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## A Cross-Content Validation: SOSI-M & BOT-SF

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**The Validity and Utility of the SOSI-M as Compared to the BOT-SF**

By

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

Dominican University of California

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## Abstract

This thesis paper examines a new assessment, Structured Observations of Sensory Integration- Motor (SOSI-M), and its concurrent validity against the well-validated Bruininks-Oseretsky Test of Motor Proficiency Second Edition (BOT-2). This research study answers the question of “*Do the scores from SOSI-M correlate with scores from the BOT-2 in a sample of children 5 to 14 years of age?*”. The participants for this study are school-aged children between the ages of five to fourteen years old, all genders, English-speaking, ambulate without assistance or use of orthotic devices, and have motor and sensory abilities sufficient in order to complete both motor assessments. Participants will be excluded if they have been administered the BOT-2 assessment within six months of the administration date for research study, or have significant impairments.

Due to the COVID-19 pandemic, and the restrictions that were set, the original project was modified to adhere to the safety precautions and recommendations determined by the Centers for Disease Control and Prevention (CDC). As a result, researchers were unable to participate in any in-person or direct-contact interactions with study participants. The modified version of this project aims to compare content of the new SOSI-M against the BOT-SF to further inform practitioners’ knowledge of this tool and allow occupational therapists to provide more comprehensive, evidence-based & client-centered care in the form of a cross-sectional activity analysis.

Key words: SOSI-M, BOT-2, Structured Observations of Sensory Integration- Motor, Bruininks-Oseretsky Test of Motor Proficiency Second Edition, Occupational Therapy, Sensory Integration, Children, Motor Skills

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## **Preface**

This master's capstone was conducted over a period of three academic semesters- beginning in August of 2019 and ending in December of 2020. In March of 2020, after the initial proposal and IRB approval, the COVID-19 pandemic shut down schools and daycare centers across the United States and prevented the in-person testing of participants. In order to fulfill academic requirements and abide by strict safety precautions put in place across California, this capstone was adapted into an alternative analysis that required no in-person interactions between researchers or participants.

To help with reader comprehension, this final paper has been broken up into two distinct sections: Section I- the original proposal for a concurrent validation of the SOSI-M versus the BOT-SF; and Sections 2- the cross-content validation of the SOSI-M versus the BOT-SF.

Thank you for your understanding,

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**Section I: The Concurrent Validity of the SOSI-M with the BOT-2**

## Literature Review

### Introduction

Sensory Integration (SI) is defined 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” (Ayers, 1991, p. 11). Essentially, SI is how people understand, organize, and respond to all physical contexts. Sensory integration affects all aspects of human function; the way someone walks, how they eat, and even whether or not they like loud concert venues. Dysfunction in sensory processing/ integration fall within the categories of sensory discrimination and praxis, vestibular/ocular/postural skills, and sensory modulation difficulties. Though the exact prevalence is unknown, based on existing studies, one can estimate that somewhere between 5% and 13% of the typical population experience some form of sensory processing dysfunction (Ahn et al., 2004). In populations with disabilities, prevalence is higher. One study suggests that as many as 98% of individuals with Autism Spectrum Disorder (ASD) demonstrate signs of sensory processing difficulties (Tomchek & Dunn, 2007).

As the use sensory integration intervention becomes prevalent in pediatric occupational therapy (OT) practice, due to increased client request, practitioners must stay up to date on current evaluation tools so that they can best identify and serve the needs of their clients (Case-Smith & O'Brien, 2010; Zimmer & Desch, 2012). While several tools already exist and are fairly well established, new assessments must also be analyzed and validated so that practitioners can confidently and effectively use them in clinical practice. The Structured Observations of Sensory Integration- Motor (SOSI-M) is a newly standardized tool based on previously unstandardized clinical observations of sensory integration (Blanche et al., 2021). This research project aims to establish concurrent validity of the new SOSI-M compared to the Bruininks-Oseretsky Test of

Motor Proficiency Second Edition (BOT™-2). Furthermore, this study hopes to help confirm the psychometric properties of the SOSI-M.

### **Current Assessment Tools in Sensory Integration**

Within the OT practice, therapists often rely on multiple methods of data acquisition in order to create a holistic and comprehensive overview of a client's occupational performance. To gather such information, practitioners often use a battery of assessment tools consisting of self-report measures such as interviews, checklists and questionnaires, structured and unstructured clinical observations, and standardized performance-based assessments. Each tool provides the therapist with unique perspectives on the client's abilities and informs intervention strategies. Within the context of Sensory Integration theory and practice framework, all three types of assessments are typically used to provide a compressive view of how sensory processing capacities support or hinder function. Checklists and questionnaires, for example, allow occupational therapists to receive information directly from the parents, caregivers, teachers, or children themselves. Having this information provides a more naturalistic view of how a sensory deficit might create barriers that impact the child's ability to engage in their occupations within their home and school environments. Information collected through these methods can inform practitioners about limitations and/or supports that the client faces outside of the clinical environment. Some of the most frequently used checklists and questionnaires for sensory integration include the Sensory Profile and the Sensory Processing Measure (Dunn, 2014; Parham et al., 2007). Performance-based standardized assessments are norm-referenced, or criterion referenced and provide information on specific skills. These assessments are normed across a population in order to provide reliable and valid normative expectations for performance. Performance-based and norm referenced standardized assessments for Sensory

Integration include the Sensory Integration and Praxis Test (SIPT), the Miller Assessment for Preschoolers (MAP), and the DeGangi-Berk Test of Sensory Integration (Ayres, 1991; Miller, 1982; DeGangi, & Berk, 1983). Possibly the most well-known assessment of SI, the SIPT, was developed in order to assess specific components of sensory integration in children through a series of subtests that evaluate vestibular, kinesthetic, somatosensory, and visual processing, and measure praxis, perceptual and visual motor abilities (Ayres, 1991). Lastly, clinical observations gain further knowledge of performance that must be seen-in-action. Whereas a performance-based assessment evaluates a child's ability against pre-standing norm-referenced and criterion-referenced data for their age range, clinical observations do not have "pass-fail" expectations but rather inform the practitioner about compensatory strategies the client uses and the "effectiveness of performance skills and performance patterns", emotional response to success and failure, etc. (American Occupational Therapy Association, 2014, p. S14). Some standardized clinical observation tools used in a SI practice framework are the Clinical Observations of Motor and Postural Skills (COMPS), which was normed on a small limited sample, and the Quick Neurological Screening test (QNST-3), which is not directed at sensory deficits. (Wilson, et al., 2000; Mutti et al., 1978). However, informal, yet structured observation of sensory integration function based on Ayres' clinical work is most commonly used (Blanche et al., 2020). To create a well-rounded evaluation, all three tools should be used in tandem to gain the most comprehensive overview of the client's occupational performance within a large range of physical and social contexts. Blanche's clinical observations approach, despite providing some guidelines, requires independent clinical judgement, which limits the reliability and validity of this assessment. In order to improve this essential assessment, Blanche along with colleagues created the SOSI-M (Blanche et al., 2021).

## **The SOSI-M**

The Structured Observations of Sensory Integration-Motor (SOSI-M) is a nationally normed standardized assessment that evaluates sensory-based motor skills including proprioceptive and vestibular processing, and motor planning (Blanche et al., 2021). The SOSI-M was developed from the Clinical Observations based on Ayres Sensory Integration and subsequent Comprehensive Observations of Proprioception (COP), both developed by Blanche and colleagues (Blanche et al., 2012). The COP is a criterion-referenced observational tool that provides structure for a clinician's observations by linking them to specific areas associated with proprioceptive processing (Blanche et al., 2012). This was the first attempt to create a reliable clinical observation tool based on Ayres. Although a helpful tool for practitioners, the COP is not normed across a population and, therefore, has barriers to generalizability since it is primarily based on observations and practitioner's judgement. In response, many of the original observations from the COP were standardized and recompiled into the SOSI-M. The SOSI-M evaluates a child's sensory-motor abilities through a series of standardized motor tests and provides norm-based scores, rather than relying solely on clinical judgement. Despite having multiple motor assessments already available for therapists to use, the SOSI-M is unique as the first standardized norm-referenced assessment based on Ayres original assessment recommendations (Blanche et al., 2021). This assessment allows the therapist to evaluate specifically how a child's sensory systems affect his or her motor abilities, which may impact occupations such as play, personal hygiene, and education. While the SOSI-M has its roots in a long-standing assessment process, it still must undergo rigorous reliability and validity testing in order to better affirm its clinical relevance. To do so the SOSI-M must be compared with an

established assessment with strong psychometric attributes, the BOT-2 (Bruininks & Oseretsky, 2005).

### **The BOT-2**

The BOT-2, is a test used to measure gross motor proficiency of individuals between the ages of four and twenty-one (Carmosino et al., 2014; Deitz et al., 2007; Bruininks & Oseretsky, 2005). Originally developed in 1978 and re-standardized in 2005, the BOT-2 examines both fine motor and gross motor skills. The BOT-2 is a good candidate for examining the concurrent validity with the SOSI-M because it was normed against 1,520 individuals ranging from the ages of four to twenty-one years old (Bruininks & Oseretsky, 2005). Both assessments evaluate similar functions in some of the subtests – for example balance and UE coordination. They also address similar populations —the BOT-2 for ages four to twenty-one, and the SOSI-M for ages five to fourteen. They differ starkly on the developmental principles and theories upon which they are structured. The BOT-2 originates from the biomechanical and developmental frames of reference; deficits in performance are attributed to motor functioning and missed developmental milestones. Its subtests focus on any physical limitations to occupational performance such as weakness, range of motion, endurance, coordination, etc. On the other hand, the SOSI-M has its roots in Sensory Integration theory and, therefore, attributes the child's performance to sensory-based functions such as skills supported by the proprioceptive and vestibular sensory systems. Within this frame of reference, the administrators identify a child's ability to decipher sensory integration information from his or her body along with the environment such as the ability to self-regulate during tasks and maintain motor control (Schaaf et al., 2010). Although these assessments are administered under different frames of references, both aim to evaluate the motor skills and abilities of clients throughout their school-aged years. Therefore, this study will

examine the relationship between the motor proficiency outcomes of the BOT-2 and the SOSI-M in order to better establish the validity of the SOSI-M.

### **Conclusion/ Purpose Statement**

This research project aims to establish concurrent validity of the new SOSI-M against the Bruininks-Oseretsky Test of Motor Proficiency Second Edition (BOT™-2). The specific research question is “Do the scores from SOSI-M correlate with scores from the BOT-2 in a sample of children 5 to 14 years of age?” By evaluating concurrent validity, this project will provide evidence for the use of the SOSI-M in general clinical practice. Further applications of this evaluation may inform practitioner’s knowledge of this tool and will allow OTs to continually grow in providing evidence-based and client-centered care through the administration of well-rounded and accurate interventions. Although both the BOT-2 and SOSI-M both assess motor performance , they are rooted in different theoretical frameworks- Ayers’ Sensory integration (SOSI-M), Developmental (BOT-SF), and Biomechanical (BOT-SF)- and attribute deficits in motor performance to different interfering factors. If the SOSI-M can be further validated, it will be a valuable tool for occupational therapists to use alongside other sensory assessments to develop a full comprehensive battery of a child’s sensory processing abilities.



## **Methods**

### **Design**

The study explores the question of “Do the scores from SOSI-M correlate with scores from the BOT-2 in a sample of children 5 to 14 years of age?”. This research project uses an exploratory-correlational design to examine the relationship between the scores on the BOT-2 and scores on the SOSI-M school aged children. The main variables are the scores of the BOT-2 and SOSI-M..

### **Participants**

The participants are school-aged children between the ages of five to fourteen years. Twenty-five to forty students will participate in this study. The participants will include all genders.

The school-aged children must be English-speaking, ambulate without assistance or use of orthotic devices, and have motor and sensory abilities sufficient in order to complete both motor assessments. Participants will be excluded if they have been administered the BOT-2 assessment within six months of the administration date for research study, or have significant motor, auditory, visual or sensory impairments to interfere with their ability to complete the assessment. To make sure that the child meets these requirements, parents or guardians will be given a child background information sheet to complete (Appendix A).

The researchers reached out to administrators of schools in Marin, Sonoma, Sacramento, and Placer school districts for permission (Appendix A) to recruit students from their after-school programs to participate in our research study. Once permission was granted and the research project has been fully vetted and approved by Dominican University of California’s Institutional Review Board (IRB), researchers provided the schools and after school programs

with information sheets (Appendix A), signup sheets and IRB approved flyers (Appendix A) to advertise. Researchers will then be distributed flyers around the school campus and asked that teachers/staff send flyers and consent forms (Appendix A) home with their students. Sign-up sheets were provided at the participating schools that allowed researchers to contact them personally for more information about the study and to schedule dates for participants.

## **Measures**

The two measures used in this research project are the Bruininks-Oseretsky Test of Motor Proficiency: Second Edition (BOT-2) and the Structured Observations of Sensory Integration-Motor (SOSI-M).

### ***SOSI-M.***

The SOSI-M is a nationally standardized assessment that evaluates sensory-based motor skills including proprioceptive and vestibular processing, and motor planning (Blanche et al., 2021). The assessment includes 14 subtests: Romberg, Heel to Toe, Standing on One Foot, Modified Postural Schilder's Arm Extension Test, Skipping, Series of Jumps, High Kneeling, Antigravity Extension, Antigravity Flexion, Ocular Movements, Slow Ramp Movements, Sequential Finger Touching, Diadochokinesis, and Projected Actions in Time and Space (Blanche et al., 2021). Within the assessment procedures, children will be asked to complete general motor and balance skills such as standing on one foot and placing heel to toe, high kneeling, and jumping jacks. Researchers will administer the entire SOSI-M according to the testing manual. Scoring for the SOSI-M is based upon the number of repetitions and length of time that a child successfully completes a prompted task or skill. A full description of psychometric properties of this assessment have not been released and can be expected in 2021- the projected publication year for the SOSI-M.

***BOT-2.***

The BOT-2, originally developed in 1978 and re-standardized in 2005, is a test used to measure gross motor proficiency of individuals between the ages of four and twenty-one. The participants will participate in the following subtests Bilateral Coordination (subtest 4), Balance (subtest 5), and Upper-Limb Coordination (subtest 7) (Bruininks & Oseretsky, 2005).

Psychometric properties of the BOT-2 is fully described in the test manual. Data is assessed over three age groups: 4-7, 8-12, and 13-21. Internal consistency reliability coefficients range from the high .70s to the mid .90s, depending on the age groups being assessed and indicate that composite and subtest scores are cohesive. Test-retest reliability coefficients assessed across 134 examinees were moderately high and ranged from .69 to .70 on subtests scores and from .77 to .80 for composite scores. Interrater reliability coefficients were assessed over the scores of 47 examinees, each assessed by two raters. These coefficients ranged from .92 to .99 depending on the subtest being assessed. Test content validity is assured through the careful selection of assessment tasks that were functionally relevant and had a moderate to high statistical relation to their respective subtest. The BOT-2 was normed across a population of 1,520 participants across the United States (Bruininks & Oseretsky, 2005).

To establish inter-rater and intra-rater reliability within the research group the following steps will be taken: researchers reviewed both assessments as a group and thoroughly read the guidelines provided by the manuals for the SOSI-M and BOT-2. The group will also familiarize with pre-existing training video material provided by the authors/publishers to ensure that testing techniques are followed precisely. Researchers will then score the same practice-runs of testing scenarios and cross-compare to both their colleagues and to their own past scoring sessions. This process will be repeated across multiple trials until test scores are consistent between researchers

and produce an interrater consensus at least 80% of the time. All scripts given for the BOT-2 and the SOSI-M will be followed word-for word.

## **Procedures**

Recruitment procedures: The researchers will reach out to children and parents in Marin, Sonoma, Sacramento and Placer counties via afterschool programs, through flyers posted in the community, or by word of mouth. After-school programs were contacted through email to obtain agreement (Appendix A) to support the research project by assisting in recruiting and providing space for assessing children. The schools will be provided with information sheets for administration and parents, recruitment flyers and reply cards to distribute to parents directly or sent home in children's backpacks (Appendix A). Agencies will also be asked to send out information via email (Appendix A) to the families. The IRB approved flyers will also be posted around the varying campuses and public community locations.

Families can express an interest in this project by contacting the research group via email address or returning the "contact me" reply cards. Parents can return the cards to the after-school program where they will be placed in a closable envelope in a secure location with only teacher access. This contact information will remain confidential with only the teachers and the research group having access. Researchers will contact all interested families.

Consent Process: Consent will be obtained for the child's participation from the parent and parents will additionally consent to complete two-parent report questionnaires. Consent forms and Assent form (Appendix A) either will be sent home in the child's backpack or sent directly to the family by mail. Forms can be returned to the teacher or by mail in a sealed envelope with "Dominican University of California Occupational Therapy Program-SOSI project" written on the envelope. Researchers will collect the consent forms from the teachers once completed and

pick them up as needed. Child assent will be collected from the child prior to testing.

Once consent forms, assent form and child background information sheet have been obtained to participate in the study, two testing sessions will be scheduled. Parents will have the option of having the child tested after school during the after-school program or at another time after school when they can be present. The children will be administered two assessments on two different days one to two weeks apart. As the assessments are similar in nature, they cannot be administered back-to-back. During the two testing sessions, Dominican Occupational Therapy students will administer the subtests of BOT™-2 which include Bilateral Coordination (subtest 4), Balance (subtest 5), and Upper-Limb Coordination (subtest 7) and all subtest of the SOSI-M. Each assessment will be given during one session, with the second assessment being administered the following session. The order of administration will be random. An online randomizer will be used to determine which test is administered on each day to prevent any order bias that might occur. Each session will be approximately 45 minutes.

BOT™-2: examines the child's motor functioning. Participants will be asked to perform tasks such as jumping jacks, skipping, standing on one foot, and balancing (Bruininks & Oseretsky, 2005)

SOSI-M: asks the child to complete general motor and balance skills such as standing on one foot and placing heel to toe, high kneeling, and jumping jacks (Blanche et al., 2021).

Testing will take place in a quiet, separate yet visible area of the after-school program facility during the after-school program hours to be arranged with after school teachers, the Dominican University Occupational Therapy Child Development Lab (Meadowlands 209) or similar location of the parents' choice. All assessments will be administered by Occupational Therapy students who have been trained in both assessments and found reliable in the testing procedures. The

researchers will administer the assessments in pairs. One will administer while the other observes as a second independent rater. The same researcher will administer both assessments to any one child.

### **Analysis**

Our research aims to establish concurrent validity of SOSI-M, a new measure intended to assess vestibular, proprioceptive and somatosensory contributions to postural and motor abilities, by comparing it with the established and well validated measure of motor skills and development, the BOT-2. Descriptive statistics will be derived from the demographics of the sample and for the scores on each of the measures. More specifically, looking at the outcome composite scores of the BOT-2's Bilateral Coordination (subtest 4), Balance (subtest 5), and Upper-Limb Coordination (subtest 7) subtests will be analyzed against all the subtests of the SOSI-M. If collected data meets requirements for parametric statistical analysis— that is, homogeneity, normality, linearity, and independence— then researchers will analyze the data using *Pearson's r* to determine the correlation between the scores on the two measures. However, if the aforesaid conditions do not apply, *Spearman's Rho* will be used.

## Results

Gathering data for this research study was terminated due to the 2020 Global COVID-19 Pandemic. Therefore, this research study was converted into a comparative activity analysis of the BOT-SF and SOSI-M subtests (see section II).

**Section II: A Cross-Content Validation: SOSI-M & BOT-SF**



### **Revised Overview**

This paper investigates and compares the sensory processing and motor skills assessed in subtests of the Bruininks-Oseretsky Test of Motor Proficiency 2: Short Form (BOT-SF) and the new Structured Observations of Sensory Integration-Motor (SOSI-M) through a comprehensive cross-content analysis. This research project aims to compare components of the new SOSI-M against the BOT-SF — regardless of the theoretical bases on which they were formed— so that future practitioners will be able to understand the key compositional differences between them. Such knowledge supports occupational therapists in providing evidence-based and client-centered care through the administration of well-rounded and accurate assessments.

## Revised Methods

### Design

This research project used a comparative content analysis to unveil the similarities and differences between the subtests on the BOT-SF (Table 1) and the SOSI-M (Table 2). Further, the analysis identified broad categories of performance skills that the assessments have in common and the key features and skills that each assessment elicits from clients that may not be seen clearly in its counterpart.

**Table 1**

*Complete list of all subtests features in the BOT-SF*

BOT-SF Subtests		
<b>Fine Motor Precision</b> #3 Drawing line through paths-crooked #6 Folding paper	<b>Bilateral Coordination</b> #3 Jumping in place-same side #6 Tapping feet & fingers - same sides	<b>Upper Limb Coordination</b> #1 dropping and catching a ball - both hands #6 dribbling a ball -both hands
<b>Fine Motor Integration</b> #2 copying a square #7 copying a star	<b>Balance</b> #2 walking forward on a line #7 standing on one leg balance beam -eyes open	<b>Strength</b> #2a knee push ups #2b full push up #3 sit-ups
<b>Manual Dexterity</b> #2 transferring pennies	<b>Running Speed and Agility</b> #3- one-leg stationary hop	

**Table 2**

*Complete list of all subtests featured in the SOSI-M.*

SOSI-M Subtests		
Romberg (#1-4)	Series of Jumps (#16-18)	Slow Ramp Movements (#26)
Heel to Toe (#5-8)	High Kneeling (#19-20)	Sequential Finger Touching (#27-28)
Standing on one foot (#9-12)	Antigravity Extension (#21)	Diadochokinesis (#29-31)
Modified Schilder's Arm Extension Test (#13-14)	Antigravity Flexion (#22)	Projected Actions in Time and Space (#32-34)
Skipping (#15)	Ocular movements (#23-25)	

## Measures

The two assessments compared in this research project are the BOT-2 short form (BOT-SF) and Structured Observations of Sensory Integration-Motor (SOSI-M).

SOSI-M: The SOSI-M is a nationally standardized assessment which originated from sensory integration theory (Ayers, 1991) and the Clinical Observations of Ayres Sensory Integration & Comprehensive Observations of Proprioception (COP), that evaluates sensory-based motor skills including proprioceptive and vestibular processing, and motor planning (Blanche et al., 2021).

BOT-SF: The BOT-2, originally developed in 1978 and re-standardized in 2005 (2nd Edition) (Bruininks & Oseretsky, 2005). For the purpose of this project, the BOT-SF will be used instead of the full BOT-2 as it is more similar in number of subtests and average length of administration to the SOSI-M. The BOT-SF originates from the biomechanical and developmental frames of reference; the subtests focus on any physical limitations to occupational

performance. The BOT-SF is used to measure fine and gross motor proficiency of individuals between the ages of four and twenty-one (Bruininks & Oseretsky, 2005).

### **Analysis and Procedures**

Occupational Therapy Practice Framework: Domain and Process (4th edition) was used as the foundation to create an initial list of categories applicable to both tests, including performance skills (process skills), context (environmental factors) and client factors (Body structures and body functions) (AOTA, 2020). Subtests of both the BOT-SF and the SOSI-M were broken down into those aforementioned categories by individual researchers. For the purpose of inter-rater reliability, these individual activity analyses were then compared to one another and the agreed-upon categories were synthesized into the aggregate categories. An extensive chart was created to clearly display these analyses so that patterns could be easily identified (Appendix B). The final product was then simplified into the categories listed in Table 3.

## Results

The following chart is derived from the content analysis between the BOT-SF and SOSI-M. The chart is a compilation of the aggregate skill categories, their corresponding subtests, as well as a detailed description of what qualified the subtests to be featured in each category. Subtests of the BOT-SF are labeled in blue and italicized, whereas the subtests pertaining to the SOSI-M are labeled in orange and non-italicized.

**Table 3**

*Analytical categories with brief descriptions and associated assessment subtests.*

Category	Assessment ( <i>BOT-SF</i> / <i>SOSI-M</i> )
<p><b>Motor Coordination, Bilateral Motor Sequencing, Rhythm</b></p> <p>The distinguishing features include a rhythmic ability to alternate motor movements on both sides of the seated body around the midline</p>	<p><b>Diadochokinesis</b> *Exists in Full BOT-2</p> <p><i>Tapping Feet and Fingers- Same Sides Synchronized</i> (subtest 4, item 6)</p>
<p><b>Motor Coordination, Motor Sequencing, Projected Action</b></p> <p>In these subtests, the child must be able to adapt motor actions to constantly changing stimuli to complete a given activity. Vision &amp; visual tracking skills are essential to successful completion. Additional skills needed to include standing, ambulating, &amp; hearing.</p>	<p><b>Projected Actions in Time and Space</b></p> <p><i>Dribbling a Ball- Alternative Hands</i> (subtest 7, item 6)</p> <p><i>Dropping and Catching a Ball- Both Hands</i> (subtest 7, item 1)</p>
<p><b>Modified BOS for Balance/ quality of equilibrium responses</b></p> <p>The key feature of the qualifying subtests is static movement on a modified or atypical base of support. Examples include a balance beam, standing in tandem, and standing on a foam surface.</p>	<p><b>Heel to Toe</b></p> <p><b>Romberg: Standing with Feet Together</b></p> <p><b>Standing on One Foot</b> *Exists in Full BOT-2</p> <p><b>High Kneeling</b></p> <p><i>Standing on One Leg on a Balance Beam- Eyes Open</i> (subtest 5, item 7)</p>

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### **Dynamic Movements Involving Bilateral Coordination/ Midline**

Items that qualify for this category have strong dynamic components that require strength, endurance, kinesthesia, and proprioception. Additionally, these movements are dependent upon a child's awareness of midline and the ability to coordinate movements both unilaterally and bilaterally across that midline.

**Series of Jumps** \*Exists in separated parts in full BOT

### **Skipping**

*Jumping in Place- Same Sides Synchronized* (subtest 4, item 3)

*Walking Forward on a Line* (subtest 5, item 2)

---

### **Manual Dexterity**

These subtests are dependent upon fine motor coordination and dexterity without any reliance on larger gross motor actions. Tactile perception and functional ROM in the hands are also important for successful completion. It is important to note that in sequential finger touching, vision is occluded, therefore vision is not a factor that can aid in the completion of this subtest.

### **Sequential Finger Touching**

*Transferring Pennies* (subtest 3, item 2)

*Folding Paper* (subtest 1, item 6)

---

### **Endurance and Strength**

Gross enduring movements against gravity in both flexion and extension are the cornerstones of these included subtests. Strength, endurance, and vestibular functioning are essential for all 4 subtests but the SOSI-M emphasizes stability while the BOT-SF emphasizes mobility.

### **Antigravity Flexion**

### **Antigravity Extension**

*Sit-Ups* (subtest 8, item 3)

*Knee Push-Ups OR Full Push-Ups* (subtest 8, item 2a/2b)

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### **Visual Motor Coordination and Writing**

These subtests require an integration of visual perception and fine motor control in order to create and copy lines and shapes. No tests in the SOSI-M directly test the combined use of visual coordination and fine motor skills.

*Copying a Square* (subtest 2, item 2)

*Copying a Star* (subtest 2, item 7)

*Drawing Lines through Paths- Crooked* (subtest 1, item 3)

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### **Neurological Soft Signs (NSS)**

Neurological Soft Signs are abnormalities in movement and sensory processing that may indicate a defect in certain neurological

### **Slow Ramp Movements**

### **Modified Schilder's Arm Extension Test**

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functions. The following subtests are all specifically targeted at cerebellar and cerebral functioning.

---

**Diadochokinesis**

**Sequential Finger Touching (SFT)**

---

**Ocular Motor Control**

**Ocular Movements**

The subtest in this category is only found in the SOSI-M. No other test specifically targets the musculature and coordination of the eye independent of other muscle movements. Along with classic visual tracking, smooth pursuits, and fixations, ocular motor control also plays a large role in maintaining and aligning postural stability.

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## **Discussion & Conclusion**

After a cross-content analysis of the SOSI-M and the BOT-SF, the researchers found a high level of overlap in the skills required for the respective sub-tests. This finding reinforces the idea that, when theoretical backgrounds are momentarily stripped away, a skilled clinician's analysis and evaluation can identify and evaluate a wide range of sensory, motor, and cognitive skills in either assessment. Although both the BOT-2 and SOSI-M assess motor performance as an outcome measure, they are rooted in different theoretical frameworks: BOT-2 based on a biomechanical and developmental frame of reference and SOSI-M based on Ayer's Sensory integration theory.

The overlapping analytical categories include: Motor Coordination, Motor Sequencing, Rhythm; Motor Coordination, Motor Sequencing, Projected Actions; Changing/Modified BOS for Balance/ quality of equilibrium responses; Dynamic Movements Involving Bilateral Coordination/ midline; Manual dexterity; and endurance and strength

However, this research team did find key differences that separates and distinctly differentiates each assessment from the other. These three sections were: Visual motor coordination, Neurological soft signs and ocular motor movements.

### **Implication for OT Practice**

These distinctions are important to note as they must be taken into consideration when practitioners select the assessment that targets the specific evaluation needs for their client. Selecting an assessment that gives the best and most targeted insight into strengths and limitations of each client is essential to providing the highest quality of care possible. Lastly, given the limited amount of time that practitioners have to select/complete evaluations, it is helpful for practitioners to have a firm understanding of the key features each assessment.



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**Appendix A: IRB Proposal**

## Agency Agreement Email

Good afternoon,

My name is \_\_\_\_\_ and I am an occupational therapy student at Dominican University of California.

I am part of a graduate research group looking for schools to participate in our study targeting motor-skill functioning of school aged children. We were hoping to obtain permission to recruit participants through your afterschool program. If you should choose to allow us to have your school as a site in our study, please let me know if you would like to discuss this further with any questions or concerns you may have.

I have also cc'd my group's faculty advisor and research mentor, Dr. Julia Wilbarger, if you prefer contacting her. Her email is [julia.wilbarger@dominican.edu](mailto:julia.wilbarger@dominican.edu).

Thank you!

(Researcher's Name)

Promotion Flyer for Research Study

**KIDS**

**SENSORY RESEARCH**

**PURPOSE**

We are occupational therapy graduate students at Dominican University of California. We are working on a research project to develop a new assesment of sensory and motor skills and how these interact in your child's daily life.

This assessment will help therapists to identify and provide therapeutic intervention for children that may need extra support to develop important sensory processing skills. Children between the ages of 5-14 will participate in two fun assessments on sensory and motor tasks. This will happen during their afterschool program or at a convenient time in their daily schedule. Parents will complete two questionnaires based on their child's daily routines and sensory needs.

If interested, please complete the contact sheet attached and return it to your child's after school program. We will be conducting research from Mid-January-March 2020.

**Prizes to all kid participants!**

**Parents will be entered in a drawing for a special prize!**

For more information please email: [Sensoryresearch.dominicasn@gmail.com](mailto:Sensoryresearch.dominicasn@gmail.com)

Made with PosterMyWall.com

## **Information On Motor Skills Research Study**

### **For Administrators**

*The purpose of this study is to aid research in validating a new assessment called the SOSI-M that evaluates a child's motor performance and responses to sensory input.*

- Participants needed are school-aged children from ages 5 to 14 years old
- Sessions will be administered in a quiet area of the after school program facility during hours to be determined with after school teachers, the Dominican University Occupational Therapy Child Development Lab (Meadowlands 209), or a similar location of the parents' choice.
- Participants will be asked to take part in two one-hour sessions using the following assessments:
  - **Bruininks-Oseretsky Test of Motor Proficiency Second Edition (BOT™-2)** examines the child's motor functioning. Participants will be asked to perform tasks such as jumping jacks, skipping, standing on one foot, and balancing.
  - **Structured Observations of Sensory Integration- Motor (SOSI-M)** asks the child to complete general motor and balance skills such as standing on one foot and placing heel to toe, high kneeling, and jumping jacks.
- Parents of the children will be asked to fill out two self-report questionnaires: taking about 20 minutes each to complete. Upon completion, parents can return the questionnaires in a sealed, pre-stamped envelope to the researcher by mail.
  - **Participation Environment Measure-Children and Youth (PEM-CY):** asks about their child's patterns of daily activities in different contexts such as school and home.
  - **Sensory Processing Measure (SPM):** asks about the child's responses to sensations encountered during daily routines.
- All assessments will be administered in pairs by Occupational Therapy students who have been trained in both assessments and are reliable in testing procedures.
- IRB approved flyers will be requested to be posted around the school as well as information sheets and consent forms sent home with children
- The goals of the research study are to:
  1. Inform the reader about the concurrent validity of the new SOSI-M against the BOT™-2.
  2. Determine the relationship between sensory integration and occupational performance and participation using the SOSI-M and SPM compared to occupational performance scores from the PEM-CY.

*Thank you for your interest and feel free to contact us for any further questions or concerns*  
**sensoryresearch.dominican@gmail.com**

## LETTER OF PERMISSION TO AGENCY DIRECTORS

**DOMINICAN UNIVERSITY of CALIFORNIA**

October 20, 2019

Director Name(s): \_\_\_\_\_  
School Name: Dominican University of California

To whom it may concern:

This letter confirms that you have been provided with a brief description of our graduate thesis research project. This research project aims to 1) inform the reader about the concurrent validity of the new SOSI-M against the Bruininks-Oseretsky Test of Motor Proficiency Second Edition (BOT™-2) and, 2) determine the relationship between sensory integration and occupational performance and participation using the SOSI-M and the Sensory Processing Measure (SPM) compared to occupational performance scores from the Participation Environment Measure-Children and Youth (PEM-CY). This letter confirms your consent for us to recruit and assess participants at your facility. This project is an important part of our graduate requirements for the Occupational Therapy, M.S. program, and is being supervised by Dr. Julia Wilbarger, Associate Professor of Occupational Therapy at Dominican University of California.

We will ask that you help us to recruit families by distributing flyers and, if possible, sending out an email introducing the study and the team. The flyer and email will have our contact information. The flyer will also include a contact form that families can return. We would ask that you collect the contact form for us and secure it in a closable envelope and kept in a secure location.

We would like to be able to assess children at your location. The testing setting will be determined in collaboration with the after school teachers and staff. Each child will be assessed on two different days for 45 minutes. The children will be asked to perform tasks such as jumping jacks, skipping, standing on one foot, and balancing.

As we discussed, we will make every effort to ensure that our data collection does not interfere with the activities of the other children in the after school program, and that the children participating are treated with the utmost discretion and sensitivity. If you have questions about the research you may contact us at [sensoryresearch.dominican@gmail.com](mailto:sensoryresearch.dominican@gmail.com). If you have further concerns you may contact our research supervisor, Dr. Wilbarger, at 415-257-0125 or the Institutional Review Board for the Protection of Human Subjects at Dominican University of California by calling (415) 482-3547.

After our research project has been completed in December 2020, we will be glad to send you a summary of our research results.

If our request to include your program in our research study meets with your approval, please sign and date this letter below as soon as possible. Please feel free to contact us if you have any questions about this project.

Thank you very much for your time and cooperation.

Sincerely,

Alyssa Ramos Asuncion, Eleanor Brewer, Taylor Hanson, Jordan Hoss, Victoria Jess, Natalie Neach, Rebecca Velasco, Marielle Villanueva, Emily Yuen, & Julia Wilbarger, Faculty Advisor.

Occupational Therapy Dept.  
50 Acacia Ave.  
San Rafael, CA 94901  
sensoryresearch.dominican@gmail.com

**I agree with the above request**

---

**Signature**

---

**Date**



## Existing Agency Agreement

### LETTER OF PERMISSION TO AGENCY DIRECTORS DOMINICAN UNIVERSITY of CALIFORNIA

October 20, 2019

Director Name(s): [REDACTED]  
School Name: Dominican University of California

To whom it may concern:

This letter confirms that you have been provided with a brief description of our graduate thesis research project. This research project aims to 1) inform the reader about the concurrent validity of the new SOSI-M against the Bruininks-Oseretsky Test of Motor Proficiency Second Edition (BOT™-2) and, 2) determine the relationship between sensory integration and occupational performance and participation using the SOSI-M and the Sensory Processing Measure (SPM) compared to occupational performance scores from the Participation Environment Measure-Children and Youth (PEM-CY). This letter confirms your consent for us to recruit and assess participants at your facility. This project is an important part of our graduate requirements for the Occupational Therapy, M.S. program, and is being supervised by Dr. Julia Wilbarger, Associate Professor of Occupational Therapy at Dominican University of California.

We will ask that you help us to recruit families by distributing flyers and, if possible, sending out an email introducing the study and the team. The flyer and email will have our contact information. The flyer will also include a contact form that families can return. We would ask that you collect the contact form for us and secure it in a closable envelope and kept in a secure location.

We would like to be able to assess children at your location. The testing setting will be determined in collaboration with the after school teachers and staff. Each child will be assessed on two different days for 45 minutes. The children will be asked to perform tasks such as jumping jacks, skipping, standing on one foot, and balancing.

As we discussed, we will make every effort to ensure that our data collection does not interfere with the activities of the other children in the after school program, and that the children participating are treated with the utmost discretion and sensitivity. If you have questions about the research you may contact us at [sensoryresearch.dominican@gmail.com](mailto:sensoryresearch.dominican@gmail.com). If you have further concerns you may contact our research supervisor, Dr. Wilbarger, at 415-257-0125 or the Institutional Review Board for the Protection of Human Subjects at Dominican University of California by calling (415) 482-3547.

After our research project has been completed in December 2020, we will be glad to send you a summary of our research results.

## Parent Information Sheet

### Information On Motor Skills Research Study

Dominican University of California occupational therapy students are asking you and your child to participate in a study looking to assess overall sensory and motor skills & how those both interact in your child's daily life!

- If you choose to participate in this study, you will be asked to:
  - Complete two questionnaires asking about your child's daily participation in the home and how they process sensory information in their daily lives
  - Each questionnaire will take approximately 30 mins
- If you and your child consent to their participation in this study, they will be asked to:
  - Participate in two assessments completed on two different days
  - Each session will take no more than 1 hour
  - Both assessments can be completed during the after school program or during a time of your convenience
  - Each assessment will ask your child to do simple motor tasks that they do in their everyday play such as jumping jacks, standing on one foot, and skipping
  - Your child will be rewarded with a small prize after both assessments!

If you are interested in participating, please fill out the interest half sheet provided or contact

[sensoryresearch.dominican@gmail.com](mailto:sensoryresearch.dominican@gmail.com)

Thank You!

*Parent Information Email From School Administration Draft*

Dear parents,

We are working with occupational therapy students at Dominican University of California to help them complete a masters research project! They are looking for participation of parents and their children (ages 5-14) to assess the child's overall sensory and motor skills and how those both interact in their daily life.

If you choose to participate in this study, you will be asked to complete two questionnaires asking about your child's daily participation in the home and how they process sensory information. Each questionnaire will take no more than 30 minutes. If you and your child consent to their participation in this study, they will be asked to participate in two assessments completed on two different days. Each session will take no more than 1 hour. Both assessments can be completed during the after school program or during a time of your convenience. Each assessment will ask your child to do simple motor tasks that they do in their everyday play such as jumping jacks, standing on one foot, and skipping

Your child will be rewarded with a small prize after both assessments and you will have the opportunity to win a raffle! If you are interested in participating, please contact the students directly via email at [sensoryresearch.dominican@gmail.com](mailto:sensoryresearch.dominican@gmail.com).

Thank you for considering,

(Principal's Name)

## Parent Information Sheet

### *Interested To Know More?*

*\*All information provided will remain confidential and only be shared with facilitators of the study: not used for any other purpose, or shared with outside sources\**

Name of Child

---

Name of Parent

---

Email

Phone Number

---

Best Time to Contact

---

*We thank you, and value your time and interest.*

## **Research Participants Bill of Rights**

### **Dominican University of California**

**Every person who is asked to be in a research study has the following rights:**

1. To be told what the study is trying to find out;
2. To be told what will happen in the study and whether any of the procedures, drugs or devices are different from what would be used in standard practice;
3. To be told about important risks, side effects or discomforts of the things that will happen to her/him;
4. To be told if s/he can expect any benefit from participating and, if so, what the benefits might be;
5. To be told what other choices s/he has and how they may be better or worse than being in the study;
6. To be allowed to ask any questions concerning the study both before agreeing to be involved and during the course of the study;
7. To be told what sort of medical treatment is available if any complications arise;
8. To refuse to participate at all before or after the study is stated without any adverse effects. If such a decision is made, it will not affect h/her rights to receive the care or privileges expected if s/he were not in the study.
9. To receive a copy of the signed and dated consent form;
10. To be free of pressure when considering whether s/he wishes to be in the study.

**If you have questions about the research you may contact me at (insert student's Dominican e-mail address here). If you have further questions you may contact my research supervisor, (insert Faculty research supervisor's name and phone # here) or the Dominican University of California Institutional Review Board for the Protection of Human Participants (IRBPHP), which is concerned with protection of volunteers in research projects. You may reach the IRBPHP Office by calling (415) 482-3547 and leaving a voicemail message, or FAX at (415) 257-0165, or by writing to IRBPHP, Office of Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA 94901**

**Parental or Guardian Permission Form  
for Research Involving a Minor  
Dominican University of California**

**Title of research project:** The Validity and Utility of the SOSI-M

**Researchers:** Dr. Julia Wilbarger (faculty advisor), Alyssa Ramos Asuncion, Eleanor Brewer, Taylor Hanson, Jordan Hoss, Victoria Jess, Natalie Neach, Rebecca Velasco, Marielle Villanueva, and Emily Yuen.

**Your permission is being sought to have your child participate in this study. Please read the following information carefully before you give your permission.**

**Purpose of the research:** The purpose of this study is to examine the validity and utility a new assessment called the Structured Observations of Sensory Integration- Motor (SOSI-M) that evaluates motor performance and the response to sensory input. To do this, the results of the SOSI-M will be compared to the results of three other established occupational therapy assessments.

**Procedure to be followed:** Your child will be scheduled for two different testing sessions on two different days. During testing, Dominican Occupational therapy students will be administering the Bruininks-Oseretsky Test of Motor Proficiency Second Edition (BOT™-2) as well as the Structured Observations of Sensory Integration- Motor (SOSI-M). Bruininks-Oseretsky Test of Motor Proficiency Second Edition (BOT™-2) examines the child's general motor functioning. Participants will be asked to perform tasks such as jumping jacks, skipping, standing on one foot, and balancing. During the administration of the Structured Observations of Sensory Integration- Motor (SOSI-M) the child will be asked to complete tasks that test their general motor and balance skills such as standing on one foot and placing heel to toe, high kneeling, and jumping jacks. There will be a total of two, one hour sessions. Each assessment will be given at different times, with the second assessment being administered the following week.

Testing will take place in a quiet, separate, yet visible area of the after school program facility during the after school program hours. Each session will be approximately one hour during the after school program or at a time of your choice.

**Discomforts/risks:** The risks in this study are minimal (i.e., no greater than those ordinarily encountered in daily life or the performance of routine physical or psychological examinations or tests). One potential risk could be that the child may find some items challenging but they will be reassured by the administrator and/or reminded that they do not have to perform any items that make them uncomfortable or overly frustrated. All efforts will be taken to make your child feel comfortable.

**Incentives/benefits for participation:** There are no direct benefits to your child, but your child will receive a small prize for participating and will have the opportunity to participate in a study that could potentially help to further occupational therapy practice.

**Time duration of participation:** Participation in the study will be approximately 2 hours on two different days.

**Statement of confidentiality:** All records are kept confidential and will be available only to student researchers and staff. If the results of this study are published, the data will be presented in group form and individual children will not be identified.

**Voluntary participation:** Participation of parents and child is voluntary and they choose to not complete any task as they wish. At the time of the study, each child will once again be reminded of this by the researcher.

**Termination of participation:** If at any point during the study you or your child wishes to terminate the session, we will do so.

**Questions or concerns regarding participation in this research should be directed to:**

Research group email: [sensoryresearch.dominican@gmail.com](mailto:sensoryresearch.dominican@gmail.com) Or Dr. Wilbarger, phone:(415) 457-0125, email: [julia.wilbarger@dominican.edu](mailto:julia.wilbarger@dominican.edu)

**This research has been reviewed and approved by Dominican University of California's Institutional Review Board. If at any time before, during or after the experiment your child experiences any physical or emotional discomfort that is a result of his/her participation, or if you have any questions about the study or its outcomes, please feel free to contact us. You may reach the IRBPHS Office by calling (415) 482-3547 and leaving a voicemail message, or FAX at (415) 257-0165, or by writing to IRBPHS, Office of Associate Vice President for Academic Affairs, Dominican University of California, 50 Acacia Avenue, San Rafael, CA 94901**

I, the parent or guardian of \_\_\_\_\_, a minor \_\_\_\_\_ years of age, permit his/her participation in the research described above and being conducted by Dominican Occupational Therapy students and Dr. Julia Wilbarger.

\_\_\_\_\_  
Signature of Parent or Guardian

\_\_\_\_\_  
Date

\_\_\_\_\_  
**Please print your name here.**

### Child Assent

Title of the Study: The Validity and Utility of the SOSI-M

You are being asked to be in a research study to learn about a new test of motor skills. If you say yes, you will work on two different days. The activities will challenge your balance, coordination, and motor skills. You will be asked to do things like jump, skip, and stand on one foot. You will work for about an hour each day. You can take breaks if you need them. Some of the tasks might be hard, but just do the best you can.

Your parents have given their permission for you to be in this research study.

Being in this study will not help you, but may help us learn better ways to test motor skills in other children.

You can decide NOT to be in this study and you can choose to stop at any time.

You don't have to do any of the tasks that you don't want to do.

Only the researchers will know how you did on the tasks.

You will get a small prize for helping with this research.

\_\_\_\_\_ has talked to me and answered all of my questions.

I agree to be in this study.

Name \_\_\_\_\_ I am \_\_\_\_\_ years old.

Signature \_\_\_\_\_ Date \_\_\_\_\_

I have described this study and explained the risks and benefits in language that is understandable to the child. I believe the child understood and has assented to participate in the study.

\_\_\_\_\_  
Signature of Investigator or Person Obtaining Consent

\_\_\_\_\_  
Date



## Child Background Information Sheet

***Background Information***

*Disclaimer: Information provided on this paper will be kept confidential and only used for the purposes of this study.*

Name of Participant: \_\_\_\_\_

Name of Parent/Guardian: \_\_\_\_\_

Age: \_\_\_\_\_ Gender: \_\_\_\_\_

Contact Information:

Cell phone number: \_\_\_\_\_

Home phone number: \_\_\_\_\_

Email address: \_\_\_\_\_

Medical History

Does your child have any allergies? (ex. Food, Pollen, Bug Bites, etc.)

Is your child currently taking any prescription medication regularly?

Does your child have any current limitations that may hinder or prevent typical movement?  
(Braces, casts, strained muscles, etc.)

Does your child have any pre-existing conditions that we should be aware of?

To the best of your knowledge, has your child ever been assessed using the Bruininks-Oseretsky Test of Motor Proficiency Second Edition? (circle one) **Yes / No**

If yes, when were they evaluated?

\_\_\_\_\_

### Permission to Use the SOSI-M in Research

Academic Therapy Publications  
20 Leveroni Ct  
Novato, CA 94949

Dear Mrs. Frauwirth:

We are writing to request written permission to use the Structured Integration of Sensory Integration- Motor (Blanche, Reinoso, & Kiefer, 2020) in our graduate research to study the validity of the SOSI-M.. This research project is part of a group collaborative master's thesis through the department of occupational therapy at Dominican University of California.

I would also appreciate any updated administration, scoring manual, or normative data that you may have.

Our research is being supervised by our advisor, Dr. Julia Wilbarger, Occupational Therapy Department, Dominican University of California, San Rafael, CA, 94901. You can contact her at [Julia.Wilbarger@dominican.edu](mailto:Julia.Wilbarger@dominican.edu) or 415-257-0125.

If this request meets with your approval, please sign, date, scan and email this document back to me.

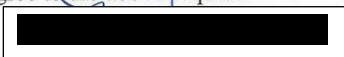
If you have any questions, please do not hesitate to contact me or, if you prefer, Dr. Wilbarger.

Thank you for your help.

Sincerely,

Alyssa Ramos Asuncion, Eleanor Brewer, Taylor Hanson, Jordan Hoss, Victoria Jess, Natalie Neach, Rebecca Velasco, Marielle Villanueva, & Emily Yuen  
Occupational Therapy Dept.  
50 Acacia Ave.  
San Rafael, CA 94901  
[sensoryresearch.dominican@gmail.com](mailto:sensoryresearch.dominican@gmail.com)

I agree to the above request.



(Addressee's name)

11/6/19  
Date

## IRB Approval



12/12/2019

Emily Yuen  
50 Acacia Ave.  
San Rafael, CA 94901

Dear Emily,

On behalf of the Dominican University of California Institutional Review Board for the Protection of Human Participants, I am pleased to approve your proposal entitled *The Validity and Utility of the SOSI-M* (IRBPHP IRB Application #10825).

In your final report or paper please indicate that your project was approved by the IRBPHP and indicate the identification number.

I wish you well in your very interesting research effort.

Sincerely,

A rectangular box with a black border and a solid black fill, used to redact the signature of the sender.

Randall Hall, Ph.D.  
Chair, IRBPHP

Cc: Julia Wilbarger, Ph.D.

## **Appendix B: Subtest Breakdown**

### Subtest Breakdown Chart

The SOSI-M subtests are denoted in orange. The BOT-SF subtests are denoted in blue.

	Subcategory	Item #	Vestibular perception & integration	Tactile perception & integration	Kines-thesia	ROM WFL in UE	ROM WFL in LE	ROM WFL in Hands	ROM WFL in Neck & C spine	ROM WFL in T & L spine	Bilateral Co-ordinaton	Postural Stability	Ocular motor control	Fine motor dexterity	Firm Surface	Soft Surface	Vision	
<b>S O S I - M</b>	<b>Romberg</b>	1	X		X		X					X			X		X	
		2	X		X		X					X			X		X	
		3	X	X	X		X						X				X	
		4	X	X	X		X						X				X	X
	<b>Heel to Toe</b>	5	X		X		X						X			X		X
		6	X		X		X						X			X		
		7	X	X	X		X						X				X	X
		8	X	X	X		X						X				X	
	<b>Standing on One Foot</b>	9	X		X		X						X			X		X
		10	X		X		X						X			X		X
		11	X		X		X						X			X		
		12	X		X		X						X			X		
	<b>Modified Schilders Arm Ext. Test</b>	13	X	X	X	X				X		X	X			X		X
		14	X	X	X	X				X		X	X			X		X
	<b>Skipping</b>	15	X		X		X			X	X	X			X		X	

<b>S O S I - M</b>	<b>Series of Jumps</b>	16	X		X	X	X	X	X		X	X			X		X
		17	X		X	X	X				X	X			X		X
		18	X		X	X	X				X	X			X		X
	<b>High Kneeling</b>	19	X	X	X	X	X	X		X	X	X	X	X	X		X
		20	X	X	X	X	X	X		X	X	X			X		X
	<b>Antigravity Extension</b>	21		X	X	X			X	X	X	X			X		X
	<b>Antigravity Flexion</b>	22		X	X	X			X	X	X	X			X		X
	<b>Ocular movements</b>	23			X				X		X	X	X		X		X
		24			X				X		X	X	X		X		X
		25			X				X		X	X	X		X		X
	<b>Slow Ramp Movements</b>	26	X		X	X					X	X			X		X
	<b>Sequential Finger Touching</b>	27		X	X	X		X			X	X		X	X		X
		28		X	X	X		X			X	X		X	X		X
	<b>Diado- chokinesis</b>	29		X	X	X		X			X	X			X		X
		30		X	X	X		X				X			X		
		31		X	X	X		X			X	X			X		
	<b>Projected Actions in Time and Space</b>	32	X	X	X	X	X	X			X	X	X		X		X
		33	X	X	X	X	X	X			X	X	X		X		X

		34	X	X	X	X	X	X			X	X	X		X		X	
<b>B O T - S F</b>	<b>Fine Motor Precision</b>	3		X	X	X		X				X	X	X			X	
		6		X	X	X		X				X	X	X	X		X	
	<b>Fine Motor Integration</b>	2		X	X	X		X				X	X	X				X
		7		X	X	X		X				X	X	X				X
	<b>Manual Dexterity</b>	2		X	X	X		X				X	X	X				X
	<b>Bilateral Co-ordination</b>	3	X		X		X			X	X	X				X		
		6		X	X	X	X	X	X		X	X	X	X	X	X		
	<b>Balance</b>	2	X		X		X					X	X					
		7	X		X		X					X	X					
	<b>Running Speed and Agility</b>	3	X		X		X					X	X					
	<b>Upper Limb Co-ordination</b>	1		X	X	X		X	X					X		X		
		6		X	X	X		X	X		X		X		X			
	<b>Strength</b>	2a/2b,		X	X	X	X	X					X					
		3		X	X	X	X	X					X					