

Sensory Measurements for Individuals with Autism Spectrum Disorders

The Sensory Profile (SP); Dunn, 1999. The Sensory Profile is a 125 item, norm-referenced, parent-report questionnaire. The parent rates frequency of each item on a 5-point Likert scale from 1= always (100% of the time) to 5= never (0% of the time). The SP is divided into three main sections:

- The sensory processing section (further subdivided into 6 subsections that assess sensory processing in difference modalities e. g. auditory, touch processing, olfactory (smell))
- The modulation section (further subdivided into 5 subsections reflecting various combinations of input for use in daily life e. g. modulation related to body position movement, modulation of sensory input affecting emotional responses)
- The behavioural and emotional section (further subdivided into three subsections reflecting emotional and behavioural responses that might reflect individual's sensory processing abilities e. g. emotional/social responses).

Dunn (1997; 1999) also identified the following 10 factors based on principal component analysis of the Sensory Profile: Sensory Seeking, Emotionally Reactive, Low Endurance/Tone, Oral Sensitivity, Inattention/Distractibility, Poor Registration (or hypo-sensitivity), Sensory Sensitivity, Sedentary, Fine Motor/Perceptual, and Other.

Also, Dunn suggested a model which suggests that individuals could be classified based on their neurological threshold and behavioural responses to incoming stimuli. The neurological thresholds continuum ranges from high thresholds (when high intensity stimuli is necessary in order to see a response), to low thresholds (when low intensity stimuli provokes a response). The model further suggests that individuals can respond either in accordance with their neurological threshold, or act to counteract their threshold. Based on the interaction between neurological thresholds and behavioural responses, Dunn's model classified patterns of sensory processing into four quadrants:

- (1) *Sensation Seeking*, which represents high thresholds and an active self-regulation strategy. These individuals energetically engage in

actions that add more intense sensations to their bodies and because of these urges have a tendency to being inattentive and unfocused during learning tasks and social interactions (Dunn, 2007).

- (2) *Sensation Avoiding*, this includes low thresholds and an active self-regulation strategy. These individuals' behaviour is characterized by rigid and uncompromising rituality, difficulty in accommodation and transition. They often feel threatened by sensation and therefore tend to adopt avoidance behaviour (Dunn, 2007).
- (3) *Sensation Sensitivity*, which includes low thresholds and a passive self-regulation strategy. These children respond to sensation faster, with more intensity or for a longer duration than those with typical sensory responsiveness. Their behaviour may range from active, negative, impulsive or aggressive responses to passive withdrawal or avoidance of sensation (Dunn, 2007).
- (4) *Low Registration* (or hypo-sensitivity), which represents a high threshold and a passive self-regulation strategy. These individuals tend to disregard or not respond to sensory stimuli in their environment. They appear not to detect incoming sensory information, and show a lack of responsiveness. Because of this they seem to appear introverted, apathetic or lethargic with a lack of inner drive to initiate exploration (Dunn, 2007).

In addition to the Sensory Profile, Dunn and colleagues have also designed the following questionnaires: the Infant Toddler Sensory Profile (Dunn, 2002), the Adolescent/Adult Sensory Profile (AASENSORY PROFILE; Brown & Dunn, 2002) and the Short Sensory Profile (SSENSORY PROFILE; Dunn, 1999).

The Infant Toddler Sensory Profile (Dunn, 2002) is a caregiver completed questionnaire suitable for infants and toddlers ages birth to 3 years. It was designed to explore strengths as well as difficulties in sensory processing. The 'birth to 6 months' form consists of 36 items related to general auditory, visual, tactile, and vestibular processing. The 7- to 36-month form consists of 48 items with the same categories

described above plus oral sensory processing. Each item is rated by the primary caregiver on a 5-point scale for the frequency of the behaviour. The Infant Toddler Sensory Profile provides scores are produced for sensory system responses and quadrants (sensory seeking, low registration, sensory sensitivity and sensory avoiding). It is a norm referenced questionnaire and cut scores for the birth to 6-month form can indicate either “typical performance” (within one standard deviation of the mean) or consult and follow-up (scores more than one standard deviation from the mean). Scores for the 7- to 36-month form can fall into the same categories used by the full Sensory Profile (Dunn, 1999) i.e. e. typical performance probable difference, or definite difference depending on their distance from the mean.

The Adolescent/Adult Sensory Profile (AASENSORY PROFILE; Brown & Dunn, 2002) is a 60-item self-report questionnaire. Individuals rate each item on a 5-point Likert Scale (from 1= almost never to 5= almost always). AASENSORY PROFILE is based on the Sensory Profile and it provides the following 4 quadrant scores: poor sensory registration (or hypo-sensitivity), sensory seeking, sensory sensitivity and sensory avoidance that correspond to quadrant scores provided by Sensory Profile. Internal consistencies of the quadrants range between 0.64 and 0.78 (Cronbach's alpha). It is a norm referenced instrument that provides cut off scores. The manual provides scores from a large normative sample of individuals without disabilities. Based on those scores, individual's performance can be classified in 5 following categories (shows particular type of responses):

- Much Less Than Other People which correspond to scores at or above the point 2SD below the mean but also lower than 1SD below the mean for TD individuals;
- Less Than Other People which correspond to scores below the point 2 SD below the mean for TD individuals;
- Similar to Other People (Typical Performance) which correspond to scores that are at or above the point 1SD below the mean for TD individuals;

- More than Most People opposite to less than other people cut off score;
- Much More than Most people opposite to Much less than other people cut off score.
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The Short Sensory Profile (SSENSORY PROFILE, Dunn, 1999) is a 38 item caregiver questionnaire. SSENSORY PROFILE items have been extracted from the full Sensory Profile. The frequency of each of the items is rated using the following scale: always, often, sometimes, rarely, never. The SSENSORY PROFILE consists of 7 sections:

- (1) tactile sensitivity (7 items),
- (2) taste/smell sensitivity (4 items)
- (3) movement sensitivity (3 items)
- (4) under reSensory Profileonsive/seekes sensation (7 items),
- (5) auditory filtering (6 items),
- (6) low energy/weak (6 items),
- (7) visual/auditory sensitivity (5 items).

The SSENSORY PROFILE is a norm referenced questionnaire using the same classification system as the Sensory Profile and the Infant Toddler Sensory Profile.

The Sensory Processing Measure (SENSORY PROFILE; Glennon, Miller-Kuhaneck, Henry, Parham, & Ecker, 2007) is a norm-referenced assessment that has the following three forms: the Home Form, completed by the primary caregiver at home consisting of 75 items; the Main Classroom Form, completed by the child's primary teacher consisting of 62 items; and the School Environments Form containing 10 to 15 items for each of the six school environments (art class, music class, physical education class, recess/playground, cafeteria, and school bus). The Home and Main Classroom Forms provide the following eight different standard scores: Social Participation, Vision, Hearing, Touch, Body Awareness (Proprioception), Balance and Motion (Vestibular Function), Planning and Ideas

(Praxis), and Total Sensory Systems. Scores from each scale can fall into one of the following three categories: Typical, Some Problems, or Definite Dysfunction. An environmental difference score allows the examiner to compare a child's sensory processing abilities at home and at school. The Sensory Processing Measure-Preschool version (SENSORY PROFILEM-P) for children aged 2 to 5 years old who have not yet entered kindergarten also exists. It has two forms—the Home Form (Ecker & Parham, 2010) and the School Form (Miller Kuhaneck, Henry, & Glennon, 2010), each of the forms consisting of 75 items. Both the Home and the School SENSORY PROFILEM-P forms provide scores for the same eight scales as the original SENSORY PROFILEM (described above).

The Sensory Sensitivity Questionnaire-Revised (SSO-R; Talay-Ongan & Wood, 2000) is a caregiver questionnaire that consists of 54 items. Each item is rated as yes/no and items are grouped in the following 6 sensory domains (each of the domains contains 9 items): auditory, visual, tactile, gustatory, vestibular, and olfactory.

The Highly Sensitive Person scale (HSENSORY PROFILE; Aron & Aron, 1997) is a Likert-type scale that includes a broad range of items related a wide range of sensitivities, from sensitivity to environmental subtleties and substances (e.g., caffeine) to distractibility and over arousal. Response options range from (1) “Not at All” to (7) “Extremely”. In spite of the variety of types of sensitivity measured, Aron & Aron (1997) originally proposed that the concept of highly sensitive person is best understood as a uni-dimensional core variable of high sensory-processing sensitivity. However, in contrast to Aron and Aron's finding that the scale is uni-dimensional, three recent factor analyses (Smolewska et al., 2006; Evans & Rothbart, 2008; Liss et al., 2010) found a three-component structure consisting of Aesthetic Sensitivity (AES), Low Sensory Threshold (LST), and Ease of Excitation (EOE). It was hypothesized that LST and EOE represent negative aspects of sensory processing while AES represent positive aspects

The Glasgow Sensory Questionnaire (GSO; Robertson & Simmons, 2012) is a questionnaire whose items are based on (a) reports in the literature of sensory signs and symptoms commonly associated with ASD and (b) signs and symptoms reported by parents of children with autism. It consists of 42 items and investigates both hyper- and hypo-sensitivities in seven modalities: visual; auditory; gustatory; olfactory; tactile; vestibular and proprioceptive. Items were equally distributed among sensory modalities, with three questions assessing reported hyper-sensitivity and three determining hypo-sensitivity. The frequency of each of the item is rated on the 5 point Likert scale ranging from never to always.

The Sensory Experiences Questionnaire version 3 (SEQ Ver 3.0; Baranek, 2009) is a caregiver report instrument designed to evaluate sensory processing problems in both social and non-social contexts in young children with ASD or/and Developmental Disabilities aged 2 to 12 years old. The SEQ Ver 3.0 has 105 items that measure the frequency of sensory behaviours across the following four sensory response patterns: hyper-responsiveness, hypo-responsiveness, enhanced perception and sensory interests, repetitions and seeking behaviours; across five modality categories: auditory, visual, tactile, gustatory/olfactory, vestibular/proprioceptive; and across two contexts (i.e., social and non-social).