

ORIGINAL ARTICLE

Assessment of Sensory Processing Characteristics in Children Between 0 and 14 Years of Age: A Systematic Review

How to Cite This Article: Shahbazi M , Mirzakhani N . Assessment of Sensory Processing Characteristics in Children Between 0 and 14 Years of Age: A Systematic Review. Iran J Child Neurol. Winter 2021; 15(1): 29-46

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Received: 02 - May- 2018

Accepted: 18-Jun-2019

Abstract

Objective

sensory processing disorder (SPD) is a neurodevelopmental disorder that can negatively affect cognitive, emotional, and behavioral functioning. Therefore, assessing sensory processing is critical in children. This study aimed to provide a current comprehensive list of assessment instruments special about sensory processing in children aged between 0 and 14 years.

Materials & Methods

This systematic review focused on pediatric assessment of sensory processing. five electronic databases (Google Scholar, Web of Science, Scopus, PubMed, and ProQuest) were comprehensively searched for eligible studies, and language restriction (English) was applied. The search strategy consisted of keywords and medical subordinate headings for sensory processing and various pediatric assessment tools.

Results

Thirty-four assessment tools were identified, of which nine met the predefined inclusion criteria. The test of ideational praxis, clinical observations of proprioception, and pediatric clinical test of sensory interaction for balance were clinical observational assessment tools. The final tool was a caregiver or teacher reported questionnaire. The obtained studies evaluated the clinical use and psychometric properties of these nine assessment tools.

Conclusion

The result of this study indicated that each of the sensory processing assessment tools considered various aspects of sensory processing. Selecting the most appropriate assessment tools to measure sensory processing function in children depends on specific components of sensory processing that need to be evaluated.

Keywords: Sensation; Outcome Assessment; Child

DOI: 10.22037/ijcn.v15i1.21274

Introduction

“Sensory processing is defined as registration, modulation, integration, and organization of sensory inputs to execute successful adaptive responses to situational demands, and in this way, engage meaningfully in daily occupations (1)”. The defect in this process leads to sensory processing disorder (SPD). SPD expresses dysfunctions in the capacity to regulate and organize the degree, intensity, and nature of responses to sensory inputs in a graded and adaptive manner. These disorders have a long-term impact on a child’s life at home, at school, and in the community (2).

Based on clinical experience, the prevalence of SPD has been determined to be 5 to 10 percent for children without disabilities, but 40 to 88 percent for children with various disabilities. Nevertheless, the frequency estimate of SPD based on parent’s perception is 5.3 percent in preschool children (3). Dunn’s model of sensory processing presents behavioral responses to sensations. This model suggests four basic patterns of sensory processing emerging from the interplay of the neurological threshold and self-regulation. The neurological threshold is a personal range of thresholds for noticing and reacting to different sensory events in daily life. People with a low sensory threshold notice and react to stimuli more often because their neurological system activates more easily and responds more readily to sensory events. On the other hand, people with a high sensory threshold often miss stimuli that others notice easily because their neurological system needs stronger stimuli to be activated. Self-regulation is a continuum of a behavioral construct. One end shows those who produce a passive strategy toward sensory events, like remaining at a place with many sensory inputs that makes them feel uncomfortable and respond

with disappointment. The other end indicates people that use an active approach; for example, adjusting one’s position to influence a manageable amount of sensory inputs. Accordingly, four patterns can result from the intersection of the neurological threshold and self-regulation; they are (1) registration (represents high neurological thresholds with passive self-regulation), (2) seeking (represents high neurological thresholds as well, but seekers have an active self-regulation strategy and generate new ideas), (3) sensitivity (represents low neurological thresholds and a passive self-regulation strategy, and (4) avoiding (represents low neurological thresholds as well, with an active self-regulation strategy. People with acute responses to a sensory event are likely to have interfered daily life. This model provides assessment and intervention approaches for therapists to promote people’s participation in major domains. Dunn’s model refers to individuals at the extremes of the continuum as experiencing atypical sensory processing patterns, while other models refer to these people as undergoing SPD (4).

Functional impairments associated with SPD include decreased social skills, decreased collaboration in daily practice, lack of adaptive responses, impaired self-confidence or self-esteem, diminished fine and gross motor skill development; delay in learning and language, and decreased executive and self-regulatory function. These factors demonstrate why sensory processing is recognized as a domain of concern in the pediatric field (5,6,7).

Based on the results of various studies and significance of factors like negative effect of SPD on children’s functional abilities, evaluation of sensory processing is one of the essential parts of

assessment for children with SPD (7,8). This study aimed to provide a current comprehensive list of pediatric assessment tools particularly developed for sensory processing in children between 0 and 14 years of age. This systematic review summarizes the psychometric characteristics of the tools evaluating sensory processing. Based on the result of our review, professionals can use suitable and valid sensory processing assessment tools fundamental to identifying and optimizing sensory processing in SPD patients.

Review question

1. What tools are available for assessing sensory processing in SPD patients?

Materials & Methods

This study was designed as a review for running overall reported assessment tools for sensory processing in the past 29 years, from 1 January 1990 to January 31, 2019. The study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences with the code IR.SBMU.RETECH.REC.1396.1393.

Search strategy for identifying relevant studies

The third search method was used to identify eligible studies. Initially, we investigated five English databases (PubMed, Scopus, Web of Science, ProQuest, and Google Scholar). Then, we electronically searched a specialized journal (American Journal of Occupational Therapy, physical and occupational therapy in pediatrics and occupational therapy in healthcare). Finally, the reference lists of the collected articles were searched for relevant studies.

Bibliographic database searches

The search strategy included MeSH databases,

and text words included: (“child behavior” OR “sensation” OR “psychomotor performance” OR “sensory processing” OR “perception” OR “sensorial modulation” OR “sensation disorder”) AND (“psychometrics” OR “outcome assessment” OR “questionnaire” OR outcome and process assessment”) AND (“pediatrics” OR “child”). The PubMed search strategy shown in Table 1 was adapted for the other databases.

Table 1. The PubMed search strategy

Search	Search terms
1	“Child” OR “Pediatrics “
2	“Sensation” OR “Sensation disorder”
3	“Outcome assessment” OR “Outcome and process assessment”
4	# 1 AND # 2
5	Studies published in English

Study selection

A total of 38 articles were identified through the original search process. Based on title and abstract screening, four articles were excluded as they did not meet the inclusion criteria. Of the remaining 34 full-text articles, 25 were excluded because they met the exclusion criteria. The remaining nine articles were selected for review (Figure 1).

Fig 1. Selection of studies for review of sensory processing assessment tools available in the literature in children between 0 and 14 years of age

Inclusion criteria

Articles were reviewed if they met all the following inclusion criteria: (1) being used to assess sensory processing in children; (2) being published in English; (3) being commercially or electronically available (4) being among psychometric studies, and (5) having assessment items mostly related to sensory processing outcomes (visual processing,

auditory processing, vestibular processing, proprioceptive processing, smell processing, and tactile processing).

Exclusion criteria

Articles were excluded if they met any of the following exclusion criteria: (1) being predominately a child behavior measure; (2) being a communication or cognitive test; (3) being an informal test; (4) being published before 1990; (5) having subjects with the age greater than 14 years, and (6) having tools with the focus mainly on motor skills.

Bias avoidance

To avoid bias, extraction and quality evaluation of published articles were properly performed by two academic researchers. If the articles were rejected, the reason for their refusal was mentioned and any disagreement between the two authors was solved with discussion.

methodological quality assessment and data report
The methodological quality of the included articles was assessed using the *can child* outcome measure rating form.

Data extraction

After excluding articles, the full texts of the remaining articles were carefully studied. Afterward, related studies were selected and irrelevant ones were excluded. A modified version of the *can child* outcome measure rating

form was applied to assess the clinical use, reliability, validity, and responsiveness of each included assessment tool. Additional assessment characteristics were extracted and documented including targeted age range, scoring, type of test (criterion or norm-referenced), author(s), year of publication, publisher, description, responders, and number of items.

Results

In this study, 38 articles were selected and after reviewing their full texts, they were assessed for eligibility. Finally, 25 articles were excluded. Table 2 lists the 25 articles that were excluded based on the inclusion and exclusion criteria.

Only nine assessment tools met the predefined inclusion criteria: (1) the sensory rating scale (10); (2) the sensory processing measure (SPM) (11); (3) the test of ideational praxis (TIP) (12); (4) the sensory experience questionnaire (SEQ) (13); (5) the clinical observation of proprioception (COP) (14); (6) the sensory profile 2 (15); (7) the participation and sensory environment questionnaire (P-SEQ) (16); (8) the pediatric clinical test of sensory interaction for balance (P-CTSIB) (17); and (9) the sensory processing three dimension scale (18). Table 3 provides a summary of the characteristics of these tools.

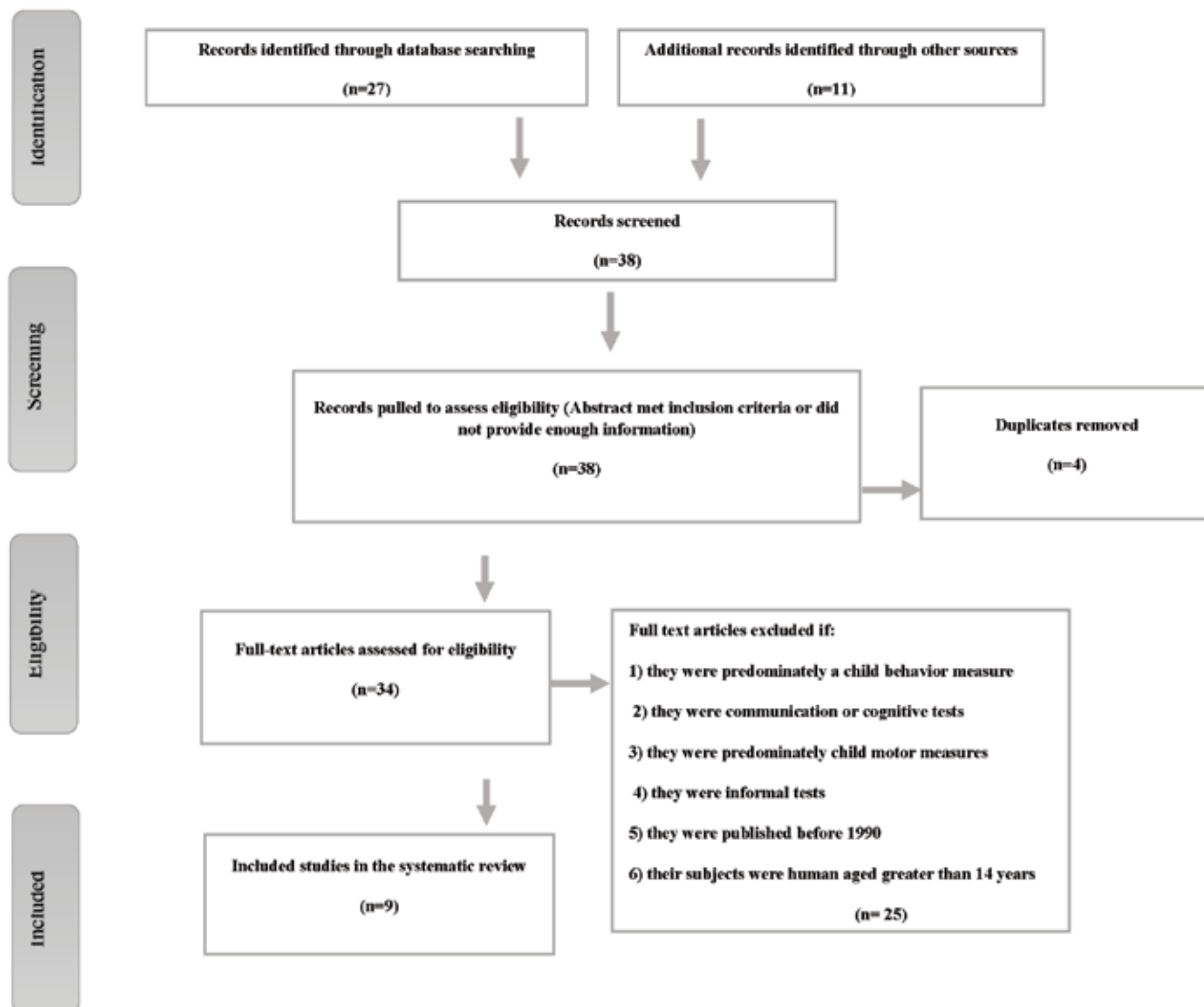


Fig 1. Selection of studies for review of sensory processing assessment tools available in the literature in children between 0 and 14 years of age

Table 2. Assessments excluded and their corresponding exclusion criteria

Assessment	Not age appropriate (< 14 years old)	Behavior temperament measure	Motor temperament measure	No published data after 1990	Not commercially or electronically available	Communication or cognitive measure	Informal measure
Behavior inventory for rating development (19)		✓					
Bruininks-Oseretsky Test of Motor Proficiency (20)			✓				
Child Behavior Checklist (21)		✓					
Children behavior questionnaire (22)		✓					
Computerized sensory organization testing (23)				✓			
Conner's parent rating scales-revised (24)		✓					
DeGangi-Berk Test of Sensory Integration (25)				✓			
DISCO diagnostic interview for social and communication disorders (26)						✓	
Evaluation of sensory processing questionnaire (27)					✓		
Evaluation of Ayres Sensory Integration (28)					✓		
Functional Assessment of Sensory Integration (FSI) (29)							✓
Goal-Oriented Assessment of Life skills (30)	✓						
Movement Assessment Battery for Children 2 (31)			✓				
Miller Assessment for Preschoolers (MAP) (32)				✓			
Neurobehavioral indicators of atypical development (33)		✓					

Table 2. (continuous)

Assessment	Not age appropriate (< 14 years old)	Behavior temperament measure	Motor temperament measure	No published data after 1990	Not commercially or electronically available	Communication or cognitive measure	Informal measure
Occupational therapy associates' sensory history checklist (34)							✓
Peabody Developmental Motor Scale (35)			✓				
Revised functional behavior assessment for children with sensory integrative dysfunction (36)					✓		
Sensory integration and praxis test (SIPT) (37)				✓			
Sensory Processing Scale Inventory (38)	✓						
Southern California post rotary nystagmus test (39)				✓			
Sensory Integration Inventory – Revised (SII-R) (40)							✓
Test of Sensory Function in Infants (41)				✓			
Touch Inventory for Preschooler (TIP) (42)				✓			
Touch Inventory for elementary school-aged children (TIE) (43)				✓			

Table 3. Characteristics of included assessments

Standardization	130 children with known developmental disabilities Reliability Interrater reliability for the total test score 0.91 (Interclass Correlation Coefficient [ICC]) Validity: Good	150 children in 2015; Ongoing development Reliability: Test–retest between 0.79 and 0.99 for all scales (Canonical correlation). Internal consistency 0.76–0.91 (CCA). Validity: Content Validity was established through 34 qualitative interviews and extensive review of the literature.	A tool with excellent interrater reliability ($r = 0.88$, range 0.60– 1.00) for children between 4 and 9 years of age. The sample data was 24 typical children. Validity of criteria: with proprioceptive disorders and SOT. CTSIB shows which children have more modulation disorders and more reduced postural control than typically developing children for all visual stimuli ($p < 0.05$), except for somatosensory input with vision. There are only data from studies conducted in the USA.
Scoring	Clinicians completing the scale were instructed to answer each item by operating a Likert scale ranging from 1 (typical performance) to 5 (most severe form of proprioceptive processing difficulties observed in children diagnosed as developmentally delayed). The scale excluded children with cerebral palsy or genetic disorders because it was undersigned for usage with those populations.	Caregiver responses are based on a 5-point scale: 1 (none), 2 (a little), 3 (some), 4 (a lot), and 5 (too much to participate) Interpretation of scores Rank up to three strategies that help your child participate in community or home activities (1th most helpful, 2nd most helpful, 3rd most helpful)	A child must complete six tests, three on a stable surface and three on an unstable one. Some of the tests are performed with eyes closed and others with eyes open. In all conditions, the objective is to maintain balance for at least 30 seconds.
Domain	Behavior Sensory-motor Muscle tone Hyper mobility	Participation is your child's involvement in an activity. Sensory features refer to a type of sensory stimulus present in the environment or when participating in an activity. This could include: tactile, auditory, vestibular, and proprioception activities. Your child's responses to the sensory features of the environment may include sensory seeking, typical responses, and hyper responses.	Vestibular, visual, and proprioceptive systems
Completed by	Clinicians	Caregiver	Examiner

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Type of test	Criterion referenced	Not reported	Not reported
Number of items	55 number of items	P-SEQ home environment consists of 15 questions P-SEQ community environment consists of 19 questions	P-CTSIB consists of six tests
Administration	15 minutes	20 minutes	Administration time is approximately 20 minutes
Age range	2–8.11 years	3–5 years old with and without AS	Over 6 years of age
Time of publication	2012	2016	1991
Publisher	Online access	Online access	Electronically available in the Journal of Physical and Occupational Therapy in Pediatrics that provides administration instructions
Description	Assesses two main areas of proprioceptive function: behavior and sensory motor abilities	Caregiver rating scales that assess the effect of the sensory environment on participation in daily activities in home and community environments	This test reflects a child's ability in combining and using different information to cope with different positions in static balance.
Author/authors	Erna Imperator Blanche et al.	Pfeiffer et al.	Crowe TK et al.
Assessment	COP	P-SEQ	P-CTSIB

Table 3. (continuous)

Standardization	1791 children (774 children with disabilities) Reliability: Test–retest between 0.87–0.97 (ICC) Internal consistency: 0.60–0.90 (CCA) Validity: Good	84 children in 2005 Reliability Interrater reliability for the total test score 0.85 (ICC) with 5- to 8-year olds and higher with 2- to 5-year olds Validity: Good	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 SP-3D is needed.
Scoring	Each item is rated in terms of the frequency of the behavior on a 5-point Likert type scale. Response options are almost always, frequently, half the time, occasionally, and almost never. Interpretation of scores The standard score for each scale enables classification of child functioning into one of five interpretive ranges: Much less than others, less than others, same as others, more than others, and much more than others.	The total number of actions (sum of scores from each of the six items) a child performed. It demonstrated that recognition of object affordances was found to have the greatest discriminative ability and thus was identified as the preferred scoring method. This method emphasized the total number of ways, in which the child interacted with objects.	Not reported

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Domain	Sensory system scores – general, auditory, visual, touch, movement, body position, oral behavioral scores – behavioral, conduct, social emotional, attentional 3. Sensory pattern scores – seeking/seeker, avoiding/avoider, sensitivity/sensor, registration/bystander 4. School factor scores (school companion only) – supports, awareness, tolerance, availability	Ideational praxis	Visual, Tactile, Auditory, Vestibular, Proprioception, Postural, Praxis, and Complex Task Domains
Completed by	Caregiver and/or teacher	A child's responses are videotaped and scored later by clinicians	completed by caregiver or Self
Type of test	Not reported	Not reported	performance-based measure
Number of items	The Infant Sensory Profile 2: consisting of 25 questions Toddler Sensory Profile 2: consisting of 54 questions The Child Sensory Profile 2: consisting of 88 questions The Short Sensory Profile 2: consisting of 34 questions The School Companion Sensory Profile 2: consisting of 44 questions	Four items (a hoop, string, a tube, and a box) are presented individually, and two items (a string and tube; a box and rope) are presented in combination	Sensory Processing 3 Dimensions has 6 subscales (Sensory Over-Responsivity, Sensory Under Responsivity, Sensory Craving, Sensory Discrimination Disorder, Postural Disorder, Dyspraxia) 30-50 items on each subscale.
Administration	Paper Administration – The Infant Sensory Profile 2: 5 to 10 minutes – The Toddler Sensory Profile 2: 10 to 15 minutes – The Child Sensory Profile 2: 15 to 20 minutes – The Short Sensory Profile 2: 5 to 10 minutes – The School Companion (the sensory profile 2): 15 minutes Scoring – Manual Scoring: Approx. 15 minutes	A child is presented with a series of six objects and asked to show the examiner all things they can think of doing with each object within a 5-min time limit for each item.	Not reported
Age range	The Infant Sensory Profile 2: Birth-6 months The Toddler Sensory Profile 2: 7-35 months The Child Sensory Profile 2: 3-14 years The Short Sensory Profile 2: 3-14 years The School Companion Sensory Profile 2: 3-14 years	3–8 years	3-13

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Time of publication	2014	2007	2018
Publisher	Pearson	Online access after training	Not reported
Description	Standardized parent or teacher rating forms that assess sensory processing patterns	Assesses a child's ideational skills based on ability to demonstrate recognition of object affordances	SP-3D designed to assess sensory processing abilities and identify three patterns of sensory processing disorder (SPD) and related subtypes, including sensory modulation, sensory discrimination, and sensory-based motor disorders
Author/authors	Winnie Dunn	May-Benson & Cermak	Shelley Mulligan, Sarah Schoen, Lucy Miller, Andrea Valdez, Aryanna Wiggins, Brianna Hartford & Amy Rixon
Assessment	The Sensory profile 2	TIP	Sensory processing three dimensions' scale

Table 3. (continuous)

Standardization	Two hundred and eighty-eight typically developing twenty-seven developmentally delayed infants with difficult temperament Internal consistency (Cronbach's alpha): Form A: total, 0.83 Form B: total, 0.90 Interrater: Total Sensory Rating Scale score: $r=0.43$ Validity: Not reported	1,051 children in the early 2000s Reliability Internal consistency > 0.75 for all scales (Cronbach's Coefficient Alpha [CCA]). Test-retest reliability > 0.94 . Validity: Good ability to differentiate between clinical and typical samples	358 children With autism, developmental and typically developing Internal consistency for SEQ was $\alpha = 0.80$. Test-retest reliability for the total score was excellent, with ICC = 0.92 Validity: Good
Scoring	Five-point rating scale Six sections: Touch; movement and gravity; hearing; vision; taste and smell; temperament and general sensitivity Sections are scored separately based on frequency of scores four and five. The total sensory rating scale score is the sum of scores obtained from all sections. Interpretation of scores Scores four and five are considered as high-risk scores for sensory defensive behaviors.	Each item is rated in terms of frequency of behavior based on a 4-point Likert scale. Response options are never, occasionally, frequently, and always Interpretation of scores The standard score for each scale enables classification of child functioning into one of five interpretive ranges: Typical, some problems, or definite dysfunction	Caregiver responses are based on a 5-point Likert scale, ranging from 1 (almost never) to 5 (almost always) Interpretation of scores SEQ measures hyper- and hypo-responsive patterns across social and nonsocial contexts; it yields four-dimensional subscale scores as well as a total score.

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Domain	Sensory modalities Touch Movement and gravity Hearing Vision Taste and smell Temperament General sensitivity	Social participation (SOC), vision (VIS), hearing (HEA), Touch (TOU), body awareness (BOD), balance and motion (BAL), planning and ideas (PLA), and total sensory systems (TOT)	Sensory domains (Tactile, Auditory, Visual, Vestibular–Proprioceptive, and Gustatory–Olfactory)
Completed by	Completed by at least one of a child's parents on the day of testing or within one week of testing	The SPM home form is completed by a child's parent or home-based care provider The SPM main classroom is completed by a child's primary classroom teacher	Caregiver
Type of test	Criterion referenced	Norm referenced	Not reported
Number of items	Not reported	The SPM home form consists of 75 items. The SPM main classroom form consists of 62 items.	21 number of items
Administration	0–3 years Two versions: form A, 0 to 8 months; form B, 9 months to 3 years	15–20 minutes Scoring-Manual scoring: 5 to 10 minutes	15–20 minutes
Age range	0–3 years Two versions: form A, 0 to 8 months form B, 9 months to 3 years	5–12 years	2–12 years with ASD, developmental disabilities, or typically developing
Time of publication	1993	2007	2011
Publisher	Electronically available in the Journal of Physical and Occupational Therapy in Pediatrics that provides administration instructions	Western Psychological Services	Currently used in research settings. Not available yet for clinical use.
Description	The sensory rating scale is a parent report measure used to identify and quantify sensory responsiveness	A system of parent and teacher rating scales that assesses sensory processing, praxis, and social participation.	A caregiver report instrument designed to characterize sensory features in children with autism spectrum disorder (ASD) and/or developmental disabilities in social and non-social contexts
Author/authors	Provost B, Oetter P	Parham & Ecker	Little et al.
Assessment	Sensory rating scale	SPM	SEQ

Discussion

To the best of our knowledge, this is the first systematic review of valuable tools evaluating sensory processing in children within 0 and 14 years of age. This investigation may be of use to professionals to apply a suitable and valid sensory processing assessment tool for identifying and optimizing sensory processing in SPD patients.

The result of our research differs from those obtained in a systematic review administered by Eeles et al. These authors conducted a review to identify instruments available for measuring sensory processing in children aged 0 to 2 years (44). However, we carried out this systematic review to investigate sensory processing assessment tools designed for the 0-14 age group. In addition, our review differs from a study conducted by Jorquera-Cabrera et al. in terms of age range, search strategy, and inclusion criteria (45).

This study aimed to provide a comprehensive list of pediatric assessment tools particularly designed for sensory processing in children between 0 and 14 years of age. In this systematic review, nine sensory processing assessment tools in children aged between 0 and 14 years were identified from 1990 to 2019. P-CTSIB was the oldest tool, and the most recent tool was the sensory processing three dimensions' scale, which were developed in 1993 and 2018, respectively. The maximum number of items was 243 in the sensory profile 2, and the minimum number of test items was 6 in TIP and P-CTSIB. According to these tests, the minimum and maximum age for performing the sensory profile 2 is 0 and 14 years, respectively. The sensory rating scale, SPM, SEQ; the sensory profile 2; P-SEQ and sensory processing 3 dimensions' scale are the caregiver or teacher reported questionnaires. TIP, COP, and P-CTSIB

are clinical observational assessment tools. The minimum testing time was 5 to 10 minutes for the infant sensory profile 2 and the maximum testing time was 20 minutes for P-SEQ.

There are many tools for evaluating sensory processing in the first 14 years of life; nevertheless, we recommend professionals, particularly occupational therapists, to use the sensory profile 2. Reasons for using this tool are as follows:

- It has a broad age range (birth to 14:11).
- It has various administration options (paper and pencil or online through Q-global™).
- It includes a set of separate questionnaires related to age and various contexts (the infant, toddler, child, short, and school sensory profile 2).
- It considers broad domains (sensory system, behavioral pattern, sensory pattern, and school factors).
- Among the tools reviewed in this study, the highest sample size (1791 typical and atypical children) was used in the psychometric study of the test.
- It identifies behaviors that children exhibit as sensory processing patterns. It is based on a conceptual structure that proposes an interaction between neurological thresholds and self-regulatory behavioral responses, initially described by Dunn (1997).
- It provides a way to capture a child's responses to sensory evidence during the course of routine life because each item describes an experience. Knowing how a child reacts in various contexts (home, school, and community) provides a way to comprehend what influences a child's behavior throughout a day. All professionals must keep a primary focus on a child's functional performance in ordinary life. To this end, the

sensory profile 2 is a viable option because few evaluation tools measure performance in ordinary life in a specific context.

- Teachers and care providers reported therapeutic benefits after completing the sensory profile 2. Items in each rater questionnaire address activities and behaviors of infants, toddlers, and children common in most classroom settings. Responding to items about familiar behaviors provides validation that caregivers' or teachers' observations are relevant and offers opportunities to further discuss challenging situations.
- It is constructed so that families and professionals can engage in theory-based decision making during comprehensive assessment and intervention planning. Principles of neuroscience, sensory processing, strength-based approaches, and ecological models are embedded in its items and scoring system.
- It provides a standardized means to capture a child's behaviors during the course of ordinary life, which is a challenging task to accomplish using other formal assessments conducted in unfamiliar settings. Prior work has illustrated that caregivers and teachers provide contextually relevant information about their own experiences to children, expanding our understanding of the impact of sensory processing on the demands of ordinary life.
- It provides a way to have a comprehensive look at a child's responses across settings. Teachers and caregivers provide unique perspectives of a child's performance because they interact with children in places and activities with various demands and supports. This facilitates discussion and collaboration among families and professionals to discover strategies that support

a child's participation in all contexts including home, school, and the community. Every so often a procedure works at home that can be used at school and vice versa; gathering all information together facilitates the discovery of effective strategies already in place.

- It presents a measure of current performance, overall impression over time, and an indication of intervention options. Test results provide information about a child's level of responsivity to sensory events (e.g., hyper or hypo responsive). Since the sensory profile 2 is organized into sensory sections, test results also suggest which sensory systems might be supporting or interfering with a child's performance in various settings and activities. Information gained from the sensory profile 2 provides a status measurement of current performance levels, and its scoring system provides guideposts for developing interventions (46).

In conclusion, rehabilitation of children in the present century addresses empowerment of clients for independent engagement in daily living activities. To achieve this goal and due to the effect of sensory processing on functional skills (cognitive, emotional, and behavioral functioning) as well as effective participation in the context of a child's home, school and community professionals need to be knowledgeable about sensory processing and evaluation. One advantage of these collective research efforts is to place appropriate assessment tools in the hands of professionals for sound clinical applications. A comprehensive evaluation of the occupational effect of sensory processing deficits on performance needs standardization of assessment tools with established psychometric properties. Interpretation of a comprehensive evaluation is essential in guiding professionals'

treatment plans and subsequent interventions.

Strengths and limitations of the review

In Conclusion

The strength of this review was that it presented a thorough and systematic search of relevant articles. To make this review more systematic and objective, the authors used standardized assessment structures to assess each study and examined the psychometric characteristic of the structures. As the limitation of the review, the authors did not include other suitable tools that are likely to be subjected to rigorous but unreported testing and thus have remained unpublished.

Acknowledgement

This research project was derived from an MSc thesis submitted to the Shahid Beheshti University of Medical Sciences. The authors would like to appreciate the staff members at the School of Rehabilitation, the Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Author's Contribution

Marjan Shahbazi: contributed to conception, design, data extraction, analysis and drafted this article, wrote the manuscript, and approved the final manuscript as submitted.

Navid Mirzakhani: contributed to conception, helped in literature review, and selected of study.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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