

Linking Sensory Factors to Participation: Establishing Intervention Goals With Parents for Children With Autism Spectrum Disorder

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MeSH TERMS

- activities of daily living
- autistic disorder
- goals
- occupational therapy
- sensation
- social participation

Parents often focus on independence in activities of daily living and social participation when setting goals for their children with autism spectrum disorders. Occupational therapy practitioners use clinical reasoning to translate these goals to define occupation-based outcomes. This article describes an exploratory analysis of 160 parent-identified goals for children with autism. We identified sensory integrative factors hypothesized to influence each goal and then categorized the goals using the *Occupational Therapy Practice Framework: Domain and Process* and the *International Classification of Functioning, Disability and Health (ICF)*. Most goals were at the *ICF* participation and activity levels. Activities of daily living were the most common area of occupation identified, followed by social participation and play. Sensory reactivity and somatopraxis were the most frequently occurring sensory integrative factors. The value of addressing parent goals using a systematic reasoning process to identify factors affecting participation and the importance of measuring participation outcomes are discussed.

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Occupational therapy for children with autism spectrum disorder (ASD) ideally focuses on the goals that parents hold for their children. This approach to family-centered care underscores dignity and respect for families. Family-centered care takes place in a milieu in which families and occupational therapy practitioners are equally involved in information exchange, empowering families to make informed decisions and thereby enabling practitioners to be responsive to families' priorities and choices (American Academy of Pediatrics, 2012). When family-centered care approaches are used, practitioners listen to parents' concerns and integrate their professional knowledge with observations of children's performance to collaboratively negotiate goals with parents (Cohn, Kramer, Schub, & May-Benson, 2014).

Parents of children with ASD identify occupational therapy as one of the most frequently requested and used services for their children (Mandell, Novak, & Levy, 2005) and occupational therapy using sensory integration as one of the most preferred choices (Goin-Kochel, Myers, & Mackintosh, 2007). An estimated 45% to 90% of children with ASD demonstrate sensory-related difficulties (Ben-Sasson et al., 2008), and these difficulties are a key factor influencing participation in daily activities (Bagby, Dickie, & Baranek, 2012; Hilton, Graver, & LaVesser, 2007; Koenig & Rudney, 2010; Schaaf, Toth-Cohen, Johnson, Outten, & Benevides, 2011). Consequently, parents often request that occupational therapy intervention address sensory-related factors that have an impact on their child's participation in daily activities. When this is

the case, it becomes increasingly important for practitioners to use family-centered care practices to negotiate goals and to communicate with families their reasoning regarding the ways in which difficulties in sensory integration may be affecting the everyday function of children in the context of home, school, and community (Cohn & Cermak, 1998; Parham & Mailloux, 2015).

To determine whether occupational therapy using sensory integration is relevant for a given child, occupational therapists must conduct a thorough assessment with the child and family to identify whether and how sensory integrative factors are connected to and influencing the child's occupational performance in relation to the goals identified by the parents. Consideration of and communication with parents about ways in which sensory integration difficulties may be affecting occupational performance are important in developing a family-centered intervention plan and in identifying and measuring outcomes that are important to parents.

Data-Driven Decision Making (DDDM) provides a structure to guide occupational therapy practitioners through this process (Schaaf, 2015) and assists them in linking identified parent priorities to the underlying factors that may be affecting occupational performance in a way that is guided by an appropriate theoretical perspective. The identified linkages then guide the design and selection of intervention strategies that target the priority areas. DDDM begins with identification of the family's goals, identification of the child's strengths and participation challenges, and systematic assessment to identify the hypothesized factors affecting participation. The occupational therapist formulates targeted goals and hypotheses that link factors identified in the assessment process to parent-identified goal areas.

In the DDDM approach, posttreatment outcomes are measured at both the proximal (underlying factors) and distal (participation) levels. This systematic process enables therapists to focus on the goals important to parents, identify the factors influencing the child's participation, and measure outcomes that are important to families at two levels. The process thus creates "evidence through practice" (Schaaf, 2015, p. 5) and uses science-driven and evidence-based practices as described in the *Centennial Vision* of the American Occupational Therapy Association (AOTA; 2007).

Purpose and Objectives

We conducted an exploratory analysis of occupational therapy intervention goals for children with ASD that were codeveloped with parents to better understand the

relationship between sensory factors and occupation. We used the *Occupational Therapy Practice Framework: Domain and Process* (3rd ed.; hereafter referred to as "the Framework"; AOTA, 2014) to identify the areas of occupation and the *International Classification of Functioning, Disability and Health (ICF)* (World Health Organization [WHO], 2001) to identify the level of human function represented in the goals negotiated with parents. Given that the focus of the original study was on the sensory factors affecting participation, we examined the goals further to identify hypothesized links between the sensory factors and the child's occupational performance or participation. The evaluating occupational therapists used the DDDM process to identify parent goals, the potential sensory-motor factors affecting goals, and participation-based outcomes. The theoretical perspective used was Ayres Sensory Integration[®], and thus sensory-motor factors (identified with assessment data) were linked to parent priorities.

Method

In this study, we analyzed 160 goals developed in a prior study with the parents of 32 children with ASD ages 4–8 yr (5 goals per child). The original study was a randomized controlled trial testing the outcomes of occupational therapy using sensory integration (see Schaaf, Benevides, et al., 2014, for a description). Inclusion criteria were a diagnosis of ASD confirmed with the Autism Diagnostic Observation Scale–Generic (ADOS–G; Lord, Rutter, & DiLavore, 1999) and the Autism Diagnostic Interview–Revised (Rutter, Le Couteur, & Lord, 2003), a nonverbal IQ score of 65 or greater, and evidence of difficulty in sensory integration as measured by the Sensory Profile (SP; Dunn, 1999) or the Sensory Integration and Praxis Tests (SIPT; Ayres, 1989) or both.

Guided by DDDM, the occupational therapists performing the assessment for the original study (the evaluators) reviewed the assessment data from the SIPT and SP to identify the sensory integrative factors each child demonstrated. The factor identification was based on the literature that identifies common patterns of sensory integrative challenges (Ayres, 1977, 1989; Ben-Sasson et al., 2008; Mailloux et al., 2011; Mulligan, 1998; Reynolds, Lane, & Thacker, 2012; Reynolds, Millette, & Devine, 2012). The evaluators identified the following sensory factors: difficulties in sensory perception, vestibular bilateral integration, sensory reactivity, and somatopraxis (i.e., processing of tactile perception and motor planning). Two experts in sensory integration (authors Schaaf and Mailloux), reviewed the factors to identify any

discrepancies, which the evaluators then discussed and resolved.

Next, the evaluators asked parents to identify 5 specific goals for each child. The evaluators used a semi-structured interview process to facilitate the identification of both strength and challenge areas for the child (see Figure 1 for interview questions). The evaluators collaborated with the parents to identify goals related to the child's and family's everyday life. The evaluators formed a goal statement for each goal identified and asked parents to review the goals, confirm that the goals reflected their concerns, and rate the importance and relevance of each goal. This step validated that the goals captured the parent-identified hopes for intervention outcomes.

The evaluators then used the DDDM process described by Schaaf and Mailloux (2015) to generate hypotheses about the sensory integrative factors influencing performance in each goal area and reviewed them with the experts for validation. Each hypothesis was a summary statement that linked assessment findings to participation challenges. To generate hypotheses, the evaluators identified the participation-related goal, examined the assessment data, and identified the factors hypothesized to be affecting the participation challenges.

For the current study, which focused on analyses of the goals and their sensory factors, two occupational therapy research assistants (authors Dumont and Miller) independently coded the goals by *ICF* level (body functions and structures, activity, or participation) and *Framework* area of occupation (e.g., activities of daily living [ADLs], play, education, social participation, rest and sleep). For example, a social participation code was used when the goal described interacting with peers during activities or participating in mealtime with family.

Interrater reliability among the research assistant coders was high ($r = .96$). Sample goals and codes are shown in Table 1. Frequency analysis was used to count the areas of occupation and the hypothesized sensory integrative factors that influenced each area of occupation. The coders created pictorial representations depicting the patterns of variation in the sensory integrative factors influencing each area of occupation in the *Framework*. The research team reviewed these pictorial representations for conceptual congruence.

- Tell me about your child.
- What are some of the things that your child does well?
- What are some of the areas that you have concerns about at this time?
- What are some of the main hopes and goals you have for your child? If you look ahead to the next 3–4 months, what would you like to see your child able to do?
- Let's identify 5 areas (or goals) that this treatment will address.

Figure 1. Semistructured parent interview questions.

For a visual representation of the flow of the current study, see Figure 2.

Results

The mean age of participants was 71.8 mo ($n = 32$; standard deviation = 12.8). Eighty-one percent of the sample were boys ($n = 26$); 91% were White ($n = 29$), 6% were Asian ($n = 2$), and 3% ($n = 1$) did not report ethnicity. The mean severity score on the ADOS–G was 8, with a range of 5–11.

The functional goals generated by parents could be categorized at multiple levels of function using the *ICF* and in multiple areas of occupation using the *Framework*. Forty-seven percent ($n = 75$) were classified at the participation level of the *ICF*, 50% ($n = 80$) at the activity level, and 3% ($n = 5$) at the body functions and structures level. Table 1 provides examples of goals at each *ICF* level. Parent-identified goals for occupational therapy most frequently focused on *Framework* areas of occupation related to ADLs ($n = 81$), social participation ($n = 38$), play ($n = 24$), education ($n = 9$), and rest and sleep ($n = 8$). Of note, 20 goals could not be definitively classified into a *Framework* area of occupation because they were not sufficiently described; thus, these goals were not included in the final analysis. The goals not included described self-regulation behaviors such as improving transitions between different environments and decreasing tantrums.

The functional goals were also examined to identify the sensory integrative factors that were hypothesized to be leading to the functional difficulty. Sensory reactivity (over- or underreactivity) was the most frequently occurring sensory integrative factor identified in the goals ($n = 86$), followed by somatopraxis ($n = 55$) and sensory perception ($n = 33$). Vestibular bilateral integration was identified in six of the goal statements.

The hypothesized sensory integrative factors affecting each *Framework* area of occupation are displayed in Figure 3. The figure reflects the occupational therapists' reasoning about the sensory integrative factors hypothesized to be influencing the parents' desired behavioral outcomes for their children. Of the 81 goals related to ADLs, sensory reactivity ($n = 34$) and somatopraxis ($n = 33$) were most frequently hypothesized to be the relevant sensory integrative factors, followed by sensory perception ($n = 12$). Similarly, the 24 play goals were most frequently affected by sensory reactivity ($n = 11$), followed by somatopraxis ($n = 8$) and sensory perception ($n = 3$). Social participation goals ($n = 38$) were most frequently affected by sensory reactivity ($n = 17$), followed by sensory perception ($n = 11$) and somatopraxis ($n = 9$). Rest and

Table 1. Sample Parent-Identified Goals, Sensory Integrative Factors, Framework Area of Occupation, and ICF Level

Goal	Hypothesized Sensory Integrative Factor	Framework Area of Occupation	ICF Level
J will decrease oral–tactile sensitivity as a basis for the ability to brush teeth for 1 min, one time per day.	Sensory reactivity	Activities of daily living	Activity
R will improve body awareness and motor planning as a basis for parallel play with other children for 5 min on 3 of 5 days per week.	Somatopraxis	Play	Participation
C will use improved tactile discrimination as a basis for using utensils (fork and spoon) for 10 min while eating dinner.	Sensory perception	Activities of daily living	Activity
A will demonstrate improved postural control needed to maintain sitting position during meals.	Vestibular bilateral integration	Activities of daily living	Activity
D will decrease auditory and tactile sensitivity to remain asleep 5 hr per night.	Sensory reactivity	Rest and sleep	Participation
K will decrease sensory overreactivity as a basis for decreased self-stimulating behaviors and improved ability to self-calm.	Sensory reactivity	[Unable to identify Framework area of occupation]	Body structure and function

Note. Framework = Occupational Therapy Practice Framework: Domain and Process; ICF = International Classification of Functioning, Disability and Health.

sleep goals ($n = 8$) were most frequently affected by sensory reactivity ($n = 6$).

Discussion

The goals analyzed in this study were developed using a DDDM systematic clinical reasoning process that guided the occupational therapists to explicitly analyze assessment data and link parent-identified goals with the sensory integrative factors hypothesized to be contributing to the client’s occupational performance. On the basis of this DDDM process, the therapists designed customized interventions that were responsive to the parents’ concerns and addressed the sensory integrative factors hypothesized to be affecting the child’s occupational performance.

The DDDM process guided the therapists as they developed goals that mattered to parents and communicated their reasoning for engaging the child in specific sensory-based intervention activities. DDDM further guided the therapists to tailor intervention to address the sensory-related factors affecting areas of occupation and to identify occupation-based outcomes. Moreover, the DDDM process required the therapists to consider outcome measures that provided evidence to support the hypothesized links between sensory integration, occupation, and participation in desired goals and activities and that were also sensitive to parents’ concerns. This process is consistent with Smith Roley et al.’s (2015) findings demonstrating a link between problems in sensory integration and social participation and with Cohn et al.’s (2014) recommendation that highlights the “importance

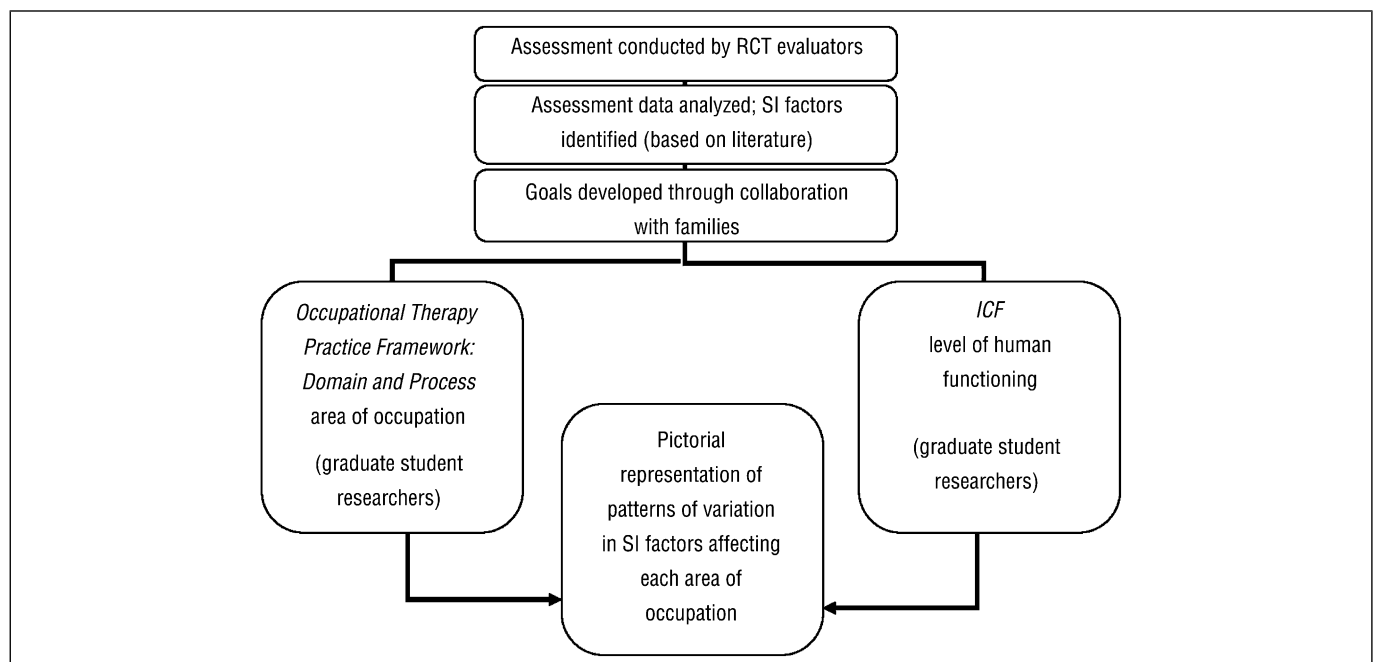


Figure 2. Flow of the study.

Note. ICF = International Classification of Functioning, Disability and Health (WHO, 2001); RCT = randomized controlled trial; SI = sensory integrative.

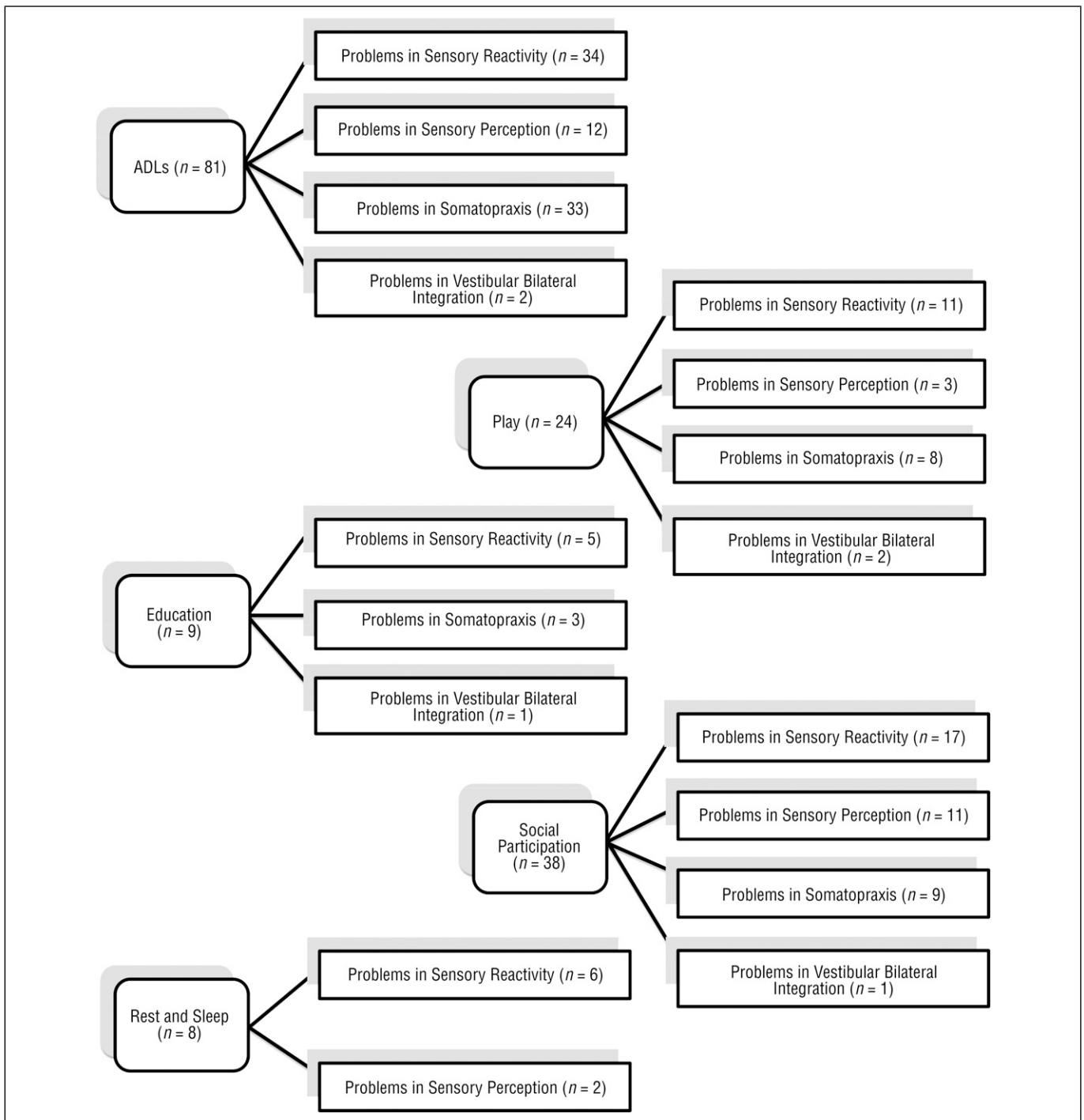


Figure 3. Sensory integrative factors affecting each area of occupation of the *Occupational Therapy Practice Framework: Domain and Process*.

Note. ADLs = activities of daily living.

of explicating the relationship between sensory and motor impairments and occupational performance in intervention” (p. 460).

Our data show that parent-identified goals for occupational therapy centered on the activity and participation levels of the *ICF* framework. This finding underscores the value the parent placed on participation in everyday life activities for their children. In fact, the parents identified

participation in ADLs (activity level of the *ICF*), play (participation level of the *ICF*), and social participation (participation level of the *ICF*) as their top three goal areas. This finding is congruent with Cohn’s (2001) work showing that parents hope that occupational therapy using sensory integration will help their children develop skills and abilities to support their performance in their everyday functioning. The findings of the current study reinforce the need to

design intervention to address concerns that matter to families and children, such as participation in home, school, and community activities.

Interestingly, problems in sensory reactivity were the most frequent sensory integrative factor identified. This finding is consistent with the literature documenting that many children with ASD have sensory reactivity difficulties (Ben-Sasson et al., 2008), but it is also consistent with the finding by Cohn et al. (2014) that parents often identified poor self-regulation of behavior as a reason for seeking occupational therapy using sensory integration intervention. Problems in sensory reactivity may affect self-regulation of behaviors, in turn reducing a child's ability to participate in desired occupations.

Problems in sensory reactivity and somatopraxis were frequently and almost equally identified as factors affecting ADL goals. This finding suggests that difficulties in ADLs among children with ASD are commonly related to sensory perception-based motor planning difficulties (somatopraxis) in addition to over- or underreactivity to sensation. The finding that somatopraxis was associated with problems in ADLs is consistent with Smith Roley et al.'s (2015) finding that somatopraxis is a key sensory integrative factor affecting children with ASD. These findings underscore the importance of assessing somatopraxis as part of a comprehensive sensory integration evaluation. Failure to do so may result in skewed assessment findings, influencing data interpretation, hypothesis generation, and ultimately the outcomes and effectiveness of intervention.

Limitations

This study is based on analysis of existing data and relied on the evaluators' skills in interpreting the underlying sensory integrative factors influencing the children's occupational performance. The evaluators completed training in DDDM and Ayres Sensory Integration[®] to learn to analyze and interpret sensory integration assessment data, and they discussed their interpretations with experts in sensory integration. Although this training validated the process of identification of sensory integrative factors, future studies may benefit from having two independent groups of evaluators interpret the assessment data, identify factors, and establish interrater reliability. Additional evaluators would lend further validity to this process.

The evaluators were unable to categorize 20 goals into a *Framework* area of occupation because the goals did not include sufficient description of an area of occupation. If we had been able to include these goals in the analysis, they may have altered the findings. Thus, in future studies, it will be important to ensure that all goals explicitly describe an area of occupation.

Implications for Occupational Therapy Practice

Ensuring family-centered care, addressing parent goals, using a systematic reasoning process to identify sensory integrative factors and tailor interventions, and measuring participation outcomes that are valued by parents are all of value in occupational therapy practice with children with ASD and their families. The findings of this study have the following implications for occupational therapy practice:

- Parent-identified goals are an essential part of the occupational therapy process for children with ASD.
- Parents are interested in goals that would improve their child's ability to participate in ADLs, play, and rest and sleep, and thus occupational therapy practitioners should consider interventions that will address these goals.
- In their clinical reasoning, occupational therapy practitioners must remain mindful of the importance of communicating effectively with parents to identify goals for a child's occupational performance and of considering the relationship between performance challenges and sensory-based difficulties.
- Although many children with ASD have difficulty processing and integrating sensory information, not all of their behaviors are related to sensory factors. Thus, it is important to use assessment data to identify whether sensory integrative factors are affecting behavior related to the goals identified by parents. If so, occupational therapy using sensory integration may be a useful approach. If not, however, other occupational therapy approaches may be more appropriate.
- When providing occupational therapy using sensory integration, it is important for practitioners to explicitly link (hypothesize) the sensory integrative factors to the areas of occupation embedded in the parent-identified goals and to communicate these hypothesized links to parents.
- When parents of children with ASD identify goals that may be related to difficulty processing and integrating sensation, a comprehensive evaluation of sensory integrative factors that includes sensory perception and reactivity, vestibular bilateral functions, and praxis should be undertaken (Schaaf, Burke, et al., 2014). This evaluation will allow the occupational therapist to determine whether a sensory integration approach is warranted.
- In research examining the outcomes and effectiveness of occupational therapy using sensory integration, it is important to use a systematic process such as DDDM to identify the child's areas of challenge and develop

operationalized goals that explicitly identify the areas of occupation affected. In addition, it is imperative to use assessment data to identify the sensory–motor factors that are hypothesized to be influencing these goals because these factors should be the targets for intervention. Outcome measurement at both the proximal (sensory–motor) and distal (occupation) levels is needed. ▲

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