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## Relationship Between Sensory Integration and Occupational Participation for School-Aged Children

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**Relationship Between Sensory Integration and  
Occupational Participation for School-Aged Children**

by

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A culminating capstone project submitted to the faculty of Dominican University of California  
in partial fulfillment of the requirements for the degree of Master of Science in Occupational  
Therapy

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### **Abstract**

Given the wide-spread use of sensory integration intervention for the pediatric population in occupational therapy practice, it is necessary to explore the connection between sensory integration and children's participation in daily occupations. Although there is a wide breadth of knowledge examining the impact of sensory integration intervention, there is currently a gap in the literature establishing the underlying relationship between sensory integration and children's occupational participation. This study recruited 22 children, ages 5-12 to examine the relationship between sensory integration and occupational participation by utilizing two parent report measures: Sensory Processing Measure (SPM) and Participation & Environment Measure-Children and Youth (PEM-CY). Our findings suggest there is a moderate negative correlation between sensory processing and occupational participation in the home setting; therefore, the less sensory dysfunction a child has, the more they were found to participate in occupations.

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## Table of Contents

Abstract .....	iii
Acknowledgements .....	iv
List of Figures .....	vii
List of Tables .....	viii
Section I: Proposal .....	1
Introduction .....	2
Sensory Integration .....	4
Classification of SI difficulties .....	4
Occupational therapists use of SIT .....	5
Sensory Integration Assessments .....	6
Relationship between SI and Occupational Performance and Participation .....	7
Occupational Participation Assessments .....	9
Conclusion .....	12
Statement of Purpose .....	13
Theory .....	14
Sensory Integration .....	14
Sources of SI difficulties .....	15
Section II: Article .....	17
Literature Review .....	18
Methods .....	20
Design .....	20
Participants .....	20
Measures .....	20
Procedures .....	22
Results .....	23

Discussion ..... 26

    Home Environment..... 26

    Community Environment..... 27

    Limitations ..... 27

Conclusion ..... 29

References..... 30



**List of Figures**

Figure 1: SPM & PEM-CY Home Frequency .....	24
Figure 2: SPM & PEM-CY Home Involvement.....	24
Figure 3: SPM & PEM-CY Community Frequency .....	25
Figure 4: SPM & PEM-CY Community Involvement .....	25

**List of Tables**

Table 1: Descriptive Statistics for Measures .....	23
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**Section I: Proposal**

## Introduction

Sixty-five million results appear when you type “sensory integration” into a search engine. People have become more interested in researching sensory integration due to the prevalence of Sensory Processing Disorder (SPD) diagnoses, formerly Dysfunction in Sensory Integration (DSI), in children to now be between 5 and 15%, and for children with Autism Spectrum Disorder (ASD) is as high as 90% (Galiana-Simal et al., 2020). Dysfunction in sensory integration (DSI) is defined as, inability to modulate, discriminate, coordinate or organize sensation adaptively" (Lane et al., 2000, p. 2). Occupational therapists use this definition and framework to analyze and observe behaviors and implement interventions to work toward normalization of sensory integration for children.

A. Jean Ayres, who developed the framework of sensory integration (SI), defined SI as, “the neurological process that organizes sensations from one’s body and from the environment and makes it possible to use the body effectively within the environment” (Ayres, 1991, p. 11). As an occupational therapist, Ayres was concerned with how sensory integration impacts a child’s occupational performance and participation. Occupational performance is defined as, “the point when the person, the environment, and the person’s occupations intersect to support the tasks, activities, and roles that define that person as an individual” (Baum & Law, 1997, p. 281). The American Occupational Therapy Association (AOTA) defines occupational participation as, “involvement in a life situation” (2014). Through occupational participation, an individual is able to obtain the necessary skills in order to connect with other people and communities to find meaning in life (Law, 2002).

Current literature shows that implementing SI intervention strategies in a clinical setting lead to improvements in occupational performance (Schaaf et al., 2013; Schaaf et al., 2018). The underlying relationship between sensory integration dysfunction and occupational performance

has begun to be explored through several studies. While the connection between SI dysfunction and occupational participation has yet to be established, it is necessary to continue evidence-based practice considering the wide-spread use of sensory integration intervention in pediatric OT practice. The current study seeks to determine the relationship between sensory integration and occupational participation using the Sensory Processing Measure (SPM) compared to occupational participation scores from the Participation Environment Measure-Children and Youth (PEM-CY).

## **Sensory Integration**

Ayres described sensory integration (SI) as, “organization of sensation for use” (Ayres, 1979, p. 5). Ayres used the term SI as the complex neuronal processes of the brain to sensory information for use in functional behavior (Case-Smith, & O’Brien, 2015). Sensory Integration theory (SIT) is the overarching frame of reference that includes theoretical tenets, terminology, assessment methods, and sensory intervention principles and strategies (Case-Smith & O’Brien, 2015). Using SIT, Ayres described sensory integration as a way of viewing the brain’s organization of sensory information for functional behavior and that this gives insight into the ways children develop, learn, and interact in the world.

In pediatric practice, sensory integration intervention is often used and is referred to as occupational therapy-sensory integration (OT-SI) . Ayres Sensory Integration © (ASI) encompasses the theory assessments methods, patterns of sensory integration and praxis problems, and intervention concepts, principles, and techniques developed by Ayres (Ayres, 1989; Case-Smith & O’Brien, 2015; Parham et al., 2011).

### **Classification of SI difficulties**

Difficulties in SI are categorized as: sensory modulation, sensory discrimination and perception problems, difficulties with praxis and motor planning, and vestibular-bilateral problems (Case-Smith & O’Brien, 2015). Sensory modulation deficits occur when there is a discrepancy between the sensation of the stimuli and the resulting response. Sensory discrimination and perception allow for refined and organized interpretation of sensory stimuli; these problems may occur in any sensory system. Difficulties with praxis and motor planning may manifest in sensory integrative challenges in childhood, including difficulty with performing novel motor activities and could lead to frustration. Vestibular-bilateral problems may lead to difficulties in activities that require bilateral coordination, like riding a bike or

cutting with scissors. Occupational therapists may help with difficulties in different patterns of sensory integration through assessment and intervention.

### **Occupational therapists use of SIT**

In ASI intervention, the occupational therapist presents activity challenges that are individually tailored to stimulate and enhance the child's sensory integrative capacities (Ayres, 1989; Case-Smith & O'Brien, 2015; Parham et al., 2011). ASI intervention strategies are aimed at improving sensory processing capacities with the goal of helping the child to gain confidence and competence in performing everyday occupations. Research on enriched environments and brain structure in animals provides empirical support for the underlying assumptions and strategies of OT-SI intervention (Reynolds et al., 2010). The characteristics of an enriched environment include multiple sensory experiences, novelty of the environment, and active engagement in challenging cognitive, sensory, and motor tasks (Case-Smith & O'Brien, 2015). A skilled occupational therapist may encourage active engagement by collaborating with the child on their interests, and setting up the clinical environment to enhance sensory and motor challenges, while ensuring the child's safety and success. A growing body of literature has provided moderate evidence that intensive, individualized clinic based ASI intervention can improve functional outcomes (Pfeiffer et al., 2011). Assessment of sensory integration function is necessary for occupational therapists to carry out skilled therapy to help normalize occupational functioning and engagement for children.

## **Sensory Integration Assessments**

Through the lens of sensory integration, occupational therapists assume that sensory processing skills influence a child's ability to perform everyday tasks and activities. Sensory integration assessments are used to address patterns of sensory function and aim to identify how the child is developing in terms of motor and sensory factors (Jorquera-Cabrera et al., 2017). Difficulties with sensory integration can be identified through skilled observation, parent and teacher report, and standardized assessments (Roley et al., 2007).

The Sensory Profile and the Sensory Processing Measure (SPM) are parent report forms, which provide information not available through observation alone, and takes into consideration the behavior and experiences of the child on a day to day basis (Dunn, 2014; Parham et al., 2007). The SPM is used to determine the sensory functioning of each child within their surrounding contexts. The home form examines social participation, vision, hearing, touch, body awareness, balance and motion, and planning and ideas (Parham et al., 2007). The SPM provides a comprehensive picture of the sensory difficulties a child may face and how these difficulties manifest in various settings.



## **Relationship between SI and Occupational Performance and Participation**

Occupational therapists have been advocating for decades that sensory integration programs can greatly impact a child's overall occupational engagement. The literature shows that the implementation of SI intervention strategies lead to improvement in functioning for children with sensory integration difficulties (Schaaf et al., 2013; Schaaf et al., 2018). Although this shows that occupational performance improves after SI intervention, the literature showing the underlying relationship between performance and sensory integration dysfunction is more limited.

Currently, there are few studies showing the direct relationship between poor sensory integration and poor occupational performance (Koenig & Rudney, 2010; White et al., 2007). One systematic review focused on sensory processing disruptions linked to functional performance difficulties for children in areas of occupations including play and leisure, social participation, activities of daily living, instrumental activities of daily living, rest and sleep, education, and work (Koenig & Rudney, 2010). The findings suggested that children and adolescents with difficulty processing and integrating sensory information do exhibit functional performance difficulties in key areas of occupation. White et al. (2007) used a quasi-experimental study to determine whether children with sensory integration difficulties received lower scores on an occupational performance measure (Assessment of Motor Process Skills) compared to typical sensory integration scores. Children identified with sensory integration difficulties were found to experience more challenges completing their daily activities, showing the impact sensory integration can have on overall performance.

This literature does begin to establish quantitative data that shows the connection between sensory integration dysfunction and occupational performance, but the direct relationship between DSI and occupational participation has yet to be explored. Due to this gap

in the literature, it is essential to provide more evidence for the impact of sensory integration dysfunction on occupational participation.

## **Occupational Participation Assessments**

Few measures address occupational participation and daily functioning in a variety of contexts and across activities for children. One assessment is the School Functional Assessment (SFA) (Coster et al., 1998). One limitation is this assessment only considers school participation. Some other occupational participation assessments are the Children's Assessment of Participation and Enjoyment (CAPE) and Preferences of Activities for Children (PAC) performance assessment examines children's participation outside of school and includes 55 everyday activities. These activities are solely leisure and recreational activities, while excluding children's ADLs and IADLs. (King et al., 2004). The Paediatric Activity Card Sort (PACS) tool is an occupation-based measurement for children between the ages of 5 to 14, which determines their level of engagement. One limitation is that the assessment lacks diverse activities that can be applied to a variety of ages and cultural contexts (Mandich et al., 2004).

The Participation and Environment Measure-Children and Youth (PEM-CY) is an assessment of occupational participation that considers multiple contexts by examining school, home and community participation in children between the ages of 5 to 17. The PEM-CY measures participation at home, school and within their community, and focuses on environmental factors (Coster et al., 2012). Parents/guardians are asked to fill out a form which breaks down each daily task, such as homework, and determines the frequency and duration, and level of involvement in each task. Further, it asks parents/guardians if they desire a change in the child's participation. This assessment is based on naturalistic observations from the parent's/guardian's perspective. The convenience of this survey also allows for a web-based survey with moderate to strong internal consistency and test-retest reliability (Khetani et al., 2014).

Bedell, Khetani, Cousins, Coster & Law (2011) observed children between the ages of 5 and 16 in their natural home environments. This qualitative study focused on group interactions and was interview based. The participants included 42 parents who had children with and without disabilities. A majority of the children were between the ages of 5 and 16 years old. In the Bedell et al. study, they described participation as; “involvement in a life situation” (2011, p. 765). They also described what it would look like when participation is restricted as “problems an individual may experience in involvement in life situations” (Bedell et al., 2011, p.765). This study also discussed how environmental impacts can support or hinder children's participation. Participants had learning, attention, psychosocial and sensory-processing disabilities, which provide a range of disabilities since before it was mostly for physical disabilities. The study highlighted multiple dimensions of participation but concluded that no single measurement tool can address all of these dimensions. The study showed the frequency of participation, which is important for population-based studies. Since this study only communicated with parents during interviews, it would be beneficial to add the children or other people in their lives to get a broader perspective on their participation (Bedell et al., 2011).

Law (2002) examined the impacts of children’s well-being. This article discussed participation nature and outcomes, which has important impacts on health and well-being. It also describes how participation is measured by the person’s interests, what they do, where, and with whom and how much enjoyment they find. Continually, it provides information on the patterns of participation across different cultures and settings. This article focuses on how occupational therapists can implement this understanding in their work (Law, 2002).

Multiple assessments measure participation in daily activities, but few are used for large-scale research across a variety of occupations and contexts, while also taking the parent’s

perspective into consideration. The PEM-CY identifies the parents' approach on promoting participation by evaluating participation and the child's environment (Coster et al., 2012).

## **Conclusion**

Although SI is often discussed within healthcare and the community, evidence showing the connection between sensory integration and occupational participation is limited and not thoroughly examined in the current literature. Using A. Jean Ayres' sensory integration framework, occupational therapists can assess how SI impacts motor function and thus the potential to affect occupational participation in children. Parent/guardian perspectives of the child's sensory skills can be acquired through the SPM, which determines overall sensory functioning in children aged 5-12. The occupational participation measure, PEM-CY, allows occupational therapists to determine the level of frequency and duration, and level of involvement of participation within multiple contexts. The relationship between SI and occupational participation has been the driving force behind implementation of SI programs through occupational therapy, although the breadth of literature directly linking the two constructs is limited. This study aims to establish the relationship between sensory integration and the impact on occupational participation in the everyday lives of school-aged children.

### **Statement of Purpose**

There is little literature that shows the direct impact of sensory integration functioning on daily occupational participation. Occupational therapists strive to learn more about this relationship in order to establish evidence-based practice. This study aims to establish that connection, specifically within the target population of school-aged children. Considering the occupational therapy perspective on sensory integration, the current study seeks to determine the relationship between sensory integration and occupational participation using the Sensory Processing Measure (SPM) compared to occupational participation scores from the Participation Environment Measure- Children and Youth (PEM-CY).

## Theory

### Sensory Integration

First introduced in 1972 by Jean Ayres, Sensory Integration Theory launched the analysis of sensory integration difficulties and their impact on performance and participation and overall childhood development. Sensory integration Theory is used by the current study to frame the impact of sensory integration on occupational participation. According to Ayres, children's "inner drive" guides the development of sensory integration through adaptive responses, which helps the brain achieve a more organized state (1979). The inner drive is tied to the limbic system of the brain, a primitive part of the brain that develops early in life, and aids in both motivation and memory. When a child makes an adaptive response to their environment, change occurs resulting in the activation of the child's neuronal plasticity (Jacobs & Schenider, 2001). In ASI, the therapist adapts sensory qualities of the environment to engage the child's inner drive, eliciting adaptive responses, advancing sensory integration and occupational competence, and allowing the individual to interact within a meaningful and challenging environment, facilitating the "just-right challenge" (Ayres, 1972). The utility of the sensory diet in therapy includes creating the optimal combination for the specific child of sensory-based activities throughout the day that support optimal functioning (Wilbarger & Wilbarger, 1991).

In typically developing children, the sensory input does not require conscious monitoring (Case-Smith & O'Brien, 2015). Sensory input from the environment nourishes the child's development, learning, behavior, and goal attainment, which leads to more advanced sensory integrative development and builds the child's occupational competence. While too much stimulation may cause stress that is detrimental to brain development. Furthermore, Ayres believed that the body-centered senses provide a foundation on which complex occupations are



scaffolded. Not acquiring the skills to engage in activities early on that build upon skills that are required later on creates a snowball effect.

### **Sources of SI difficulties**

Ayres postulated that the first decade of life was a period of rapid development in sensory integration (Ayres, 1979). Ayres' work focuses on the vestibular, tactile and proprioceptive senses, which had largely been ignored in studies of child development (Case-Smith & O'Brien, 2015). As the brain begins to organize sensory information, motivated by the inner drive, adaptive responses are formed, while occupational and social participation increase (Parham, 2002). However, not all children form sensory integration patterns of behavior in a succinct way, if some aspect of SI does not work well.

There are three general categories that Ayres theorized contribute to sensory integration difficulties: 1) Sensory Discrimination 2) Postural-Occular-Vestibular Control and 3) Sensory Modulation (Bundy et al., 2002; Ayres, 1972; Ayres 1979). All of these factors, according to SI theory, lead to decreased occupational performance and participation. Ayres suggests that typical sensory integration is necessary for normal development, adaptation, and overall function. She also theorized that active engagement in therapy produces adaptive responses and that these adaptive responses work to improve both the development of a child and their functional abilities (Bundy et al., 2002; Ayres, 1972; Ayres 1979). Ayres proposes that SI treatments are effective at normalizing these conditions and improving performance and participation (Ayres, 1972).

The severity of SI problems, as well as the presence of other disabilities, impacts the degree of SI difficulties and which aspects of occupational participation are impacted. Children with normal intelligence may have sensory integration problems that may lead to more effort and difficulty with many things in life; however, those with additional diagnosis may experience difficulties beyond those associated with sensory integrative problems (Ayres, 1979). The

obstacles to participation may gradually have more impact than the SI difficulty itself (Case-Smith & O'Brien, 2015). For example, tasks that require coordinating two sides of the body, like riding a bicycle or cutting with scissors may be difficult for the child when vestibular processing difficulties are present. The impact on participation of sensory integration difficulties extends to all areas of occupational engagement (Koenig & Rudney, 2010).

**Section II: Article**

## Literature Review

The prevalence of Dysfunction in Sensory Integration (DSI), or Sensory Processing Disorder (SPD), in children is currently reported to be between 5 and 15%, and for children with Autism Spectrum Disorder (ASD) is as high as 90% (Galiana-Simal et al., 2020). Pediatric occupational therapists implement sensory integration intervention in order to address difficulties that often come with this diagnosis. There is a wide body of evidence that SI interventions lead to improvement in overall occupational functioning for children with sensory integration difficulties (Schaaf et al., 2013; Schaaf et al., 2018). Pediatric occupational therapists witness the relationship between sensory integration dysfunction and occupational performance and participation every day. Given the wide-spread use of sensory integration intervention, it is essential to establish evidence that shows the underlying connection between sensory integration and occupational participation.

Ayres defined sensory integration (SI) as “the neurological process that organizes sensations from one’s body and from the environment and makes it possible to use the body effectively within the environment” (Ayres, 1991, p. 11). Ayres was concerned with how brain function impacts a child’s ability to participate and perform daily occupations. Ayres introduced the concept that when there is a pattern of sensory integration, it is important to address these patterns and create interventions that work toward improving occupational engagement. Dysfunction in sensory integration (DSI) is defined as, inability to modulate, discriminate, coordinate or organize sensation adaptively" (Lane et al., 2000, p. 2). Pediatric occupational therapists can work toward increasing occupational functioning by implementing SI intervention strategies, which have been found to lead to improvements in engagement for children with sensory integration difficulties (Schaaf et al., 2013).

Occupational therapists have continued to use sensory integration theory as a fundamental framework, because a growing body of research has provided moderate evidence that intensive, individualized clinic-based Ayres Sensory Integration® intervention (ASI®) intervention can improve functional outcomes (Pfeiffer et al., 2011). However, there is little quantitative data on the underlying relationship between sensory processing dysfunction and deficiencies in occupational performance, and even less about how this dysfunction impacts occupational participation. The few studies published do point to a foundational relationship between SI and the motor performance that supports children's occupations. For example, researchers used the Assessment of Motor and Process Skills (AMPS) and the Sensory Profile to examine the relationship between processing skills and sensory processing in a group of 68 children (White et al., 2007). The researchers found a significant correlation between atypical sensory scores and difficulties executing in ADLs and concluded that sensory processing deficits may lead to limitations in occupational performance across many occupations and contexts (White et al., 2007). The results show the impact DSI can have on occupational performance. One can make the connection that DSI may also impact occupational participation, but the data has yet to be established.

Providing more evidence for the impact of sensory integration dysfunction on occupational participation is essential and relevant for evidence-based pediatric practice. Considering the occupational therapy perspective on sensory integration, the current study seeks to determine the relationship between SI and occupational participation by comparing scores on the Sensory Processing Measure (SPM) to scores from the Participation & Environment Measure-Children and Youth (PEM-CY) (Coster et al., 2010; Parham et al., 2007).

## Methods

### Design

The current study uses an exploratory-correlational design to examine the relationship between sensory integration and occupational participation. The study had two main variables: SPM Home form and PEM-CY Home and Community Form.

### Participants

The participants in this study are 22 school-aged children with and without disabilities, between the ages of 5 to 12 years old. This study included 14 male and 8 female participants. The mean age of the children was 8.5 years with a standard deviation of 1.91 years. This study included 5 sets of siblings; two of which had identical scores. The background of participants included White (12), Latinx/Hispanic (3), Asian (1), and ethnically mixed (6) participants. One participant had a diagnosis of Autism. The parents completing the report forms needed to be able to read English in order to complete the measures. Participants were excluded if they have significant motor impairments or are physically dependent on their caregiver. To make sure that the child meets these requirements, parents or guardians were given a child background information sheet. The participants were recruited through convenience sampling in Marin, Sonoma, Sacramento, and two were recruited from out-of-state. The study was approved by the Dominican University of California Institutional Review Board for the Protection of Human Participants (IRB-PHP IRB Application # 10825).

### Measures

The parents/caregivers filled out two questionnaires, Sensory Processing Measure (SPM) developed by Parham et al. (2007) to scores from the Participation & Environment Measure-Children and Youth (PEM-CY) developed by Coster et al. (2010) to measure their child's participation and sensory preferences. The PEM-CY is a parent report measure of occupational

participation that takes about 30 minutes to complete; sections include participation in daily tasks within a variety of contexts--including home, school, and community, while the home and community were only included in this study. The PEM-CY measures frequency and duration, and level of involvement in daily tasks such as homework, household chores and indoor games resulting in an average frequency for involvement and overall environmental support based on caregiver report. The scale for average frequency of participation is 0 to 7 from never to daily. The scale for involvement is 1 to 5 from minimally involved to very involved. Higher scores indicate more involvement in occupations within the home or community setting, and lower scores indicate limited involvement. This assessment is based on naturalistic observations from the parent's/caregiver's perspective. Psychometric properties were examined; internal consistency and test-retest reliability of the PEM-CY are reported to be moderate to very good (Coster et al., 2012).

The SPM Home Form was filled out by the participants' parents/caregiver that took approximately 15-20 minutes to be complete. This questionnaire gathers information about the child's sensory processing, praxis and social participation as reported by the parent/caregiver. For the purpose of this study, the SPM Home Form was used to determine the sensory functioning of each child within their contexts outside of school. Parents/caregiver rate functioning on a scale of one to four to yield a raw score that is transformed into a t-score with a mean of 50 and a standard deviation of 10. Lower scores on the SPM are indicative of better sensory processing and social participation. The SPM norms are based on a nationally representative sample of 1,051 children. Additional data was collected on a clinical sample of 345 children. The SPM Home Form was found to be significantly correlated with the Sensory Profile, providing evidence of convergent validity (Parham et al., 2007).

## **Procedures**

Once the parents/caregiver agreed to participate in the study and signed informed consent and a participant's bill of rights forms, they filled out the two assessments: SPM (Home Form) and PEM-CY (Home and Community forms). All of the forms were either personally delivered or mailed to the participant's home where they signed and returned in a pre-stamped and pre-addressed envelope. Each participant was given an identification number. One researcher initially scored both the SPM and PEM-CY, and individual scores were stored on secured google sheets utilizing their participant ID number to maintain privacy. Digital copies of the surveys were uploaded to a password protected google drive, with the participant ID only, to allow for a second researcher to check data entry and scores to establish accuracy and reliability of the survey scores.



## Results

Descriptive statistics were used to determine the demographics of the sample and the means and standard deviations of the scores from each assessment. The data from the main variables of the PEM-CY and SPM scores met the requirements for parametric statistics, having equal variance and a normal distribution. A *Pearson's Product Moment correlation (r)* was used to determine the correlation between t-scores for SPM compared to the mean frequency and involvement scores for PEM-CY home and community forms. Four comparisons were tested: SPM Home form to PEM-CY Home Involvement; SPM Home form to PEM-CY Home Frequency; SPM Home form to PEM-CY Community Involvement; and SPM Home form to PEM-CY Community Frequency. The significance level for the correlation was set at .05 (2-tailed).

Overall, most of the participants performed within typical ranges on both measures. The means, range and SD are presented in Table 1.

**Table 1**  
*Descriptive Statistics for Measures*

Measure	Mean score	Range	Standard Deviation
PEM-CY Home Freq	6.23	5.40-6.80	.464
PEM-CY Home Inv	4.17	3.00-5.00	.544
PEM-CY Comm Freq	3.39	2.00-5.80	.930
PEM-CY Comm Inv	3.19	1.50-5.00	.942
SPM	50.41	40-79	10.74

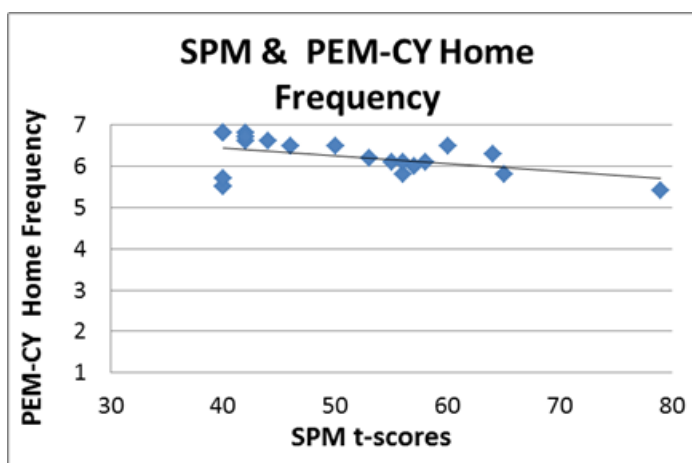
The first analysis was a comparison for SPM scores to PEM-CY Home scores for frequency and involvement of participation. Figures 1 and 2 shows the relationship of SPM

scores to the PEM-CY Home scores for frequency of activities and how involved the child is in their activities according to their caregiver.

The comparison of SPM scores to PEM-CY Home Frequency scores revealed a moderate significant negative correlation ( $r_{(22)} = -.43, p = .04$ ). The comparison of SPM scores to the PEM-CY Home Involvement scores showed a strong significant negative correlation ( $r_{(22)} = -.80, p < .001$ ).

**Figure 1**

*SPM & PEM-CY Home Frequency*



**Figure 2**

*SPM & PEM-CY Home Involvement*

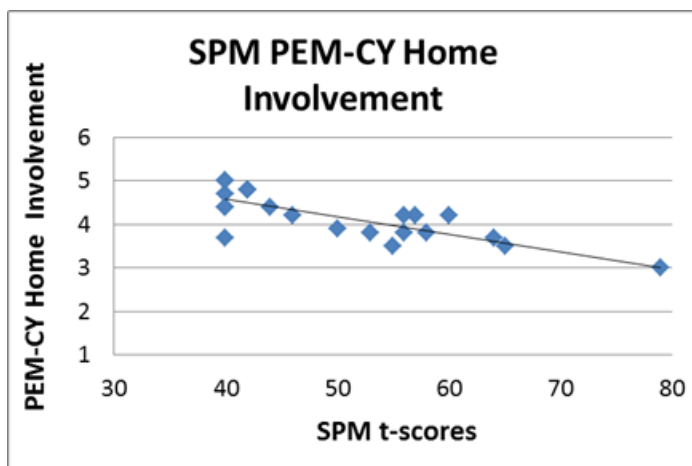
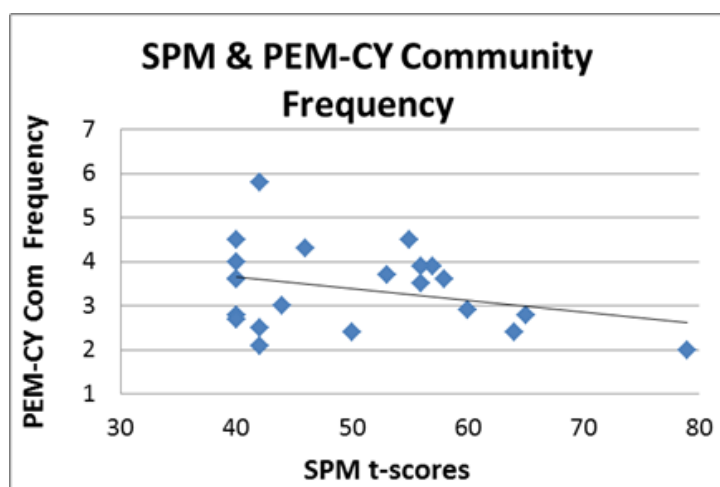


Figure 3 and 4, shows the relationship of SPM scores to the PEM-CY Community scores for frequency of activities and how involved the child is in their activities according to their caregiver. Both the PEM-CY Community Frequency and Involvement were found to have a weak, non-significant relationships with SPM scores ( $r_{(22)} = -.31, p = .17$  &  $r_{(22)} = -.4, p = .07$ , respectively).

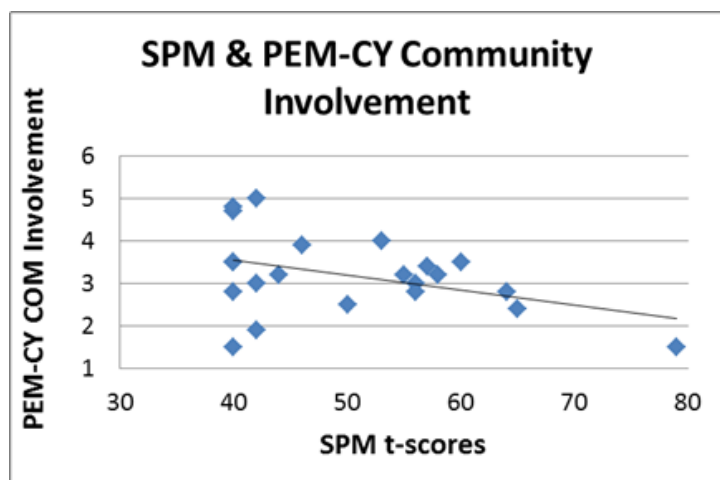
**Figure 3**

*SPM & PEM-CY Community Frequency*



**Figure 4**

*SPM & PEM-CY Community Involvement*



## **Discussion**

Within the OT community, sensory integration difficulties can be seen every day in practice; however, the connection to occupational engagement is yet to be established in the current literature. A body of evidence exists that supports the idea that children's occupational engagement improves after sensory integration intervention; however, there is little data showing the underlying relationship between SI dysfunction resulting in decreased occupational participation.

The current study examined the impact of sensory integration on occupational participation, by utilizing the SPM and PEM-CY parent report forms. The main findings of this research indicate that if a child has better sensory integration functioning, then they will have more occupational participation within their home environment. The results provide evidence for the relationship between sensory integration capacities and occupational participation and support the need to address sensory integration dysfunction within the pediatric population.

### **Home Environment**

The data indicated scores from the SPM had a strong correlation with the PEM-CY Home Involvement and a moderate correlation with Home Frequency. The significant correlation within the home environment indicates that if a child has dysfunction in sensory integration, then this child's occupational participation may be impacted in this context. Establishing the connection to occupational engagement is crucial for maintaining an evidence based pediatric practice. Utilizing quantitative evidence to establish a statistically significant relationship adds to the body of literature that occupational therapy SI intervention facilitates children's occupational engagement. Overall, our results show that children who have less sensory difficulties have more participation in their home environment.

## **Community Environment**

The SPM scores had weak, non-significant correlations with PEM-CY Community scores. SPM scores and PEM-CY Community involvement scores showed a trend towards a moderate relationship. This indicates that children with fewer sensory challenges might tend to be more involved in community activities. The PEM-CY community scores may have been impacted due to COVID-19 restrictions happening at the time of data completion. Data for this study was collected during the summer of 2020, when significant restrictions in community activities were in place due to the world pandemic. Parents were asked to respond to the questionnaires based on pre-pandemic activity, however, this could not be verified completely. Many child participants had low frequency and involvement in community activities, and these findings need to be interpreted with caution.

Our results indicate that children who have typical or better sensory processing capacities, have a wider range of participation in occupations than those with sensory integration difficulties. Since there were not a variety of symptoms of sensory difficulties presented in our participants, this impacted the distribution of the children's scores. For the purposes of future occupational therapy practice and research, it would be beneficial to include children with a range of symptoms to be represented in order to generalize the data.

## **Limitations**

Limitations of this study included the limited areas of recruitment. The researchers recruited from Marin, Sonoma, and Sacramento counties, as well as individual participants from Washington and Maryland. Limited participant recruitment does not allow for a generalization to a larger population sample. This study required participants to be between the ages of 5 and 12, which narrows it to only elementary-aged children. Parents were required to be English readers in order to effectively complete assessments, which excluded participants who are fluent in other

languages or across multiple age groups. Limitations of this study also includes multiple sets of siblings and a pair of twins, resulting in similar scores. One set of siblings had neuro-typical results and one presented with difficulties in their presentation.

The data acquired from this study benefits the occupational therapy profession and will enhance the literature for future studies. It is important to determine if a child has sensory integrative difficulties and distinguishing how this may impact their occupations, in order for occupational therapists to help these children engage in their everyday meaningful activities. Establishing a significant relationship between sensory integration and occupational participation provides evidence as to why SI dysfunction needs to be addressed for children with sensory processing difficulties.

## **Conclusion**

Within the OT pediatric community, the adverse effect of SI difficulties is seen every day in practice. A body of evidence currently exists that supports the idea that children's occupational engagement improves after SI intervention; however, there is little data showing the relationship between SI dysfunction and decreased occupational participation. This study explored the relationship between measures of sensory integration using the SPM and measures of occupational participation using the PEM-CY. The measures used the parent/guardian perspective to evaluate children's sensory systems and occupational participation within the home and community. Overall, our findings indicate that children who have less SI difficulties have more participation in occupations in their home environment. It would be beneficial to replicate this study when social distancing and community gathering restrictions are lifted, as these circumstances likely impacted the results of the study. Establishing a significant relationship between sensory integration and occupational participation would provide evidence as to why SI dysfunction needs to be addressed for school-aged children.

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