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Precursors and Trajectories of Sensory Features: Qualitative Analysis of Infant Home Videos

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Abstract

Objectives—This study explored precursors and trajectories of extreme sensory patterns in children with ASD compared to DD.

Methods—A retrospective analysis of infant home videos was conducted with 12 cases that displayed extreme presence or absence of three sensory patterns at preschool and school age.

Results—In ASD, hyporesponsiveness was most evident in infancy, followed by sensory repetitions. Hypo-responsiveness appeared stable over time and also as a precursor of sensory seeking. Infants with DD had few sensory precursors.

Conclusions—Precursors of extreme sensory features emerge early in children with ASD, and appear relatively stable over time for a pattern of hyporesponsiveness, but less so for patterns of hyperresponsiveness and sensory seeking. These findings highlight the emergent nature of sensory features that may inform early identification and intervention.

Keywords

autism; retrospective video analysis; sensory processing

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Introduction

Sensory features are highly prevalent, heterogeneous, and problematic in children with Autism Spectrum Disorders (ASD). Extreme patterns of either hyporesponsiveness, or the co-occurrence of hyporesponsiveness with hyperresponsiveness appear to differentiate ASD from developmentally delayed (DD) comparisons by school age (Baranek et al., 2006; Rogers, Hepburn, Stackhouse, & Wehner, 2003). However, little is known about the precursors and developmental trajectories of sensory features.

A few retrospective video analysis (RVA) studies have documented unusual responses to sensory stimuli in ASD during infancy using cross-sectional methodologies and quantitative coding (Baranek, 1999; Osterling & Dawson, 1994; Palomo, Belinchon, & Ozonoff, 2006). Studies have not included in-depth qualitative analysis of extreme sensory patterns, or considered their change over time.

Some prospective studies with high-risk infant siblings of children with ASD have identified developmental progression of early features (e.g., Bryson et al., 2007; Chawarska, Klin, Paul, & Volkmar, 2007); however, these reports were not focused on sensory precursors and trajectories. The current study used a qualitative methodology to elucidate infant precursors and trajectories of sensory features recorded in the context of family videos of children later diagnosed with an ASD or a DD. Three primary questions are addressed: a) Are precursors of extreme sensory patterns visible in early home videos, and if so, what is their nature? (b) Are these early sensory features stable over time? (c) How do early sensory features and trajectories in children with ASD compare to those of children with DD?

Methods

Participants

Participants included 10 males and 2 females. Children with ASD (n=6) or DD (n=6) were confirmed by clinical diagnosis and gold-standard diagnostic measures conducted at 2–6 years of age. Cases that fell > 1.5 standard deviations above or below the mean for sensory pattern scores of hyporesponsiveness, hyperresponsiveness, or sensory seeking were selected from a larger data set. The sensory pattern scores were derived from an aggregate factor score of four measures (two parent report, and two observed): the Sensory Experiences Questionnaire (SEQ; Baranek et al., 2006), the Sensory Profile (SP; Dunn, 1999), the Tactile Defensiveness and Discrimination Test (TDDT-R; Baranek, 2007), TDDT, and the Sensory Processing Assessment for Young Children (SPA; Baranek, 1999). (See Watson et al., 2011 for details of factor model and scores). Two cases for each of three patterns within each group were used yielding 12 cases of either an extreme presence OR absence of sensory features at preschool or school age.

Data Collection

All procedures were approved by IRB as part of a larger grant. All parents signed written consent, and were paid $25 for videos, which were copied and archived digitally. ‘Extreme case sampling’, (Tashakkori & Teddlie, 2003) was used to identify cases that were unusual in terms of the intensity of sensory patterns (i.e., hyporesponsiveness, hyperresponsiveness, and sensory seeking). Videos with sufficient footage between birth and two years were coded. Total footage for each case ranged from 1 hour, 13 minutes to 25 hours, 52 minutes. A total of 63 hours, 54 minutes of video footage was analyzed.

Qualitative Analysis of Home Videos

Analysis was informed by a grounded theory approach (Strauss & Corbin, 1990), and identified emergent codes through the lens of a conceptual framework (Watson et al., 2011), which categorizes sensory features within the three patterns of: hyporesponsiveness, hyperresponsiveness, or sensory seeking. Our research questions led the first author (A.F.) to identify instances of behaviors that appeared to be related to one of the 3 sensory features, with the goals of both strengthening theories surrounding sensory processing as well as exploring the phenomena of sensory features and the nuances of the contexts in which they occur.

ATLAS.ti was used for reviewing and coding. The first of three phases included repeatedly viewing all footage for each case, and identifying 'incidents' of behaviors as units of analysis (Larkin, 2009). These incidents included any behaviors that 1) appeared to be sensory in nature, 2) were potentially related to development of sensory patterns, or 3) any other behaviors 'of interest' that emerged as unusual or noteworthy during the coding process (e.g., atypical motor patterns).[1] A second phase reviewed the incidents using open coding to describe the context or observed activity (e.g., *free play, community*), as well as observed behaviors or perceived affect (e.g., *spinning object, positive affect*) and sensory-related descriptors (e.g., *hyporesponsiveness*). Finally, A.F. re-reviewed all footage to ensure that assigned codes described the identified incidents. Following the open coding process, she used her familiarity with the totality of the footage for each case to give an overall clinical impression of the observed sensory features for each child (see Figure 1). In line with the qualitative nature of the study, the first author was not blind to diagnostic group.

All authors participated in an ongoing process of reviewing the video segments and associated codes, as well as in theoretical discussion surrounding A.F.'s observations, coding, and clinical impressions for the purpose of member checking. Further, a series of 'incidents' for selected cases were reviewed by all authors to validate the clinical impressions.

Results

Precursors

Qualitative analysis of infant home videos revealed a number of emergent codes, some of which identified early features that may be precursors to later extreme sensory patterns in the ASD group. These codes included *hyporesponsiveness* (e.g., child displays delayed or lack of response to name call), *hyperresponsiveness* (e.g., child displays aversive reaction to being dipped in ocean as evidenced by holding feet up coupled with a negative affective facial expression), and sensory repetitions (e.g., *spinning, mouthing objects)*, as well as *atypical motor* postures (e.g., unsteady gait, posturing). Overall clinical impressions of features in the infant videos showed that hyporesponsiveness was most evident in the ASD group, followed by sensory repetitions. Hyperresponsiveness was noted in only two cases at infancy. There was no evidence of intense sensory seeking that was qualitatively distinct from the developmentally common sensory repetitions noted above.

In the DD group, evidence of sensory precursors was surprisingly lacking in the infant videos. In two cases, there were instances of *atypical motor* postures and *mouthing*,

[1]While a conceptual lens surrounding sensory features guided the coding process, A.F. remained open to emergent codes that appeared to be relevant to the current study.

however, each case in the DD group received an overall clinical impression of 'no significant evidence of sensory features' during infancy.

Stability of Features

In the ASD group, two trajectories were observed: (1) stability of hyporesponsive patterns from infancy to preschool or school age, and (2) shift from hyporesponsiveness in infancy to sensory seeking at preschool or school age (See Figure 1). Of the ASD cases presenting with stable hyporesponsive features, all children also showed sensory repetitions in the videos. In contrast, for those cases for which a clinical impression of hyperresponsiveness was given during infancy, there was an 'extreme' *absence* of any of the three sensory patterns at a later age. In the DD group, all of the cases presented with little evidence of sensory precursors based on clinical impressions of observed home movies, regardless of the extreme presence or absence of the three sensory patterns evident at preschool or school age.

Discussion

Overall, the analysis revealed that precursors to sensory features emerge early in children with ASD. Despite heterogeneity in sensory patterns at preschool or school age, early features were more homogeneous, providing evidence that hyporesponsiveness may be a precursor for all three extreme sensory patterns present at later ages. Hyporesponsiveness was also relatively stable across time, perhaps suggesting these features may be related to enduring temperamental traits. Alternately, sensory hyperresponsiveness was less evident during infancy, and there was no strong evidence for stability over time. Although parents may not videotape situations that cause distress for infants, it is also possible that hyperresponsiveness becomes apparent in later years as children are exposed to increased sensory challenges in their environments and begin to assert more independence in their activity patterns (e.g., avoiding foods or play materials; showing distress to grooming).

We also found that children with DD who presented with extreme sensory patterns during school age did not demonstrate sensory precursors in infancy. It is unclear why this would be different for the two groups. Possibilities requiring further research are that (a) sensory features emerge later in the DD group (b) children with DD present with fewer or less intense features, or (c) parents of infants with DD are more aware of unusual behaviors associated with known disabilities and more likely to make accommodations.

The lack of evidence for intense or unusual sensory seeking in the infant videos was also surprising, although one study using a parent report measure also identified fewer sensory seeking features in toddlers with ASD (Ben-Sasson et al., 2007). Sensory seeking may emerge from more typical infant repetitive behavior (Thelen, 1979) but intensifies with age, or parents may not videotape behaviors clearly unusual in appearance. We suggest that current conceptualizations of sensory seeking developed from observations with older children may not capture the nuances of sensory features during infancy.

Limitations

This study demonstrates the utility of a qualitative approach to the discovery of infant precursors of later sensory features in ASD; however, assumptions surrounding the generalizability of these findings should be interpreted cautiously given the exploratory nature of this study and the inherent methodological limitations of RVA (Baranek, 1999; Palomo et al., 2006). Difficulty controlling the variability inherent in home videos serves to further strengthen the choice of qualitative methods to gain rich insights into the nuances of early emerging sensory features in their naturalistic contexts. The current study did not consider the specific contexts in which sensory response patterns occur as differentially

influencing the quality or pattern of sensory responses. Rather, the first author reviewed the cross section of available footage for each case, which most often consisted of free play, grooming, or mealtime in the home environment, in order to determine an overall clinical impression of presenting sensory features. Future research should consider specific contexts (e.g., birthday party, free play, mealtime) as differentially influencing particular sensory response patterns. Finally, it should be noted that the first author was not blind to group assignment, which may have biased our findings.

Conclusions

This study provides evidence of the early emerging nature and individual differences in trajectories of sensory features over time. These findings suggest that practitioners need to be sensitive to a pattern of sensory hyporesponsiveness in infancy as a potential behavioral precursor of more extreme sensory patterns in children with ASD later in development. Further research is needed to more comprehensively study the emergence of sensory features within the context of daily activities for children with ASD as well as other DD, and to refine conceptual models that explicate the nuances of the developmental trajectories of sensory patterns.

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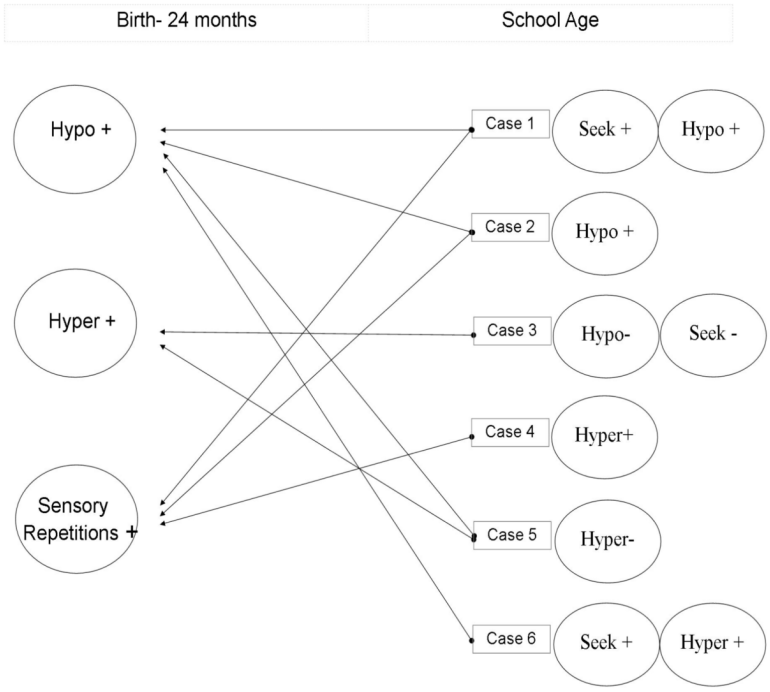

Figure 1.
Trajectory of Sensory Features – ASD group only