**SENSORY INTEGRATION ASSESSMENT**

This section will include papers about specific assessment tools, methods of measurement of specific sensory functions, or papers about typical development of sensory related skills.

**2020**

**Delgado-Lobete, L., Pértega-Díaz, S., Santos-Del-Riego, S., & Montes-Montes, R. (2020). Sensory processing patterns in Developmental Coordination Disorder, Attention Deficit Hyperactivity Disorder and typical development. *Research in Developmental Disabilities, 100.* doi:10.1016/j.ridd.2020.103608.**

**Background:** Sensory processing difficulties (SPD) are present in children with Developmental Coordination Disorder (DCD) and Attention Deficit and Hyperactivity Disorder (ADHD). However, little is known about sensory processing variability in these disorders.

**Objective:** The purpose of this study was to explore SPD among children with DCD, ADHD and co-occurring symptoms in comparison to children with typical development (TD) and to determine how potential social confounders may influence these associations.

**Methods:** The study involved 452 children aged 6–12 years. The Short Sensory Profile-2 was used to assess sensory processing patterns. Multiple linear regressions were utilized to investigate the relationship between DCD, ADHD and co-occurring symptoms and sensory processing patterns, adjusting for social covariates.

**Results:** Children with DCD and ADHD symptoms showed greater variability of atypical sensory processing patterns compared with TD children. Low registration and sensory sensibility issues were more prevalent in the DCD group. ADHD children showed higher rates of low registration, sensory sensibility and sensory seeking, and all children in the co-occurring symptoms group presented sensory sensibility.

**Conclusion:** This study reports significant variability in sensory processing among children with DCD, ADHD and co-occurring symptoms using a population-based sample. These differences can contribute to understand how neurological and social factors correlates across diagnoses.

**2019**

**Mulligan, S., Schoen, S. A., Miller, L. J., Valdez, A., & Magalhaes,**

**D. (2019). The Sensory Processing 3-Dimensions Scale: Initial studies of reliability and item analyses. *The Open Journal of Occupational Therapy, 7*(1). doi:10.15453/2168-6408.1505.**

**Background:** The Sensory Processing 3-Dimensions Scale (SP-3D) is a performance-based measure for assessing sensory processing abilities and challenges, including sensory modulation, sensory discrimination, and sensory-based motor disorders. Initial studies of reliability were conducted, and item response theory was applied to assist in refining the measure.

**Methods:** Descriptive and correlational methods were used to examine internal consistency of the scales and inter-rater reliability. Item response theory using Rasch analyses was applied to examine unidimensionality of scales, model fit, and item difficulty.

**Results:** Internal consistency for most measures was acceptable, demonstrating the subtests, domains, and behavior scales as distinct constructs. Inter-rater reliability results were mixed, with fair to strong reliability coefficients for most sensory discrimination and postural and praxis subtests. Scales measuring sensory modulation and motor behaviors had moderate to poor interobserver agreement. Rasch analyses supported subtests as unidimensional and identified the most rigorous items in the subtests.

**Conclusions:** Preliminary results show promise of the SP-3D as a stable, reliable tool. A need for refinement of some operational definitions for behavior ratings was identified, and items to consider for elimination because of redundancy or ill-fit were exposed. Directions for research include refinement of the SP-3D and the need for further reliability and validity studies.

**Pfeiffer, B., Bevans, K., & Piller, A. (2019). Reliability and factor structure of the Participation and Sensory Environment Community Questionnaire (PSEQ-C). *American Journal of Occupational Therapy, 73*(4\_Supplement\_1). doi:10.5014/ajot.2019.73s1-po7012.**

**Background:** The Participation and Sensory Environment Questionnaire (P–SEQ): Community Scales is a parent report questionnaire designed to examine the impact of the sensory environment on participation within community activities for children with autism spectrum disorder (ASD).

**Methods:** This study used a cross sectional quantitative design to establish the reliability and discriminant validity of the P–SEQ: Community Scales.

**Results:** This study established the initial reliability of the questionnaire including internal consistency of 0.98 test-retest reliability of 0.76. The P–SEQ: Community Scales demonstrated significant differences in item distribution for children without ASD as compared to those with ASD, an essential aspect of construct validity.

**Conclusions:** The results of this study indicate that the questionnaire is a reliable tool that can be used to assess the impact of sensory environment’s impact on participation in community activities. Identified barriers can be modified to support participation in community tasks.

**2018**

**Mulligan, S., Schoen, S., Miller, L., Valdez, A., Wiggins, A., Hartford, B., & Rixon, A. (2018). Initial studies of validity of the Sensory Processing 3-Dimensions Scale. *Occupational Therapy In Pediatrics, 39*(1), 94-106. doi:10.1080/01942638.2018.1434717.**

**Aims:** This study examined the validity of a new measure of sensory processing for children, the Sensory Processing 3-Dimensions Scale (SP-3D). The SP-3D is a performance-based measure for children ages three to thirteen years, designed to assess sensory processing abilities, and identify the three patterns of sensory processing disorder (SPD) and related subtypes, including sensory modulation, sensory discrimination, and sensory-based motor disorders.

**Methods:** Age trends were explored using descriptive statistics and graphing techniques with a sample of children with and without SPD. SP-3D scores were correlated with scores from the Sensory Processing Measure (SPM) to examine criterion-related validity. Discriminant validity was assessed by comparing SP-3D scores from children with and without SPD.

**Results:** Age trends of SP-3D scores supported sensory discrimination, praxis and postural functions as developmental constructs. Several mild to moderate correlations were found between the scores of the SP-3D and the SPM, indicating that the tools are measuring similar constructs, and supporting the SP-3D as a measure of sensory processing. Modulation and Motor Behavior Scores from the SP-3D discriminated typically developing children from those with SPD, while results from subtests measuring sensory discrimination, postural and praxis were mixed regarding capacity for discrimination suggesting revision to several items.

**Conclusion:** The study provides preliminary evidence of the SP-3D as a valid measure of sensory processing abilities and dysfunction. Further research regarding the reliability and validity of the SP-3D are needed.

**Piller, A., Fletcher, T., Pfeiffer, B., Dunlap, K., & Pickens, N. (2018). Construct validity of the participation and sensory environment questionnaire–teacher version. *Assessment for Effective Intervention, 44*(3), 212-224. doi:10.1177/1534508418758363.**

The Participation and Sensory Environment Questionnaire–Teacher Version (PSEQ-TV) is a teacher report questionnaire designed to examine the impact of the sensory environment on participation for preschool children with autism spectrum disorder (ASD). This study examines the construct validity of the assessment through principal components analysis (PCA). One hundred three preschool teachers completed the research version of the PSEQ-TV. Component analysis revealed six factors: modification, support, preschool tasks, group routines, mealtime, and tactile. This study provides evidence as to the construct validity of the PSEQ-TV. The PSEQ-TV can be used to identify sensory-related environmental barriers within the preschool environment. By identifying these barriers, teachers and other support staff can modify the environment and/or provide support to increase participation of preschool children with ASD across school environments.

### **Mailloux, Z., Parham, L. D., Roley, S. S., Ruzzano, L., & Schaaf, R. C. (2017). Introduction to the Evaluation in Ayres Sensory Integration® (EASI). *American Journal of Occupational Therapy,72*(1). doi:10.5014/ajot.2018.028241**

### **Abstract**

Comprehensive, reliable, and valid assessment is essential for individually tailored, appropriate, and effective intervention planning and implementation. Research, education, and practice using an Ayres Sensory Integration® (ASI) approach have a long history of prioritizing comprehensive assessment. To meet the need for a set of tests that will fully evaluate the constructs of ASI with psychometrically strong, internationally appropriate, and easily accessible measurement tools, the development of the Evaluation in Ayres Sensory Integration®(EASI) has been initiated. This article introduces the EASI, describes the overarching plan for its development, and reports the results of promising preliminary analyses of discriminative validity data.

### **Dugas, C., Simard, M., Fombonne, E., & Couture, M. (2017). Comparison of two tools to assess sensory features in children with autism spectrum disorder. *American Journal of Occupational Therapy,72*(1). doi:10.5014/ajot.2018.024604**

**Abstract**

**Objective:** This article documents the convergent validity of the Sensory Profile (SP) and the Sensory Processing Measure (SPM)-Home Form for children with autism spectrum disorder (ASD).

#### **Methods:** Parents of 34 children with ASD between ages 5 and 8 yr filled out both measures. Through correlations, χ² tests, and levels of agreement between classifications, the results for the SP and the SPM-Home Form were compared.

#### **Results:** The raw scores were correlated for some sensory domains (hearing, vision, touch, and proprioception) and for social functioning. The classifications showed a significant level of agreement for most scales (κs = .247-.589, p ≤ .05) and for the total scores (κ = .324, p ≤ .01).

#### **Conclusion:**This study provides further evidence of convergent validity between both tools. The SPM-Home Form identifies more children with ASD who present with sensory features for every domain measured by both tools.

### **Mazella, A., Albaret, J., & Picard, D. (2017). The development of haptic processing skills from childhood to adulthood by means of two-dimensional materials. *Canadian Journal of Experimental Psychology/Revue Canadienne De Psychologie Expérimentale,72*(1), 48-57. doi:10.1037/cep0000121.supp**

### **Abstract**

Research into haptic perception has mostly focused on 3-dimensional objects, and more needs to be known about the processing of 2-dimensional materials (e.g., raised dots and lines and raised-line shapes, patterns and pictures). This study examines the age-related changes in various skills related to the haptic exploration of 2-dimensional raised-line and dot materials and how these skills are related to haptic picture perception. Ninety-one participants, aged 4 years to adult, were asked to perform a series of haptic tasks that entailed (a) finding dots and following lines; (b) matching elements based on texture, shape, and size; (c) matching elements based on spatial location and orientation; (d) memorising sequences of dots and shapes; and (e) identifying complete and incomplete raised-line pictures. On all the tests, the results showed that scores improved with age. Shape discrimination scores accounted for variability in comprehension scores for outline pictures. We suggested that identifying tactile pictures by touch improved with age and mainly depended on the improvement of shape discrimination skills.

### **Auld, M. L., & Johnston, L. M. (2016). A touchy topic: Tactile assessment among pediatric therapists. *Disability and Rehabilitation,40*(3), 267-276. doi:10.1080/09638288.2016.1250170**

#### **Abstract**

#### **Purpose:** Tactile impairments affect over 77% of children with unilateral cerebral palsy (CP). This study aimed to examine the current practices of pediatric therapists in relation to tactile assessment and the barriers to carrying out tactile assessment in children with CP.

#### **Methods:** The study was in two parts. In part one, pediatric therapists (n = 35) completed a questionnaire detailing their current knowledge and the use of tactile assessments in children. In part two, therapists (n = 12) completed a questionnaire based on the Theoretical Domains Framework examining the barriers and facilitators to completing tactile assessments in clinical practice.

#### **Results:** Most therapists (over 90%) carry out tactile assessments in the minority (less than 25%) of children with CP that they treat. Therapists reported the need for improved knowledge/skills (n = 24) and confidence (n = 19) in carrying out tactile assessments, alongside the provision of necessary equipment (n = 17). Qualitative reports also suggested that organizational assessment guidelines and templates may facilitate the implementation of tactile assessment.

#### **Conclusions:**A multi-faceted knowledge translation strategy to address the barriers to tactile assessment among pediatric therapists needs to be developed. Implications for rehabilitation Pediatric occupational therapists and physiotherapists may not be completing tactile assessments according to current evidence-based recommendations. Therapists identified five main barriers, including a lack of knowledge, skills, belief in their capabilities (confidence), behavioral regulation (organizational procedures), and environmental context (e.g., equipment). Therapists recommended several potential facilitators, including access to necessary equipment, procedures, record sheets, training in tactile assessments, and research supporting related interventions. Service providers are encouraged to develop multi-faceted knowledge translation strategies that address these barriers and maximize facilitators.

### **Ciolek, P. J., Kang, E., Honaker, J. A., Woodson, E. A., Hopkins, B. S., & Anne, S. (2018). Pediatric vestibular testing: Tolerability of test components in children. *International Journal of Pediatric Otorhinolaryngology,113*, 29-33. doi:10.1016/j.ijporl.2018.07.009**

**Abstract**

#### **Introduction:** Objective of the study is to define rates of successful completion of components of pediatric vestibular testing (VT).

#### **Methods:** Retrospective review of VT performed on patients less than 18 years of age from 2004 to 2015.

#### **Results:** 188 pediatric patients (mean age: 13.9 ± 3.56 years old, range 2-17 years) underwent testing. Thirty-five (18.6%) had abnormal test results. Pediatric patients unable to complete all aspects of VT could still complete an average of 7.9 ± 4.0 of 12 test components. The optokinetic tracking test was the most commonly omitted component of the vestibular tests. In a multivariate analysis, failure to perform Nylen-Barany positional testing (χ2 27.5, p < 0.0001) or Dix-Hallpike (5.66, p = 0.0174) testing was associated with inability to obtain final diagnosis on VT.

#### **Conclusions:**Interpretable VT may be obtained in most children, even in those that do not tolerate the full testing protocol. Spontaneous and gaze-evoked nystagmus testing may be considered as part of initial testing protocol before attempting less well-tolerated components such as bithermal calorics or components that require VNG goggles.

### **Chang, S., & Yu, N. (2018). Development and validation of the comprehensive praxis assessment for children aged 6–8. *Human Movement Science,57*, 332-341. doi:10.1016/j.humov.2017.09.011**

**Abstract**

This study examined the psychometric properties of motor praxis using a large school-based sample of children (n=239). We developed and evaluated the construct validity of a motor praxis assessment using confirmatory factor analysis (CFA). A model with four latent variables was evaluated for goodness of fit. CFA established that the scale was multifactorial and supported the four-factor model (motor imagery, verbal gesture production, imitative gesture production and knowledge of object-use). The internal consistency, inter-rater reliability and concurrent validity of the praxis assessment mostly demonstrated good to excellent results for the full scale and the subscales. The motor praxis demonstrated an ontogenic progression in 6-, 7- and 8-year-olds, suggesting a developmental trend during these ages, but with the exception of gestural representation on imitation. Implications for motor development and clinical evaluation are discussed herein in relation to the four instruments.