# Sensory Over-Responsivity, Psychopathology, and Family Impairment in School-Aged Children

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**Objective:** To establish the diagnostic validity of sensory overresponsivity (SOR), there is a need to document rates of SOR and the co-occurrence of SOR with other psychiatric disorders. Although this was not a diagnostic study of SOR, this study was designed to investigate rates of elevated SOR symptoms and associations between elevated SOR symptoms, psychiatric disorder status, and family impairment. **Method:** From a larger birth cohort followed from infancy to school age, 338 children aged 7 to 10 years (51% boys, 49% girls) and their parents participated in an intensive assessment. Parents were interviewed with the Diagnostic Interview Schedule for Children (DISC) and completed the SensOR inventory and the Family Life Impairment Scale. **Results:** Approximately one-fifth (21.2%) of children had elevated SOR symptoms. One-fourth (24.3%) of those with an elevated SOR score met criteria for a *DSM-IV* diagnosis, and 25.4% of children with a *DSM-IV* diagnosis had an elevated SOR score. Parents of children with elevated SOR alone reported a similar number of restrictions in family life as parents of those with an internalizing and/or externalizing diagnosis. SOR predicted concurrent family impairment above and beyond DSM diagnostic status and socio-demographic risk. **Conclusions:** Elevated SOR occurs in the absence of other psychiatric conditions and is associated with impairment in family life. Services for children with comorbid elevated SOR and an externalizing disorder are needed to address the extremely high level of family impairment reported. J. Am. Acad. Child Adolesc. Psychiatry, 2011;50(12): 1210–1219. **Key Words:** sensory over-responsivity, psychopathology, internalizing, externalizing, family impairment

Accurate diagnosis of childhood conditions has implications for service eligibility and for planning interventions that meet child and family needs. Sensory overresponsivity (SOR) is a condition in which exaggerated or prolonged responses to sensory stimuli interfere with participation in daily life.[1,2] However, criteria for diagnosis and differential diagnosis are not adequately specified and the validity of the disorder continues to be questioned.[3] Because of limited research, SOR has not been considered as a formal diagnosis within the Diagnostic and Statistical Manual of Mental Disorders[4] or International and Statistical Classification of Diseases and Related Health Problems[5] nosological systems. One criterion for determining that SOR warrants consideration for inclusion as a significant form of psychopathology is independence from other forms of psychopathology. A second criterion is that the presence of elevated SOR symptom presentation is impairing to children and families, independent of other diagnosable disorders. Thus, the goals of this study were to determine whether elevated SOR would be observed independent of other psychiatric conditions and whether SOR contributes uniquely to family impairment, independent of the presence of other psychiatric disorders.

As described by Miller et al,[1] SOR is characterized by behavioral responses toward sensory experiences that are exaggerated in intensity, frequency, and/or temporal features, such as rapid, intense onset and long duration of response. Children with SOR often show high distress levels and may be easily irritated and

This article is discussed in an editorial by Drs. Cynthia Rogers and Joan Luby on page 1205.

distracted by various sensory stimuli from one or more than one sensory modality. High SOR scores are stable across early childhood.[6] Although showing one or two symptoms of SOR (e.g., being bothered by tags in shirts or having finger or toe nails cut) may be normative in school-aged children, those with four or more symptoms of SOR appear to be at increased risk for social and emotional problems.[7] SOR is conceptualized under the broader category of Sensory Processing Disorders (SPD) and is considered to reflect an imbalance between sensitivity (i.e., identification of novel or changing stimuli) and habituation (i.e., adjusting to familiar or ongoing stimuli). Supporting the validity of SOR, children with SPD evidence different physiological responses than children without SPD[8-11] and there is evidence of genetic heritability of SOR symptoms.[12,13]

Clinical models classify SOR into subtypes which capture two different associated behavioral and coping profiles. Dunn[2] classified SOR into two subtypes: first, an avoider subtype, characterized by responding to overwhelming sensations with withdrawal, defiance, resistance, and taking control over input; and second, a sensitive subtype, characterized by distress, fear, and distractibility. These sensory subtypes seem to include symptoms from and are somewhat comparable to distinctions between internalizing and externalizing problems. Similarly, the Interdisciplinary Council of Developmental and Learning disorders[14] described two subtypes of sensory overresponsive in children less than 3 years of age: an overresponsive, negative, stubborn subtype versus an overresponsive, fearful, anxious subtype. Both clinical classifications define SOR with an associated affective profile to account for the different emotional patterns and coping strategies displayed by those with SOR. There is some preliminary evidence to support these subclassifications.[15] Given the linkage to anxious and disruptive behaviors, it is not surprising that there would be some confusion as to the independence of SOR in relation to other psychopathological conditions.

Few studies have documented rates of co-occurrence between SOR and other *DSM* diagnoses. Gouze et al.[16] reported that 33% to 63% (depending on criteria applied) of 4-year-old children who met criteria for a SPD (including but not limited to SOR) also met criteria for a DSM diagnosis according to parent reports. However, the sample was not representative and a broader set of sensory problems included. Using continuous measures of SOR, researchers have reported moderate correlations between SOR symptoms and scores on internalizing scales (e.g., anxiety) in children with developmental disabilities such as autism spectrum disorders (ASD)[17,18] and attention-deficit/hyperactivity disorder (ADHD).[19] There also appear to be elevated anxiety symptoms in adults with sensory defensiveness.[20] Moreover, there is evidence for an association between internalizing symptoms and SOR[13] or dysregulation in general[21] among nonreferred children. In a study of a representative sample, 28% of children with elevated SOR also showed elevated internalizing scores which is significantly higher than the expected 10% rate based on the Infant-Toddler Social and Emotional Assessment (ITSEA) norms.[13] Furthermore, multiple studies indicate that infants who are highly reactive to sensations show higher levels of fear and inhibition at school age.[22,23] Thus, SOR appears to be associated with both internalizing symptoms and psychiatric disorders.

Empirical evidence of an association also exists in the externalizing domain but to a modest degree. In a study of preschool Latino children, there were low-to-moderate correlations between parent-based sensory scores and parent reports of externalizing problems, oppositional defiant disorder (ODD), and ADHD.[24] Consistent with this, SOR scores showed modest correlations with externalizing scores in two population-based samples of children up to 3 years of age.[13,21] In a representative community sample of 1- and 2-year olds, 20.6% of children with elevated SOR also had elevated externalizing scores on the ITSEA; however this rate did not differ significantly from the expected ITSEA normative rate of 10% with elevated scores.[13] Yet, clinical characterizations suggest that SOR may result in externalizing behaviors, such as impulsivity and aggression in response to unexpected and overwhelming input.[1]

Researchers have generally studied associations between SOR and child rather than family impairment. Children with SOR demonstrate impairments across a variety of daily activities including self-care and social participation.[2] Understanding children's impairment through restrictions in family life activities provides an additional measure of the severity of SOR impairment. It is also important to recognize that the impact of SOR upon the child and family is not solely a reflection of the child's symptom

severity and coping strategies but also reflects family resources and the ways in which family members respond to, adapt, and cope with the child's overresponse.

In the current analyses, our measure of family impairment is based on parents attributing difficulty completing tasks of daily family life to their children's "behavior, personality or special needs" (e.g., not being able to take a long car ride or visit with relatives). Previous research describing an earlier time point for the full sample showed strong relations between elevated early social-emotional problems and greater family life impairment[25] as well as evidence that family life impairment was a significant predictor of persistent social-emotional problems[26] and help-seeking for social-emotional problems.[27] Studies of children with developmental disabilities such as ASD describe SOR as a factor that limits family participation and contributes to rigidity of routines and to parental stress.[28,29] Whether or not a developmental disability is present, parents of a child with SOR may restrict family activities (e.g., outings, shopping) to minimize the child's exposure to bothersome, unpredictable, and overwhelming sensations (e.g., loud sirens, being bumped into gently by a stranger in a public place, trying on new clothing), and consequently avoid tantrums and outbursts associated with their child's negative responses to sensory experiences. Thus we hypothesized that elevated SOR symptoms would contribute uniquely to family impairment, even after controlling for symptoms of other psychopathological conditions.

In conclusion, the study goals were to conduct a preliminary investigation of the construct of SOR by the following: determining whether children with no other psychopathologies evidence elevated SOR; and quantifying its unique contribution to family impairment in both children with and without other significant psychopathology.

Research questions were as follows:

1. What is the rate of co-occurrence between elevated SOR symptoms and *DSM-IV* disorder status?
2. Does having elevated SOR symptoms contribute to family impairment uniquely, above and beyond other *DSM-IV* disorders?
3. Do parents of children with elevated SOR (with or without co-occurring *DSM-IV* disorders) report greater family impairment than those with only a *DSM-IV* diagnosis or those with neither elevated SOR nor a *DSM-IV* diagnosis?

## METHOD

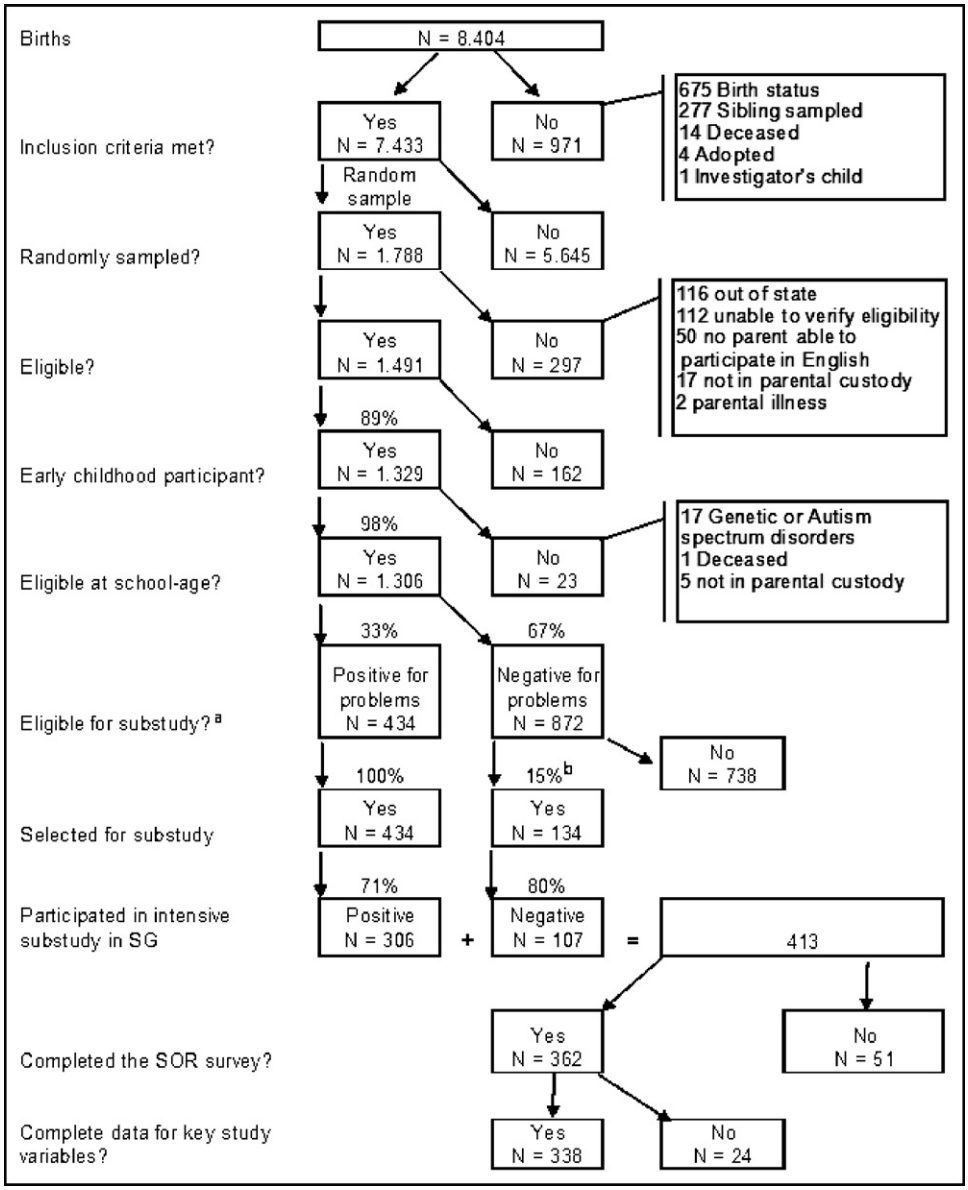
### Study Participants

This study is comprised of a subsample of children whose parents provided data on sensory overresponsivity and *DSM-IV* disorders when children were in second or third grade. Children and parents had all participated in a larger longitudinal sample. Details about sampling and longitudinal response rate and retention are provided elsewhere.[30] As shown in Figure 1, children were initially selected from birth records (N = 8,404) provided by the State of Connecticut Department of Public Health from July 1995 to September 1997. A random sample of birth records was stratified to have equal representation of girls and boys within 3-month age groupings between 11 to 35 months of age. Eligible children were born healthy at Yale New Haven Hospital and lived in the Greater New Haven Standard Metropolitan Statistical Area of the 1990 Census. Children who were likely to have developmental delays due to low birthweight (<2,200 g), prematurity (<36 weeks), low APGAR scores (defined as both 1- and 5-minute scores <5), or birth complications (e.g., anoxia, need for resuscitation, long hospital stay) were excluded and only one child per family was sampled. A random sample of 1,788 was selected from the 7,433 births meeting these criteria. Children were excluded after the initial sampling if no parent was able to participate in English, if no biological parent had custody of the child, if the family had moved out of state at the time of the first survey (1998–1999), or if eligibility could not be verified. After exclusions, 1,491 subjects were eligible, of whom 1,329 participated in one or more of three early childhood surveys (89.1% response rate).

All participants in the early childhood surveys were followed to school-age. The focus of this report is on data collected when children were in second or third grade. By the time of this final wave of data collection, 24 children had been excluded on the basis of significant genetic disorders, developmental delays, and/or ASD (including autism, pervasive developmental disorder not otherwise specified, and Asperger syndrome), resulting in an eligible sample of 1,306.

Of the full eligible sample, an intensive assessment subsample, which was enriched for psychopathology (n = 567 after removal of one child lost to custody), was selected for more in-depth diagnostic interview and direct child assessment (detailed in Carter et al.[30]). All children who met the following criteria were eligible (n = 434): (1) persistent social–emotional/behavioral problems in early childhood: parent-reported social-emotional problems on measures completed at both 2 and 3 years-of age; (2) social–emotional/behavioral problems in early elementary School: par-

**FIGURE 1** Flowchart of intensive sample and Sensory Over-Responsivity Inventory (SOR) recruitment and retention. Note: SG = second to third grade. [a]Includes all early childhood participants, including those lost to follow-up by school-age. [b]This represented 20% of 670 children negative for sensory over-responsivity who participated in the school surveys.




ent- or teacher-reported social-emotional/behavioral problems on a standardized checklist or indicated need for social-emotional/behavior problems services at school age; and (3) risk for language/learning difficulties: parent reported low language at 3 years of age or in early elementary school or teacher reported low language on a checklist or significant concern about the child's language abilities in early elementary school. Language difficulties were included in these criteria because these have been linked to problem behaviors.[31] An additional 134 children who were negative on all of these criteria were also selected.

In this article, we focus on 338 of 413 (82%) children whose parents completed the intensive assessment and completed a school-age SensOR inventory,[32] a measure added to the school-age survey after data collection began. This subsample was similar to the full school-age intensive subsample with respect to poverty status, single-parent household, child sex, maternal education, minority ethnicity, and the per-

**TABLE 1** Sociodemographic Characteristics of Study Group

| | School-Age Sample (N = 413) | | | Intensive Subsample (N = 338) | | |
|---|---|---|---|---|---|---|
| **Sociodemographics** | **N** | **Unweighted %** | **Weighted %** | **N** | **Unweighted %** | **Weighted %** |
| Boys | 208 | 50.4 | 48.7 | 171 | 50.6 | 49.7 |
| Girls | 205 | 49.6 | 51.3 | 167 | 49.4 | 50.3 |
| Marital Status | | | | | | |
| Single parent household | 100 | 24.4 | 22.5 | 76 | 22.6 | 20.3 |
| Poverty Status | | | | | | |
| Non-poor | 265 | 66.6 | 70.2 | 217 | 66.8 | 71.8 |
| Borderline poverty | 60 | 15.1 | 12.5 | 50 | 15.4 | 11.5 |
| Poverty | 73 | 18.3 | 17.3 | 58 | 17.9 | 16.7 |
| Parental Education | | | | | | |
| Maternal education ≤HS | 98 | 24.6 | 23.9 | 76 | 23.3 | 22.2 |
| Paternal education ≤HS | 87 | 30.0 | 27.5 | 69 | 27.7 | 25.7 |
| Race/ethnicity | | | | | | |
| Non-minority | 260 | 63.0 | 67.0 | 218 | 64.5 | 67.6 |
| Minority | 153 | 37.0 | 33.1 | 120 | 35.5 | 32.4 |

*Note: Sample of children who participated in the home visit was comparable to the subsample that had Sensory Over-Responsivity Inventory scores. HS = high school or General Education Development completion.*

centage selected based on meeting enrichment criteria ($\chi^2$ values ranged from 0.04 to 3.17, $p > .05$; Table 1). In this subsample, children were between 6.9 and 9.6 years of age (mean = 8.0, SD = 0.4), 50.6% were boys, and 64.5% were white. Informants were between 23.0 to 56.5 years of age (mean = 38.7, SD = 6.5), and 94.0% were biological mothers. Most informants had a partner, were working, and had an education level greater than high school.

*Sampling Weights.* Weights were applied in all analyses to adjust for unequal probabilities of initial selection and retention across the longitudinal study. Information from birth records concerning sociodemographic background (e.g., parental age and race) and birth status (e.g., birth weight and gestational age) were used to calculate sampling weights. As sociodemographic changes in the retained sample based on loss-to-follow-up are associated with small effect sizes[30] and as we are not inflating to the full sample, sampling weights are associated with small changes in sample sizes.

## Measures

*Sensory Over-responsivity Inventory (SensOR[32]).* This inventory includes 76 items that describe sensations that may bother a child. In the present study, 41 items from the auditory and tactile modalities were included as sensitivities in these modalities are the most frequently reported.[3] Parents are asked to check all items that apply to their child. Items are divided into five lists that assess tactile overresponsivity (garments, activities, experiences, surfaces, and materials) and three lists that assess auditory overresponsivity (specific sounds, background noises, and loud places). A total overresponsivity score as well as modality scores are computed.

This inventory was validated through factor and reliability analyses as well as discriminant analysis. The sensitivity and specificity of the SensOR inventory in differentiating children with SOR ($n$ = 101) from typically developing children (n = 120) was highest (sensitivity = 69.09, specificity = 84.16) when at least four tactile or auditory items were present.[32] Previously, we reported that the internal consistency for the 41 SensOR items was good in the full school-age sample (Cronbach's $\alpha$ = 0.74).[7] In this report, we categorize children into two groups: those with SensSOR total scores of four tactile or auditory symptoms, and those below this threshold.

*Diagnostic Interview Schedule for Children, Version IV.*[33] This is a structured interview that determines *DSM-IV* child psychiatric disorders. The following disorders were assessed: specific phobia, social phobia, separation anxiety, generalized anxiety, agoraphobia with and without panic, depression, dysthymia, tic disorders, ADHD, ODD, and conduct disorder (CD). The Diagnostic Interview Schedule for Children (DISC) has acceptable test–retest reliability. Diagnostic status is determined by a set of computerized symptom algorithms. Impairment is defined as present if interference in functioning occurred "some of the time" or "a lot of the time" or caused "bad" or "very bad" problems or feelings in at least one context, including home, school or other context. In this study a conservative approach was applied by focusing on

**TABLE 2** Rates of Diagnostic Interview Schedule for Children, Version IV (DISC) Diagnoses by Sensory Over-Responsivity (SOR) Status

| | Weighted % (n) | | Nonweighted % (n) | |
|---|---|---|---|---|
| | SOR (n = 71)[a] | No SOR (n = 262) | SOR (n = 75) | No SOR (n = 263) |
| Any DISC diagnosis: | | | | |
| Yes | 25.4% (18) | 74.6% (53) | 36.0% (27) | 26.6% (70) |
| No | 20.2% (53) | 79.8% (209) | 64.0% (48) | 73.4% (193) |
| DISC internalizing diagnosis: | | | | |
| Yes | 10.0% (7[b]) | 90% (63) | 16.2% (12) | 11.8% (31) |
| No | 9.2% (24) | 90.8% (238) | 83.8% (62) | 88.2% (232) |
| DISC externalizing diagnosis: | | | | |
| Yes | 18.6% (13[b]) | 81.4% (57) | 25.7% (19) | 19.4% (51) |
| No | 13.7% (36) | 86.3% (226) | 74.3% (55) | 80.6% (212) |

*Note: SOR grouping was based on Miller's cutoff of at least four bothering auditory or tactile sensations. DISC diagnoses are defined by moderate impairment criteria.*

[a]*There is one missing child in the internalizing and externalizing diagnosis comparison.*

[b]*Two of these children also qualified for an internalizing diagnosis.*

DISC diagnoses based on moderate level of impairment in all analyses.

*Family Life Impairment Scale (FLIS[34]).* This scale assesses the extent to which parents report that child behavior limits participation in activities typical of families with young children (e.g., family outings, leaving child with babysitter). Items are rated on a three-point scale from "Not true" to "Very true" and begin with "Because of my child's behavior, personality or special needs, we rarely . . .". The FLIS has good internal consistency (Cronbach's $\alpha = 0.81$) with item loadings ranging from 0.33 to 0.62. Test–retest reliability was 0.70. Support for the validity of the FLIS comes from evidence that it is associated with persistence of mental health problems[26] and with service-seeking among families of children with behavior problems.[27]

*Socioeconomic Risk Measure.* This measure was based on six parent-reported demographic variables: parent education, minority ethnicity, poverty and parent employment status, single, and teen parenting. The distribution of socioeconomic status (SES) risk scores supported the categorization of SES risk into the following categories: 0, showing no more than three risk factors (93.9% of the sample); and 1, showing more than three risk factors. We decided to adopt a conservative approach and to include SES as a covariate, as it was associated with SOR in the full school-aged sample[7] and with social–emotional problems at earlier time points.[25]

## Procedure

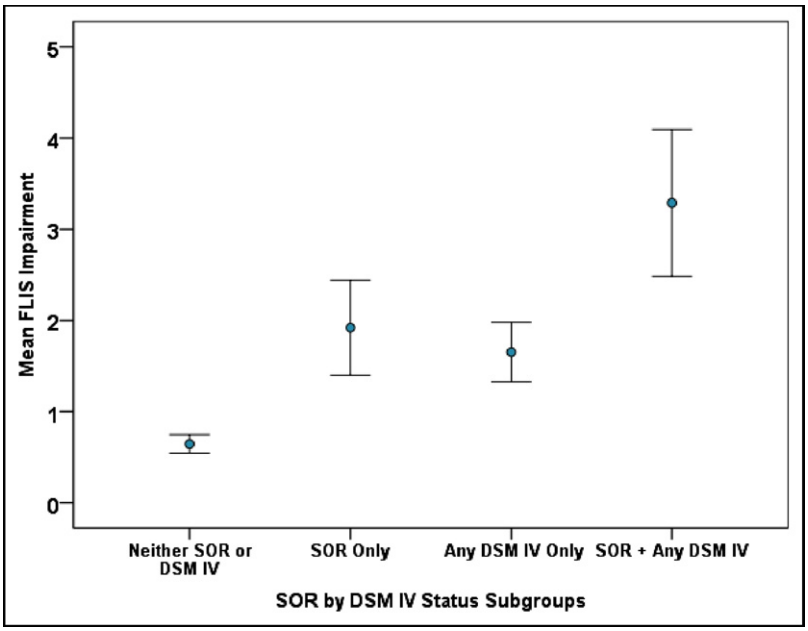
The current study describes the fifth assessment time point, with separate parent consent obtained at each time point. Data collection for this survey, which included the SensSOR, FLIS, sociodemographic, and new diagnostic and services information began in the 2002/2003 academic year and continued through the

**TABLE 3** Linear Regression Model Predicting the Family Life Impairment Scale (FLIS) from Sensory Over-Responsivity (SOR) Status, Controlling for *DSM* Disorders and Socioeconomic Status (SES)

| Steps | β on Entry (*SE*) | β in Final model | $\Delta R^2$ | Cohen's d |
|---|---|---|---|---|
| 1. DSM Disorders | | | 0.05 | 0.5 |
| Internalizing | −0.07 | −0.04 | | |
| Externalizing | 1.53** | 1.46** | | |
| 2. SES | −0.19 | −0.14 | 0.01 | 0.2 |
| 3. SOR | 1.23** | 1.23** | 0.04 | 0.4 |
| Total $R^2$ | | | 0.11 | 0.7 |
| Model F value | | | 9.53** | |

*Note: **p < .001.*

**FIGURE 2** Mean Family Life Impairment Scale (FLIS) scores across Sensory Over-Responsivity (SOR) and *DSM-IV* diagnosis status. Note: Weighted subgroup sizes are presented along with weighted raw means.




2005/2006 academic year, with families first contacted to identify whether or not their children had entered second grade. DISC-IV interviews were conducted during the intensive subsample visits, which occurred in project offices or at the family home, depending upon family preference. Parents received $30 for completing this survey and $100 for participating in the intensive visit.

## RESULTS

### Research Question 1: Rates of SOR and *DSM-IV* Diagnosis Co-occurrence

Approximately one-fifth of parents (21.2%, n = 71) reported that their child was bothered by at least four auditory sensations and/or four tactile sensations (the recommended cut-off for the SensOR). These children with elevated SOR symptoms represented 25.4% of children with any *DSM-IV* diagnosis. Similarly, children with *DSM-IV* diagnoses represented 25.4% of children with elevated SOR. Examined by diagnostic domain, of children with elevated SOR, seven met criteria for an Internalizing disorder (10.0%), 13 met criteria for an externalizing disorder (18.5%), and two (2.9%) met criteria for all three classifications (elevated SOR, internalizing disorder, and externalizing disorder) (Table 2).

### Research Question 2: SOR Unique Contribution to Family Impairment

A linear regression model showed that having an SOR score above the cutoff contributed unique variance to family life impairment after controlling for variance associated with concurrent DISC internalizing and/or externalizing diagnoses, and SES risk [$F(4, 322) = 9.27$, $p < .001$) (Table 3). The full model $R^2$ (0.11) was translated into a Cohen's d of 0.7; SOR explained 4% of this variance (Cohen's d = .4). Meeting criteria for an externalizing diagnosis significantly ($p < .001$) predicted family life impairment upon entry and in the final model.

### Research Question 3: Family Impairment of Children With SOR and *DSM-IV* Diagnosis

To further understand the clinical significance of these relations, a follow-up ANCOVA, controlling for SES risk, was run. Significant differences in mean FLIS scores were observed across four groups of children: (1) neither elevated SOR nor *DSM-IV* diagnosis (n = 192); (2) elevated SOR only (n = 47); (3) DSM-IV diagnosis only (n = 44), and (4) both elevated SOR and at least one DSM-IV diagnosis (n = 14) ($F(4, 296) = 6.44$, $p < .001$, $R^2 = 0.08$) (Figure 2). Consistent with the results of the regression analysis, SOR conferred

unique risk for family impairment, as least significant difference post-hoc two-tailed tests revealed that that children with only a *DSM-IV* diagnosis (mean = 1.58, SD=2.24) had significantly lower family impairment than those with elevated SOR and a DSM-IV diagnosis (mean = 3.09, SD = 3.18) and that parents of children with SOR only (mean = 1.85, SD = 3.76) rated higher family impairment than those with neither condition (mean = 0.70, SD = 1.64), who were also lower than the two groups with *DSM-IV* diagnoses.

## DISCUSSION

This study addressed the co-occurrence of elevated SOR symptoms and psychopathology in school-aged children as well as the unique contribution of elevated SOR symptoms (over and above DSM disorder status) to family impairment. In our sample there was relatively limited co-occurrence of elevated SOR and psychiatric disorder status. Specifically, approximately one-fourth of children with elevated SOR also met criteria for a *DSM-IV* diagnosis; similarly, approximately one-fourth of children meeting criteria for a psychiatric diagnosis were rated as having elevated SOR. Furthermore, SOR accounted for unique variance in concurrent family impairment above and beyond that associated with internalizing and externalizing diagnostic status and SES risk. Examining differences in family impairment across families with a child with neither elevated SOR nor a *DSM-IV* diagnosis, elevated SOR only, a *DSM-IV* diagnosis only, or both conditions highlights that the presence of elevated SOR constrains families' ability to engage in routine daily activities. Parents of children with elevated SOR without a *DSM-IV* diagnosis reported higher levels of family impairment than parents of children with neither of these conditions and these rates were comparable to those of families with a child with a *DSM-IV* diagnosis only. Moreover, parents of children with both elevated SOR and a *DSM-IV* diagnosis reported greater family impairment than those with a child with only a *DSM-IV* diagnosis.

The relatively low co-occurrence (25.4%) of SOR and psychopathology lends support to the notion that SOR is a distinct entity. This rate is somewhat lower than the co-occurrence of SPD and *DSM-IV* disorder status reported in a 4-year-old sample of referred children (33%–63% depending on impairment criteria),[16] but Gouze et al did not focus exclusively on SOR; including a broader range of sensory problems and disorders and different ascertainment may have also influenced observed rates. Given that SOR is the most prevalent sensory disorder,[3] it would be expected to account for most of the co-occurrence. A significant limitation of the present estimate of co-occurrence is that the SOR criteria used were based on a checklist assessment rather than on a clinical diagnosis that included direct observation. In addition, although the most prevalent,[3] it is also possible that limiting inquiry to tactile and auditory sensitivities reduced SOR rates in this study. In contrast, *DSM-IV* diagnoses were assigned after a structured diagnostic interview that required a moderate-to-severe level of child impairment. There is a need to replicate and corroborate these findings using a clinical assessment of SOR and multi-informant ratings of symptoms and impairment. Moreover, the development of clear criteria that specify a clinical threshold for assigning a diagnosis of SOR would greatly facilitate research in this area, as currently there is no gold standard method for determining a diagnosis of SOR.[15]

The majority of children with SOR did not meet criteria for any *DSM-IV* diagnosis (74.6%). Of those with both elevated SOR and a *DSM-IV* disorder, the majority appeared to adopt either an internalizing (39% met criteria for an internalizing disorder) or externalizing (72% met criteria for an externalizing disorder) behavioral style; the mixed style was rare (11% of those with both elevated SOR and a disorder were comorbid across internalizing and externalizing, which represents 2.9% of those with SOR). Independent of SOR, the prevalence of having both internalizing and externalizing disorders has been observed to be low in this community sample (3.5%).[30] It is possible that some children who did not meet criteria for a disorder evidence subthreshold internalizing or externalizing symptoms and are at higher risk for later diagnosis. It is also possible that our requirement of impairment for *DSM-IV* disorders and studying a representative community sample reduced comorbidities. To date, most of the evidence of an association between SOR and psychopathological disorders has been derived from correlations between continuous measures of these constructs in the general population[13,21] or studies of individuals with developmental disabilities.[18] Given

the higher likelihood of a dual diagnosis for children with developmental disabilities and the exclusion of children with developmental disabilities including ASD from this sample, rates reported likely represent an underestimate of the co-occurrence of these conditions.

To our knowledge, this is the first attempt to examine categorical co-occurrence in a nonreferred sample at risk for psychopathology. Children with SOR may develop maladaptive emotional and behavioral patterns as a result of their ongoing alertness toward and avoidance of sensation. Alternatively, the presence of psychopathology may heighten risk for SOR among children with baseline vulnerability for SOR.[35] Longitudinal research is needed to determine whether specific trajectories of SOR in early childhood are associated with increased rates of psychopathology and/or whether co-occurrence of elevated SOR and psychopathology in school-age predicts persistence of psychopathology to adolescence as shown in younger ages.[26]

This study also demonstrates that SOR confers unique risk for family impairment over and above that associated with internalizing and externalizing psychopathology and sociodemographic factors. Families raising children with elevated SOR symptoms reported greater restrictions in their social (e.g., "I rarely take the child to visit friends or family," "We rarely leave the child with relatives") and personal (e.g., "I am usually exhausted all day," "We rarely make changes in daily schedule") lives. These restrictions may reflect efforts to minimize the child's distress, fear, and withdrawal, and/or to increase the child's need for control in presence of bothering sensations that parents reported as distressing for their children.[36] Consistent with prior work,[37] the presence of an externalizing disorder was associated with interference in family life activities. Moreover, findings indicated that behavior problems such as aggression, noncompliance, and high activity level pose restrictions to family activities that are independent of those posed by SOR.

Primary findings provide support for consideration of SOR as an independent clinical entity: first, elevated SOR appears to be a distinct condition with relatively low co-occurrence with *DSM-IV* conditions; and second, SOR was associated with increased family burden, independent of *DSM-IV* disorder status, an index of the impairing nature of this condition. There is a need to replicate and extend this work using direct clinical assessments of SOR as well as multi-informant reporting of symptoms of *DSM-IV* psychopathology, SOR, and family impairment. Moreover, future studies should include neurocognitive and neuroanatomical assessments, as it has been recently argued that processes such as selective attention, inhibition, and sensory gating may be implicated in SOR.[38]

This study underscores the need for being cognizant of the heightened family impairment associated with raising children with elevated SOR as a child's aversive reaction to daily activities and need to control incoming inputs may lead parents to restrict their family routines in a manner that, over time, may diminish the quality of family life.[36] Although only 25% of children with internalizing and/or externalizing disorders evidenced elevated SOR, assessment of SOR in this clinically significant subgroup could lead to more tailored and effective intervention efforts. Historically, occupational therapists have identified, diagnosed and treated individuals with SOR.[1] As the identification of SOR as a clinical entity may be new to many mental health clinicians, establishing interdisciplinary teams with occupational therapy expertise may aid in differential diagnosis. Reciprocally, occupational therapists need to be aware of the potential for co-occurring psychopathology among children with SOR. Evidence of increased family burden supports the need for greater understanding of the role of SOR in maintaining and exacerbating child psychopathology. &

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