pusponegoro, H. D., Efar, P, Soedjatmiko, Soedbadi, A., Firmansyah, A., Chen, H., & Hung, K., (2016). Gross motor profile and its association with socialization skills in children with autism spectrum disorders. *Pediatrics and Neonatology,* 57 (501-507).

Ratcliff, M. J., (2018). A temporal puzzle: Metamorphosis of the body in Piaget's early writings. *Constructivist Foundations,* 14(1), 73-81.

Razza, R. A., Martin, A., & Brooks-Gunn, J., 2016). Links between motor control and classroom behaviors: Moderation by low birth weight. *Journal of Child and Family Studies,* 25, 2423-2334.

Read, J., Fosse, R., Moskowitz, A., and Perry, B., (2014). The traumatic neurodevelopmental model of psychosis revisited. *Neuropsychiatry,* 4(1), 65-79.

Robles, R. P., Ballabriga, C. J., Dieguez & de Silva,P. C., (2012). Validating regulatory sensory processing disorders using the sensory profile and child behavior checklist (CBCL 1 ½ - 5). *Journal of Child Family Studies, 21*(2), 906-916.

Rubtsov, V. V., (2020). Two approaches to the problem of development in the context of social interactions: L. s. vygotsky vs. j. piaget. *Cultural-Historical Psychology*, 16(3), 5-14.

Santos, A., & Maia, J. (2016). *An Overview of Indirect Measures of Psychometric Testing. Psychology*, 7(14), 1-13.

Sassu, K. A., Gelbar, N. W., Bray, M. A., Kehle, T. J., & Patwa, S., (2015). Exploring neuropsychology: Seeking evidence of added worth to school psychology practice. *National Association of School Psychologists*, 9(3), 269-276.

Sawyer, J. K., Braz, M. E., & Babcock, J. L., (2009). To get-to-know-you or not get-to-know-you: A two phase study of initial engagement activities. *International Journal of Teaching and Learning in Higher Education*, 21(2), 187-196.

Scherzinger, M. & Wettstein, 2018. Classroom disruptions, the teacher-student relationship, and classroom management from the perspective of teachers, students, and external observers: A multimethod approach. *Learning Environment Research*, 22, 101-116.

Shaffer, R., Thurman, A. J., Ronco, L., Cadavid, D., Raines, S., Kin, & S. H., (2022). Social communication in fragile X syndrome: Pilot examination of the brief observation of social communication change (BOSCC). *Journal of Neurodevelopmental Disorders,* 14(1), 1-11.

Shafer, R. L., Newell, K. M., Lewis, M. H., & Bodfish, J. W., (2017). A cohesive framework for motor stereotypy in typical and atypical development: The role of sensorimotor integration. *Frontiers in Integrative Neuroscience,* 11(19), 1-7.

Shin, H. & Ryan, A. M. (2016). Friend influence on early adolescent disruptive behavior in the classroom: Teacher emotional support matters. *Developmental Psychology*, 53(11), 114-125.

Sinclair, J., Herman, K. C., Reinke, W. M., Dong, N., & Stormont, M., (2021). Effects of a universal classroom management intervention on middle school students with or at risk of behavior problems. *Remedial and Special Education,* 42 (1), 18-30.

Stevenson, H. W. (1962). *Piaget, behavior theory, and intelligence*. Monographs of the Society for Research in Child Development, 27 (2), 113-126.

Strauss, E., Sherman, E. M., & Spreen, O. (2006). *A compendium of neuropsychological tests: Administration, norms, and commentary*. American chemical society.

Sparrow, S.S. (2011). Vineland Adaptive Behavior Scales. In: Kreutzer, J.S., DeLuca, J., Caplan, B. (eds). *Encyclopedia of Clinical Neuropsychology*. Springer, New York, NY.

Spencer Pulaski, M. A., (1980). *Understanding Piaget*. Harper & Row, Publishers, New York, New York.

Sydney, M., Tartaglia, N., Richardson, P., Cordeiro, L. Shanless, D., (2019). The association of motor skills and adaptive functioning in XXY/klinefelter and XXYY syndromes. *Physical & Occupational Therapy in Pediatrics,* 39(4), 446-459, 446-460.

Tsilidis, K., Brotky, M., Stavropoulos, P., & Kefali, A. (2020). Effect of reducing maladaptive behavior in the classroom on academic achievement, self-esteem, and social skills: A systematic review. *International Journal of Mental Health and Addiction*, 18(3), 628-636.

Tucker, J. S. (2017). *Psychometric testing: An introduction to principles and applications*. New York, New York. Routledge.

van den Berg, Y. H. M. & Stoltz, S. (2018). Enhancing social inclusion of children with externalizing problems through classroom seating arrangements: A randomized controlled trial. *Journal of Emotional and Behavioral Disorders*, 26(1), 31-41.

von Glasersfeld, E., (1996). Footnotes to the many faces of constructivism." *Educational Researcher, 25(6), 19.*

Watson, T. S. & Woodin, M. F., (2010). Sensory processing measure. *The eighteenth mental measurements yearbook*. Buros Institute of Mental Measurements. Lincoln, NE, United States.

Wellsby, M. and Pexman, P. M., 2014. Developing embodied cognition: insights from children's concepts and language processing, *Frontiers in Psychology*, 5(506), 1-10.

Woodruff Smith, D. and Thomasson, A. L., (2005). *Phenomenology and Philosophy of Mind.* Claredon Press, Oxford, England.

Yoder, M. L., Williford, A. P., & Vitiello, V. E., (2017). Observed quality of classroom peer engagement in a sample of preschoolers displaying disruptive behaviors. *Early Childhood Research Quarterly*, 47, 206-217.

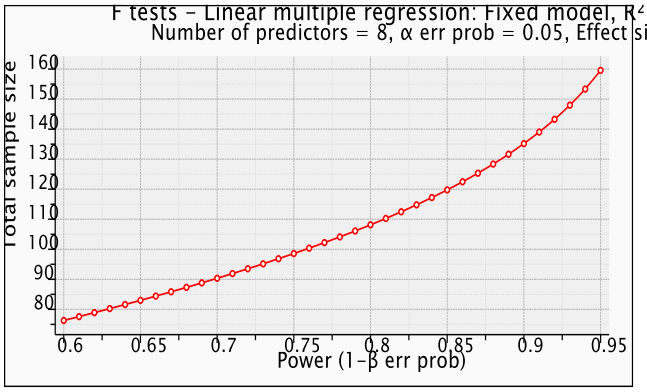
Zhong, J., Cangelosi, A., and Wermter, S., (2014). Toward a self-organizing pre-symbolic neural model representing sensorimotor primitives. *Frontiers in Behavioral Neuroscience,* 8(22), 1-11.

Zobairi, N., and Piotrowski, N. A., (2019)., *Cognitive development*. Salem Press Encyclopedia of Science, Amenia, New York, 5.

Zsuzsanna, S. & Brakas, N., 2020. Children's ability to recognize implicit and explicit reasoning of storybook characters. *Journal of Psychological and Educational Research*, 28 (1), 24-44.

Appendix A

Figure 1: The graph shows G power calculations used for the research population.



Appendix B

The following graphs P-Plot Plot of Regression Standardized Residual graphs demonstrate a relatively normal distribution for each the of the criterion variables using internal t-scores, external t-scores, adaptive t-scores, and BERI t-scores.

Figure 1: Normal P-P Plot of Regression Dependent Variable Internalizing

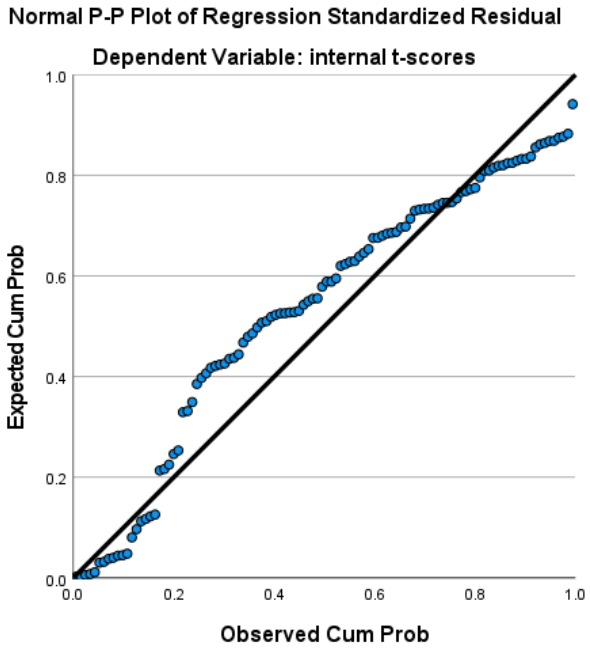


Figure 2: Normal P-P Plot of Regression Dependent Variable Externalizing

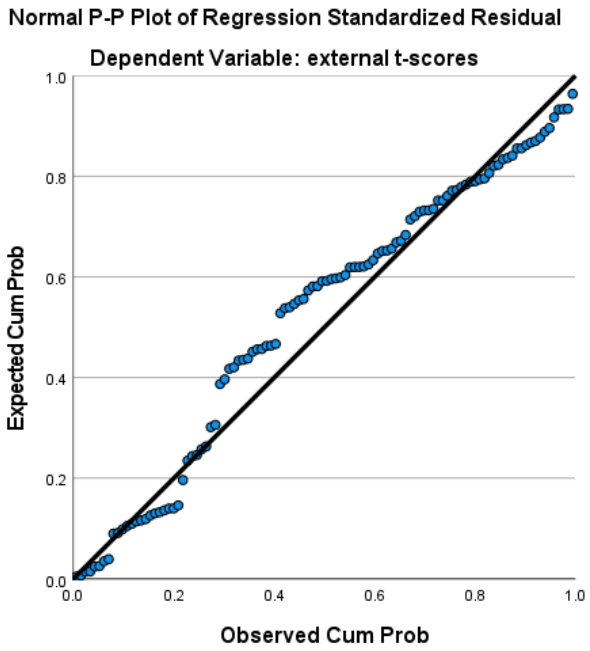


Figure 3: Normal P-P Plot of Regression Dependent Variable Adaptive Skills

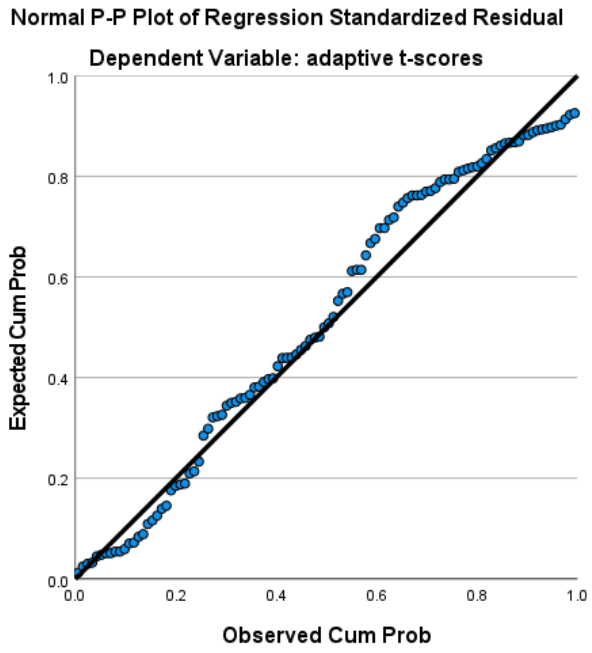


Figure 4: Normal P-P Plot of Regression Dependent Variable BERI