Circumscribed Interests in Higher Functioning Individuals With Autism Spectrum Disorders: An Exploratory Study

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Circumscribed interests are a fascinating and an under-studied phenomenon in some individuals with autism spectrum disorders (ASD). Research in this area is likely to contribute to our understanding of ASDs and to advancing developmental knowledge on learning processes used to adapt to the demands of everyday social life. This study reports on a survey of special interests in 96 children and adolescents with higher functioning ASD. The survey included listing of up to three special interests for each child, and the rating of level of interference of a given interest upon children’s activities when by themselves and when in contact with family members, peers, and other adults. This information was collected for both preschool and elementary school years. Special interests were classified into eight categories in terms of their nature (rather than topic), which included the ways through which the interest was manifest and pursued. Results indicated that circumscribed interests (a) are the norm rather than the exception in this population (75% and 88% of the sample for the younger and the older age periods, respectively), (b) most frequently involve verbal learning and memorization of facts (65% and 81% for the younger and the older age periods, respectively), (c) often involve an element of interest in letters and numbers in the preschool years (35% of the sample), (d) greatly interfere with activities pursued by oneself or with others, and (e) level of interference is predictive of lower social and communicative adaptive behavior later in life. Given the ubiquity of circumscribed interests in this population, their verbal nature, and the passion that children with ASD invest in these pursuits, we suggest the need for studies that will trace the longitudinal course of learning profiles from early childhood and possible interventions that may address these areas.

DESCRIPTORS: Asperger syndrome, autism, restricted interests, circumscribed interests

The autism spectrum disorders (ASDs) are a family of neurodevelopmental conditions marked by early-onset social and communication disabilities, challenges with imagination, and a range of restrictive behaviors and interests that range from stereotypic movements to amassing large amounts of information on circumscribed topics (Volkmar, Lord, Bailey, Schultz, & Klin, 2004). Although most of the psychological and experimental literature on the ASDs focuses on deficits in a wide range of abilities, some recent theoretical models pose that the style of learning of these individuals may also result in relative strengths within their own profile, or even in absolute strengths relative to typical peers. For example, the “weak central coherence” hypothesis (Happe, 2005) suggests that these individuals focus on isolated fragments of knowledge rather than on integrated meanings, thus accounting for their deficits in holistic or configural processing and in conceptual knowledge. By the same token, however, these individuals would be at some advantage in aspects of knowledge that require featural, fragmentated, or rote learning. Thus, they may be more accurate or faster than their typical peers at identifying simple figures embedded in more complex designs (Jolliffe & Baron-Cohen, 1997; Shah & Frith, 1993) and maybe have some advantage at learning discrete facts and rote information about a given topic (Klin & Volkmar, 1997). This would result from a learning style that is unimpeded by the normative tendency to seek configural patterns, conceptual meanings, or gist in what they learn. Whereas in typical development the trees obscure the leaves, in individuals with ASD the leaves take center stage.

This potential learning advantage in individuals with ASD has been primarily described in instances of prodigious skills, such as those exhibited by “autistic savants” (Hermelin, 2001). These are individuals who despite a degree of intellectual disabilities are capable of showing surprising accomplishments in one or more circumscribed areas such as calendar calculation, mathematics, art, or memorization of facts and information. Such feats are particularly noteworthy because they occur as islets of special ability that can be extreme. And
yet, the clinical literature on the ASDs is replete with descriptions of special interests that may not be prodigious in their own right but which otherwise dominate the mental lives of these individuals (Attwood, 2003). For them, the all-absorbing nature of these pursuits may disrupt learning in areas important for real-life adaptation and can significantly interfere with reciprocal social interaction (Klin & Volkmar, 1997). In fact, they are one of the more specific behaviors listed in the DSM-IV cluster of “restricted repetitive and stereotyped patterns of behavior, interests, and activities” (American Psychiatric Association, 2000). Within this cluster, there is some suggestion that criterion A—“encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or in focus,” might be more commonly met in higher functioning individuals with ASD (with IQ in the normative range or above) than criterion B

\[ \text{restricted repetitive and stereotyped patterns} \]

or criterion D—preoccupation with parts of objects (Klin, Pauls, Schultz, & Volkmar, 2005; Klin, McPartland, & Volkmar, 2005; Szatmari, 1991; Wing, 1981), but there are no prevalence data on this matter. And because criterion A is phrased in a rather general manner, a “pattern of interest” could range from an intense focus on patterns of sensory stimuli (e.g., color or texture of a toy) to an all-absorbing interest in a topic such as botanic nomenclature. Given that one of the greatest challenges in autism research, at both the phenotypic and the genotypic levels, is the vast variability of syndrome expression (Volkmar et al., 2004), and that the residual (and thus poorly defined) subtype of the ASDs, pervasive developmental disorder not otherwise specified (PDD-NOS), is the most prevalent of these conditions (Fombonne, 2003), more detailed information about the range of manifestations of a specific symptom cluster might contribute to the development of more refined subtyping among the PDDs. For example, some have suggested that individuals with prototypical forms of Asperger syndrome are more likely to collect facts and information about specific topics, whereas individuals with prototypical forms of autism are more likely to show special skills and become absorbed in activities such as drawing, memorization of a wide range of seemingly unconnected bits of information, calendar calculation, or other rote numerical procedures (Klin, Pauls, et al., 2005; Klin, McPartland, et al., 2005). However, the concepts of Asperger syndrome and of circumscribed interests have lacked consensual and operationalized definitions, thus impeding elucidation of these issues.

The present study aims at exploring the concept of circumscribed interests as manifest in higher functioning individuals with ASD. There are at least two pressing reasons for studies of this nature. First, most experimental research in autism has focused on attempts to identify factors accounting for the breakdown of socialization processes. In many ways, studies of how learning processes build up might be equally important in understanding the pathogenesis and natural course of the ASDs. Second, it is a matter of practical clinical and nosologic need that central features of the ASDs are explicated and empirically characterized so as to refine the operationalization of symptoms, which may in turn yield more homogeneous samples.

**Historical Background**

The four children described by Asperger (1944/1991) in his original text exhibited areas of remarkably intense interest that focused on specific topics about which they learned a great deal of information. Kanner’s (1943) contemporaneous description of autism included similar examples, although the range of activities was wider, very likely because, in some contrast to Asperger’s sample, these were children both with and without varying degrees of intellectual and language impairment. Whereas Asperger’s descriptions were more likely to involve amassing facts and information about a specific topic, Kanner’s descriptions were more likely to involve astounding memory for events, names, texts, or complex visual patterns and sequences.

Robinson and Vitale (1954) provided a rich description of the circumscribed interests of three children, which were much more reminiscent of Asperger’s descriptions than Kanner’s (1943). One child focused on chemistry, names of plants and shrubbery, nuclear fission, and corporate finance, speaking in a longwinded fashion about these topics in a manner that frequently alienated his peers. Another child was extremely knowledgeable of the local transportation system. The third one was interested in astronomy, lectured on that frequently to his classmates, and started all conversations with a leading question about the origins of the names of stars and planets. Commenting on this paper, Kanner (1954) made a direct connection to his own description of autism, adding, however, that these children did not show the preservation of sameness and were not as socially withdrawn as the original group he had described. Kanner also described how these three children used their circumscribed interests to make connections with other people, how the all-absorbing nature of these interests interfered with learning about other areas of thought, and how they interfered with these children’s ability to engage in reciprocal conversations, which in turn made it very difficult for them to make friends.

Despite these seminal and rich descriptions of circumscribed interests and their impact on social adaptation of children with autism and Asperger syndrome, this phenomenon was not empirically studied for the next 45 years.

**Recent Research on Circumscribed Interests**

Baron-Cohen and Wheelwright (1999) reported on a survey completed by parents of the content of “obsessions” or fascinations in a sample of 92 children with ASDs with a mean age of 11.2 years and a male–female
ratio of 4.75:1. Participant IQs were not reported. Their comparison group consisted of 33 children with Tourette syndrome, 7 of whom had comorbid ADHD and 9 had comorbid obsessive–compulsive disorder (OCD). The focus of this study was on the content of such obsessions. Thus, the subjects of obsessions were coded in terms of 15 categories: physics, mathematics, biology, psychology, language, taxonomy, attachments to specific objects, crafts, routines, memorization of facts, food-related activities, people, sports or games, television or video, and sensory phenomena. Individuals with ASD showed more obsessions in the realm of physics (e.g., machines, vehicles, computers, astronomy) and less in the realm of psychology (e.g., imagination, relationships, gossip, desires, beliefs) than the group with Tourette syndrome, thus corroborating the authors’ main hypothesis that the groups would differ in terms of a more pronounced fascination with “folk physics” relative to “folk psychology” in individuals with ASD. The group with ASD, however, showed “obsessions” at varying degrees, in most of the categories coded by the investigators. Although a fascination with physics was shown by 84% of their sample, they also had fascination with topics related to biology (38%) (e.g., plants, animals, nature), math (35%), taxonomy (73%) (e.g., sorting, categorizing, lists), TV/video (64%), among others. However, it was surprising that individuals with Tourette syndrome also showed “obsessions” (although to a lesser degree) in physics, in taxonomy, and had in fact significantly greater fascination with sensory phenomena (91%) relative to individuals with ASD (63%). The emphasis of this study was on the subject matter of the fascination exhibited by these individuals, and there was no attempt to more systematically address the possibility that a child’s topic of interest could be scored in several of the categories (e.g., physics, memorization of facts related to the physics topic, or making drawings related to the same topic).

A more comprehensive study of circumscribed interests was conducted by South, Ozonoff, and McMahon (2005) within the context of a broader investigation of repetitive behaviors in 40 children and adolescents with Asperger syndrome and higher functioning autism. Only the work on circumscribed interests is described here given the focus of the present study. Individuals in both clinical samples showed a wide range of special interests that were similar to each other (thus, the results are combined here). No attempt was made to categorize the interests in terms of the conceptual categorization used by Baron-Cohen and Wheelwright (1999).

The more common topics of interest were Japanese animation (22%), space/physics (20.5%), video games and Internet (17.5%), gadgets (16%), power heroes (15%), and dinosaurs (13.5%), although there was a considerable number of children interested in historical events, reading of technical manuals, reptiles and rodents, among several others. Both groups pursued these interests by reading about the topic, collecting related objects, watching TV/videos and playing video games, and rote memorization of facts.

Although there is a body of research looking at the various manifestations of repetitive behaviors in the ASDs (e.g., Szatmari et al., 2006), there remains a strong need for additional investigations specifically into circumscribed interests with greater specificity than has been carried out. The two available studies illustrate the various complexities in such investigations. In the context of the present study, an attempt was made to utilize the coding system used by Baron-Cohen and Wheelwright (1999) but acceptable interrater reliability could not be achieved. This is likely a result of the fact that in that study, a more or less a priori classification of “obsessions” was established in the format of the survey. In contrast, both in the South et al. (2005) and in the present study, an open-ended format was used, thus necessitating a system of classification to codify the answers collected. And in many cases, the same circumscribed interest can be scored in multiple categories. For example, an interest in a topic in physics will likely involve memorization of facts associated with that topic, interest in classification systems related to that topic, pursuit of video games associated with it, drawings or models made of exemplars, hoarding of items, among other possibilities. Also, the true nature of a circumscribed interest is often only revealed once more detailed information on the child’s activities related to that topic is provided. For example, a child’s interest in computers may be really an interest in memorizing computer serial numbers; a child’s interest in a historical figure may be really an interest in memorizing a very large body of facts and trivia about that person with no conceptual understanding of that person’s significance in history. The anecdotes available in the clinical literature since Asperger’s (1944/1991) and Kanner’s (1943) descriptions all point to what seems to be an unlimited number of exemplars of more or less unusual topics of fascination which, however, are pursued in rote but intense fashion without ever reaching conceptual insights that can be shared with others as hobbies or vocational avenues (Attwood, 2003; Klin & Volkmar, 2000) unless a concerted effort is made by interventionists trying to capitalize on those powerful intrinsic interests. And activities associated with that interest may be as varied as there are opportunities available to a given child. In fact, many activities of a child can be molded by the circumscribed interest, from reading to hoarding, and to shaping conversations with others to focus on that interest.

Within the context of these various challenges, this exploratory study was intended to categorize and characterize circumscribed interests in higher functioning individuals with ASD based on the nature of the interest rather than the specific content of the topic of interest. This strategy was adopted as a way of exploring the
structure and process of knowledge displayed by these children in the pursuit of their various choices of special interests. An attempt was made to measure the extent to which these interests interfere with learning of other things when the child is by him or herself or is involved in activities with family members, peers, and other adults. We also assessed the extent to which this interference predicted adaptive functioning in the communication and social domains later in life. It is well known that these interests can hamper reciprocal communication because of these children’s tendency to engage others in one-sided conversations focused on an interest that is not shared by their conversational partner. Similarly, these interests can be stigmatizing. For example, a child whose interest and speech revolve around unusual topics such as washers and dryers or deep-fat fryers will have difficulty finding peers who are interested in these topics.

An open-ended survey completed by parents was adopted for this initial study with a view not to constrain information on the range and the descriptions of special interests. As noted, the nature of a given interest can be mistakenly inferred without sufficient detail about the ways in which the topic is pursued and learned. The limited goal of the study was to establish some basic facts about the nature of circumscribed interests with a view to generate hypotheses regarding knowledge structure and the process of learning.

**Methods**

**Participants**

Ninety-six individuals (five females) with normative IQ ASDs were recruited from the Autism Program at the Yale Child Study Center who also participated in a larger investigation on the neurobiology and genetics of these conditions. The parents’ consent and the subjects’ assent were attained in accordance to a protocol approved by the Yale University School of Medicine Institutional Review Board. The mean age for this group was 14.3 years ($SD = 5.9$). Their mean full scale IQ as measured with an age-appropriate Wechsler scale (Wechsler, 1991, 1997) was 97.7 (22.1), with verbal IQ and performance IQ of 102.4 (22.3) and 92.8 (22.2), respectively. Measures of adaptive functioning using the Vineland Adaptive Behavior Scales, Expanded Edition (Sparrow, Balla, & Cicchetti, 1984) were available on all subjects. Scores on this instrument corroborate the level of severity of adaptive functioning deficits in this sample, particularly in the domain of social adaptation. For this group of children and adolescents with ASD, the mean age-equivalent score in the communication, daily living, and socialization domains were 9.36 (2.95), 7.73 (3.47), and 4.97 (2.19) years, respectively.

Diagnostic characterization included the Autism Diagnostic Interview–Revised (ADI-R; Rutter, LeCouteur, & Lord, 2003) and the Autism Diagnostic Observation Schedule–Generic (ADOS-G; Lord et al., 1999). All subjects met criteria on the ADI-R and met criteria for autism or an ASD on the ADOS-G. On the ADOS-G, the mean score in the communication cluster was 4.16 (1.61) with a range of 2–7, and the mean score in the social cluster was 9.49 (2.76) with a range of 4–14. Two experienced clinicians confirmed the diagnosis of an ASD independently. Given the complications involved in subtyping of the higher functioning ASDs (Klin, Pauls, et al., 2005; Klin, McPartland, et al., 2005), no attempt was made to investigate differences in the nature of circumscribed interests by ASD subtype. However, using the diagnostic system proposed in the study of Klin, Pauls, et al. (2005) on the nosology of Asperger syndrome, the subtyping breakdown resulted in 41 individuals with autism, 36 individuals with Asperger syndrome, and 19 individuals with PDD-NOS.

**Survey of Circumscribed Interests**

The Yale Survey of Special Interests (YSSI; Klin & Volkmar, 1996) is an open-ended questionnaire eliciting information about areas of particular interest to children with ASD and the extent to which pursuit of these interests dominate the child’s learning activities and communication with others. An interview modification of this survey was used in the report by South et al. (2005). In the present study, the original survey was completed by parents as a written questionnaire rather than as an interview. The survey is divided into four identical sections based on age ranges: preschool (ages 2–6), elementary school (ages 7–12), adolescence (ages 13–18), and adulthood (age 19 and up). Given the age distribution of the sample included in this study, only data on the preschool and elementary school ages were analyzed as there were not sufficient numbers in the older categories. Parents were instructed to complete the sections corresponding to their child’s current age and the sections for all earlier ages. For each section, parents were first asked whether their child exhibited an unusually intense interest at the corresponding age and if the response was “yes,” they were instructed to list up to three of the child’s topics of interest and provide “examples of the things the child knew or did involving this topic” (see Appendix B). Parents then completed ratings of how much of the child’s free time was spent on the topic of interest when by him or herself and how much of the child’s interaction with their family, peers, and other adults was related to the topic of interest. The ratings of interference utilized a 3-point scale that consisted of “sometimes” (less than 25% of the time), “quite a bit” (between 25% and 75% of the time), and “almost always” (more than 75% of the time).

**Coding Special Interests**

Topics of interest were coded into eight descriptive categories. Rather than focusing on the object or topic of interest, the categories were intended to capture the
nature of the child’s knowledge and interest-related behaviors as well. The categories are briefly described as follows:

1. **Facts/verbal memory and learning**: collection of facts within a system or topic involving verbal memory (e.g., makes and models of cars, lyrics of Broadway musicals, facts about the Jonestown Flood, electrical appliances);
2. **Facts and activities/visual memory and learning**: collection of facts or engagement in activities within a system or topic involving visual memory (e.g., drawing horses, designing highways out of blocks, constructing dragons out of legos);
3. **Sensory behaviors**: activities related to seeking sensory stimulation, ordering objects, or “sameness” (e.g., smashing light bulbs on the floor, lining up objects, sensing textures);
4. **Math**: memorization of numerical facts, math procedures, or fascination with abstract shapes (e.g., geometric forms, prime numbers, calculating square roots);
5. **Classifying/ordering information**: learning of classification systems or attempts at classifying or otherwise ordering information according to one or different factors (e.g., categorizing names from a school yearbook, classifying insects and reptiles according to traits, alphabetizing);
6. **Dates and time**: dates of birth, calendars, time concepts (e.g., memorizing birthdays and holidays, studying clocks or time keeping devices);
7. **Hoarding**: collection of objects (e.g., buying board games, collecting newspapers, collecting Frisbees or vinyl records);
8. **Letters and numbers**: fascination with letters, numbers, reading decoding. This category was used only for the preschool section because this phenomenon is more difficult to assess once reading emerges in these children and in typical children in elementary school years (e.g., counting forward and backward, spelling words, using toys to form letters and numbers).

These descriptive categories were deliberately designed to exclude instances of savant skills that do not relate to a topic of interest (e.g., general drawing or musical ability). Behaviors that are common in typical children (e.g., playing video games) for which the parent provided no additional information that could disambiguate their true nature were also excluded. This likely resulted in exclusion of some behaviors that might quality as a circumscribed interest in a more in-depth investigation.

Because (a) there were over 250 specific topics of interest recorded for the 96 individuals over the various developmental periods (for a sample, see Appendix A), (b) these interests could thematically overlap or could be codified in multiple different a priori categorization attempts, and (c) the way in which a given special interest evolved with time, becoming more complex and thus defying more subject-specific codification, an effort was made to capture the nature of the circumscribed interests in terms of knowledge structure and process of pursuing those interests. The system adopted here still allows for overlap in the way that a given interest is manifested, but each category represents a sufficiently distinct code that places emphasis on underlying learning processes. This was required to attain acceptable levels of interrater reliability.

**Reliability**

Two trained individuals coded the topics of interest listed by parents on the YSSI. For children who had more than one topic of interest at a given age, the coders considered all of the topics listed. Across the four age groups, *kappa* ranged from .81 to 1 and percent agreement ranged from .93 to 1. Overall, *kappa* equaled .85, with 94.66% agreement between the coders.

**Results**

**Descriptive Data and Developmental Trend**

To assess the frequency of different types of behaviors and activities related to each child’s special interests, we compared the number of individual children whose interests were classified into each category for each age group. As noted, only data referring to the preschool and elementary school years were included in this study. We found that interests involving verbal memory and learning were by far the most prevalent in the two age groups, followed by interests involving letters and numbers (among preschool age children) and interests involving visual memory and learning (see Table 1). The frequencies of all of the other categories tended to be low, particularly among the elementary school age children. These results suggest that verbal memory and learning, such as memorization and recollection of facts, is the predominant behavior associated with special interests in children with ASD.

Moreover, because the coding methods allowed for an individual child’s interests to be concurrently classified into several categories, we were able to examine the amount of overlap among categories of interests. An examination of the overlap between the categories revealed that among both preschool and elementary school children, special interests are often characterized by multiple types of behaviors associated with the topic of interest (see Figure 1). With the exception of verbal memory and learning, which was often the only characteristic observed in individual children, children’s behaviors rarely occurred in isolation. This pattern suggests that children may exhibit multiple types of behaviors associated with special interests rather than focusing on just one aspect of their topics of interest.

Examining the Venn diagrams in Figure 1, it is possible to see, for example, that for the preschool years,
37 individuals exhibited verbal memorization of facts on a given topic of interest without pursuing their interests in a different way; 21 others pursued their given interests via both verbal and visual learning and activities; 8 individuals combined verbal learning with hoarding of exemplars of that interest; and it is of interest that in 6 of the 10 cases exhibiting sensory-seeking behaviors, 6 of them sought sensory stimulation in ways that were related to special interests pursued through verbal or visual learning and memorization. Thus, special interests involving verbal memory and learning were about equally likely to occur in isolation or with other types of

<table>
<thead>
<tr>
<th>Category of Interest</th>
<th>Preschool age</th>
<th>Elementary age</th>
<th>Percentage of Sample (N = 96)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facts/verbal memory and learning</td>
<td>65.6</td>
<td>81.3</td>
<td></td>
</tr>
<tr>
<td>Facts and activities/visual memory and learning</td>
<td>22.9</td>
<td>27.1</td>
<td></td>
</tr>
<tr>
<td>Sensory behaviors</td>
<td>12.5</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Math</td>
<td>2.1</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td>Classifying/ordering information</td>
<td>0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Dates and time</td>
<td>3.1</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Hoarding</td>
<td>10.4</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>Letters and numbers</td>
<td>35.4</td>
<td>n/a</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1. (A) Venn diagram showing distribution of cases and overlap of the four most frequent categories at Preschool Age (diagram not to scale). (B) Venn diagram showing distribution of cases and overlap of the four most frequent categories at Elementary School Age (diagram not to scale).
behaviors, but other categories of special interest were very unlikely to happen without some form of verbal learning and memorization, at least for the top four categories. The predominance of verbal learning and memorization as the avenue of expression of special interests was also observed for the elementary school years.

Developmental trends were analyzed by means of the chi-square statistic comparing preschool with elementary school years. Given the frequencies obtained for the various categories of interest, comparisons were made for only the four top categories of interest. A fifth comparison involved number of overall cases exhibiting special interests. At the \( p < .05 \) level, going from preschool to elementary school years, there was a significant increase in number of individuals exhibiting circumscribed interests, as well as in the categories facts/verbal memory and learning and hoarding, \( \chi^2 = 5.90, p < .025, \chi^2 = 5.44, p < .025, \chi^2 = 4.18, p < .05, \) respectively, and a significant decrease in Sensory Behaviors, \( \chi^2 = 5.68, p < .025 \). There was no fluctuation in the facts and the activities/visual memory and learning category.

**Relationship Between Circumscribed Interests and Interference With Learning and With Interaction With Others and Developmental Trends**

Among the children with identified circumscribed interests, an attempt to measure interference with activities was made by comparing levels of interference in four different situations: (a) self-directed learning and activities and interaction with or activities involving (b) family members, (c) peers, and (d) other adults. As noted, the level of interference was crudely measured in a 4-point scale as some (less than 25% of time or occurrences; score 1), substantial (between 25% and 75% of time or occurrences, score 2), or almost all the time (over 75% of time or occurrences, score 3). In both preschool age years and in elementary school years, the level of interference was high (with group means above score 2) and stable for the two age periods across the four situations, indicating that self-guided activities and activities involving others were substantially shaped by the child’s circumscribed interest. Given the number of paired comparisons, significance level was placed at \( p < .01 \). In preschool years, there was significantly more interference in self-guided activities (\( M = 2.40, SD = 0.6 \)) relative to the other settings and comparable levels of interference in activities involving family members (\( M = 2.14, SD = 0.6, \)) peers (\( M = 2.01, SD = 0.7, \)) and other adults (\( M = 2.08, SD = 0.7, \)). Similar results were obtained for elementary school years, with significantly more interference in self-guided activities (\( M = 2.41, SD = 0.5 \)) relative to the other settings, and comparable levels of interference in activities involving family members (\( M = 2.17, SD = 0.6, \)) peers (\( M = 2.05, SD = 0.8, \)) and other adults (\( M = 2.06, SD = 0.7, \)). As noted, none of the paired comparison across the two age groups was significant, suggesting that the high level of interference across all situations remained stable during preschool and elementary school years.

**Relationship Between Interference and Adaptive Behavior**

Total interference scores were calculated by assigning a numerical value of 0 (no interference) to 3 (high interference) for each of the interference questions on the YSSS. Summing the scores for the four interference situations (activities by self, with family members, with peers, and with other adults) yielded a total interference score between 0 and 12. We were interested in whether there would be a relationship between the frequency of interference and the adaptive behaviors measured on the Vineland. Because the measurement of special interests referred to preschool and elementary school age and the Vineland measure was obtained at a much later stage, the relationship studied concerned the extent to which special interests in the preschool and the elementary school years predicted adaptive behavior in later childhood and adolescence. For the preschool years, there was a significant correlation between preschool total interference scores and age equivalents on the Socialization domain of the Vineland, \( r(75) = -.230, p = .049 \). The relationship with the communication domain of the Vineland was in the expected direction but did not reach significance (\( p = .090 \)). Thus, children whose special interests were judged to interfere with their learning and interactions with others more frequently during preschool years exhibited lower scores on social adaptation, and a trend in the same direction was obtained on communicative adaptation. For the elementary school years, there was a significant correlation between total interference scores and age equivalents on the Vineland communication domain, \( r(83) = -.244, p = .027 \), and the relationship to age equivalents on the Vineland Socialization domain approached significance, \( r(83) = -.210, p = .058 \). Thus, children whose special interests interfered with their learning and social interactions more frequently during the elementary school years displayed lower scores on communicative and maybe social adaptation as well.

**Discussion**

This exploratory study of circumscribed interests in higher functioning individuals with ASD was aimed at generating hypotheses about the nature of these phenomena, the degree of interference with self-guided and other-directed activities and experiences, the possible developmental trends, and the extent to which degree of interference might predict social and communicative adaptation in later childhood and adolescence. Despite fascinating accounts of these phenomena in the early, descriptive literature on autism and Asperger syndrome, several decades went by with no further systematic study of circumscribed interests. And to date, there have been only two studies more specifically focused on these...
symptoms despite their centrality in clinical descriptions, if not in the definition itself, of the ASDs.

Using an exploratory system to code circumscribed interests in terms of their nature and the learning processes used to pursue them, we focused on two developmental periods—preschool and elementary school years—and adopted a crude measure of deleterious interference of these interests in activities that are self-guided or which involve interaction with family, peers, or other adults.

**Frequency of Circumscribed Interests**

The more obvious by-product of this study was the documentation of frequency of circumscribed interests in this population. Indeed, of the 96 individuals in this sample, 72 of them displayed such interests during preschool years and 85 of them did so in elementary school years. Thus, it would appear that circumscribed interests are the norm, not the exception. By far, the most frequent form of special interest involved amassing facts and information through verbal learning and memory. Over two thirds of children in preschool years and over three fourths of children in elementary school years displayed such interests. About one fourth of the sample displayed interests pursued through visually based learning, memory, and activities in both age periods. Hoarding and sensory-seeking behaviors were much less frequent. Thus, verbal learning and memorization is the predominant way through which circumscribed interests are expressed. In fact, exemplars of other categories of interest were likely to involve some verbal learning and memorization aspect. This was so even in regards to some sensory-seeking behaviors, which focused on objects that were also a subject of a verbal interest. Alongside this finding is the notion that in preschool years, a third of the sample displayed fascination with letters and numbers and activities involving them. Thus, language, letters, and numbers, including reading, appear to be the most prevalent means to learn about, explore, and memorize aspects of the world that are important to these children. This is rather striking considering that there were over 250 exemplars of specific topics listed by parents.

In generating hypotheses as to why circumscribed interests are so prevalent in this population, and why the main avenue for expression of these interests is through verbal learning and memory, current theoretical approaches offer only limited explanation. The “weak central coherence” approach (Happé, 2005) would explain the rote and decontextualized nature of these interests, as well as the likely improved learning of this kind of knowledge by individuals with ASD relative to other individuals. However, it would not necessarily account for the verbal nature of the interests or for the passion with which these children embrace these interests. Baron-Cohen and Wheelwright’s (1999) notion that, in choosing topics of interest, these individuals are more likely to pick interests associated with physics or with systems in general rather than those based on people’s psychology is fully born out in our data, as not only were exemplars of special interests typically associated with aspects of the physical world, but even when they were associated with people, there was little evidence that this reflected an interest in their thoughts, feelings, or experiences. Much more likely, an interest in “people” would revolve around learning rote facts and trivia and making this center stage in self-guided and other-directed experiences.

**Interference With Other Experiences and With Outcome Measures**

The pursuit of circumscribed interests greatly impacts the activities of these children. In both preschool and elementary school years, interference was high, suggesting that 25–75% of time or occurrences within the various settings were affected or molded around the child’s circumscribed interest. Granted the crude nature of the measure used to estimate such a high level of interference, it is clear that circumscribed interests play an important role in the way that children spend their time by themselves and the nature of contact that they have with others.

Although the impact of circumscribed interests have been alluded to since Asperger’s (1944/1991) and Kanner’s (1943, 1954) original papers, little systematic attention has been devoted to understanding the possible impact of this phenomenon on shaping and determining children’s means of understanding the world around them, particularly the social world. Although verbally learned and memorized facts about people constitute one aspect of our knowledge of others (e.g., gender, age, date of birth, address, and such “factual” pieces of information), in most situations, and particularly in our daily lives when we tend to interact with familiar people most of the time, most social interactions and conversations require many other forms of learning about others (e.g., Klin, Jones, Schultz, Volkmar, & Cohen, 2002a; Klin, Jones, Schultz, & Volkmar, 2003) that cannot be reduced to this kind of information, such as processing of nonverbal cues, intentions, and attitudes. In fact, it is likely that such information should be either presupposed (e.g., when asked “What kind of a person is Elizabeth?” one adult not involved in this study replied “A woman”) or it might be irrelevant in a given situation (e.g., the person’s date of birth, the kind of car owned).

Among the four situations measured, greatest interference was found in self-guided activities when the child was alone. Even so, we suggest that the true degree of interference might not be fully known, even to parents. Although observable behaviors provide them with a sense of the content of their child’s mental activities, the child might still be thinking about or be mentally manipulating the topic of interest without any outward sign. This would be similar to a case of a prodigious child with savant skills in calendar calculation...
thoughts that result in great emotional discomfort (i.e., whereas in OCD obsessions are irrational and dreaded very distinct (Baron-Cohen, 1989; Klin & Volkmar, 1997). Obsessions and compulsions in these two conditions are not typically developing individuals invest that amount of passion and mental “currency” into their social experiences and their internalized social life and fantasies. Thus, it would appear important to fully appreciate what might be the impact of this phenomenon on the very tools of learning and adaptation of individuals with ASD. We suggest that the vast investment made by typically developing individuals in self-referenced social experiences, thoughts, and emotions is replaced with verbally learned, memorized, and manipulated topics of special interest that typically manifest in routinized behavioral or mental manipulations. Like anybody, children need to make a decision as to what they do with finite time, attention, and learning resources. For individuals with ASD, impaired social ability implies that learning through social experiences and the typical enjoyment associated with the social world are not present in the way that they are present in typical individuals. Hence, it is not surprising that they may attempt to make sense of their surrounding world through learning about special interests as it may be the means that comes to them most naturally and is most enjoyable.

Minimally, our results suggest that attempts to understand the nature and course of circumscribed interests need to take into account the level of investment or passion of these children relative to their circumscribed interests, and the possibility that they serve as an adaptive means that they avail themselves of to try and navigate the demands of everyday life.

Limitations of This Study

There are obvious limitations in this exploratory study. First, we did not compare patterns of circumscribed interests to control groups involving other populations of individuals with disabilities and typical children and adolescents. Given some evidence that special interests may also be present in typically developing children (e.g., Johnson, Alexander, Spencer, Leibham, & Neitzel, 2004), it will be important to examine the lines of convergence and divergence of such findings relative to individuals with ASD. But in this regard, in choosing a control group among other developmental or psychiatric disorders, it is important to clearly operationalize the concept of circumscribed interests. For example, the psychiatric terms “obsessions” and “compulsions” have been used in descriptions of circumscribed interests in individuals with ASD, prompting immediate comparisons with individuals with OCD. And yet, the clinical characteristics of obsessions and compulsions in these two conditions are very distinct (Baron-Cohen, 1989; Klin & Volkmar, 1997). Whereas in OCD obsessions are irrational and dreaded thoughts that result in great emotional discomfort (i.e., they are ego-dystonic), “obsessions” in individuals with ASD are beloved activities apparently associated with great positive valence. Also, whereas in OCD obsessions are typically fears that take on enormous proportions to these individuals while being only minor annoyances or concerns to others (e.g., germs, safety), in individuals with ASD “obsessions” take the form of passionate pursuit of knowledge or routines that are unusual in form and content. Thus, despite the apparent face validity of including control groups with OCD or genetically related psychiatric disorders such as Tourette’s syndrome (like in the Baron-Cohen & Wheelwright’s study, 1999), other groups might be equally relevant.

A second limitation of this study has to do with the actual methodology of collecting information about circumscribed interests, and particularly the measurement of interference of such interests in these children’s self- and other-directed activities. The survey used in this study was conceived as a clinical instrument meant to collect information about special interests from parents prior to the child’s evaluation. Parents provided some of the data retrospectively, particularly for interests at the preschool age, which may have resulted in less accurate information. Future instruments should investigate the content and nature of interests in greater depth at the time they are occurring, and measurements of interference should be more detailed and provide for much wider numerical distributions.

Clinical Examples of Circumscribed Interests and Their Impact on Learning and Social Adaptation

In many ways, the anecdotes are more fascinating than the numerical data yielded in this study of circumscribed interests. As noted, of the more than 250 exemplars, content ranged from topics of interest and activities that are also frequently exhibited by typical children (e.g., Muppets, Power Rangers, Dinosaurs, Greek Mythology), to topics that might be more typical of much older typical individuals who might specialize in a given branch of science (e.g., tsunamis, astronomy, insects, King Tut, virology, stock market), to topics that might be considered idiosyncratic in most situations at any age (e.g., deep-fat fryers, telephone pole insulators, cul-de-sacs, codes of radio stations). Regardless of how “acceptable” a circumscribed interest could be judged to be at face value, the ways in which they were pursued and the actual content of what was learned were often very atypical. Likewise, although behaviors such as learning based on verbal memory may be common in typical children, children with ASD are unusual in that they seem to dissociate verbal learning from other types of learning. Thus, whereas typical children integrate the facts they learn through verbal memory into activities such as play with other children or into a larger body of conceptual knowledge, children with ASD do not appear to do so.

From a clinical standpoint, these interests appear to anchor these children’s experiences of the world around
them quite broadly. For example, a child with a fascination with trains and whose vocabulary is rich in adjectives and descriptors of trains and locomotives tends to use the same qualifiers when asked to describe people (with no intention of using metaphor or analogy). In a way, whereas typical individuals appear to anthropomorphize the inanimate world around them (e.g., Klin, 2000), children with ASD appear to do the reverse, namely to use the concepts and reasoning processes that they have for learning about a special interest (typically about the physical world or some factual aspect of people or the social world) to try and make sense of social phenomena (Attwood, 2003; Klin & Volkmar, 1997). Some children feel very strongly about their interests in such a way that these can impact their mood and motivation in striking ways. For example, a child with interest in cul-de-sacs was profoundly despondent because he had just found out that the street that he lived in, itself a cul-de-sac, was going to be open for traffic because of a newly built connection with an adjacent road. It appeared that a core component of his self-identity (being a cul-de-sac resident) was now being taken away from him. One individual, who was fascinated with watches, clocks, and “time-keeping devices,” mentioned that he would give away his “most treasured possession [a watch] for a girlfriend” if he could. Although amusing to some, this statement reflected how badly he wanted to have a meaningful relationship. Another child who became fearful of snakes at the age of 9 years learned everything about snakes and would introduce the topic of snakes in conversation with peers and others. Given that anxiety is a frequent comorbid impairment, particularly among the higher functioning individuals with ASDs (Kim, Szatmari, Bryson, Streiner, & Wilson, 2000), the degree to which a relationship exists between the presence and the intensity of circumscribed interests and symptoms of anxiety is a question worthy of systematic exploration. Thus, circumscribed interests appear to play a multifaceted role in the lives of these children. They seem to help shape their understanding of an otherwise confusing and perplexing social world and to allay anxieties resulting from these challenging situations (see Klin, McPartland, et al., 2005). It is not surprising therefore that they become so intellectually and emotionally invested in such interests.

**Clinical and Research Implications**

In addition to the needs for detailed longitudinal designs, better instrumentation, and better measurement, there is a need for practical knowledge on how to harness this tremendous learning potential to advance social and communicative competence and adaptive behavior in individuals with ASD. A clinical literature is emerging that suggests the possibility of making use of these talents (e.g., Attwood, 2003; Klin & Volkmar, 2000) in a way that both encourages socialization and results in the child with autism being a valued member of the peer group (Baker, Koegel, & Koegel, 1998). Asperger’s (1944/1991) initial optimism that circumscribed interests would naturally transfigure into vocational opportunities (Asperger, 1979) may be possible. The key is how to accomplish it. For example, a child involved in this study had his own pseudovocabulary for his imaginary electronics contraptions and even built radios (of cardboard pieces). Several years later, he had acquired real knowledge about computers and became knowledgeable of computer programming required for gaming and other applications. With the advent of a much broader definition of autism and its wider genetic boundaries (i.e., the autism broader phenotype; Bailey et al., 1995), there is increased awareness of individuals whose success in life (e.g., in information technology or academics) resulted from highly circumscribed, but real knowledge and passionate pursuit of a given topic or area of study. Our hope would be that the same talents subserving nonadaptive pursuits such as encyclopedic knowledge of sports statistics, political geography, or botanic nomenclature might be channeled to learning that is more readily translatable into skills promoting independent living, remunerable pursuits, and meaningful employment and relationships.

**APPENDIX A**

A sample of the over 250 exemplars of circumscribed interests exhibited by the individuals with higher functioning autism spectrum disorders

<table>
<thead>
<tr>
<th>Aliens</th>
<th>Furnaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>American revolution</td>
<td>Furniture</td>
</tr>
<tr>
<td>Anime</td>
<td>Game shows</td>
</tr>
<tr>
<td>Animorphs</td>
<td>Geography</td>
</tr>
<tr>
<td>Astronomy</td>
<td>Greek alphabet</td>
</tr>
<tr>
<td>Bus schedules</td>
<td>Greek Mythology</td>
</tr>
<tr>
<td>Canals</td>
<td>Guinness Book of World Records</td>
</tr>
<tr>
<td>Catastrophic weather</td>
<td>Records</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Hotels</td>
</tr>
<tr>
<td>Chinese and Russian Dynasties</td>
<td>Hyenas</td>
</tr>
<tr>
<td>Clocks</td>
<td>Insects</td>
</tr>
<tr>
<td>Cows</td>
<td>Japanese science fiction</td>
</tr>
<tr>
<td>Deep-fat fryers</td>
<td>King Tut</td>
</tr>
<tr>
<td>Digimon</td>
<td>Lawnmowers</td>
</tr>
<tr>
<td>Dinosaurs</td>
<td>Light bulbs</td>
</tr>
<tr>
<td>Dragons</td>
<td>Logos</td>
</tr>
<tr>
<td>Eagles</td>
<td>Map drawing</td>
</tr>
<tr>
<td>Electronics</td>
<td>Military hardware</td>
</tr>
<tr>
<td>Encyclopedias</td>
<td>Name of records</td>
</tr>
<tr>
<td>Famous people</td>
<td>Numbers and locations of pay phones</td>
</tr>
<tr>
<td>Fighter aircraft</td>
<td>Power lines</td>
</tr>
<tr>
<td>Fish</td>
<td>Recycling</td>
</tr>
<tr>
<td>Food labels</td>
<td>Redrawing borders of counties in states</td>
</tr>
<tr>
<td>Frisbees</td>
<td>Shakespearean plays</td>
</tr>
<tr>
<td>Fruits and vegetables</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX A (continued)

Sharks
Skyscrapers
Smoke detectors
Space
Spiders
Sports schedules
Sports statistics
Star Trek
Star Wars
Stock market
Storm drains
Superman
Telephone pole insulators
Three Stooges
Titanic
Tools
Traffic signs

Trains
Transformers
Travel A&A books
Tsunamis
TV and radio stations
Ukuleles
US congress
US Presidents
Virology
Volcanoes
Vinyl records
Weather and meteorology
Whales
WW-II bombers
Yachts and boats
Zip codes

APPENDIX B: Sample Page from Yale Special Interests Survey

Did your child have an unusually intense interest at this age in one or two topics or activities, more so than other preschool-age children? For example, an intense interest in unusual topics such as traffic lights or telephone pole insulators; or an amazing knowledge of age appropriate topics such as dinosaurs or volcanoes that is clearly much more than other children of the same age. Topics may change over time, but the child is probably involved with only one or two at the same time. YES NO

If YES, please complete the following: 1) List the most striking topics that preoccupied your child at this age (in order of their occurrence). 2) Give brief but specific examples of the types of things your child knew or did that seemed very unusual to those who knew him/her well. 3) Answer the other questions about the amount of time the child spent related to the topic at the preschool age

Topic A: _______
Examples of the things the preschooler knew or did involving this topic:

Topic B: _______
Examples of the things the preschooler knew or did involving this topic:

Topic C: _______
Examples of the things the preschooler knew or did involving this topic:

When left by himself/herself (free time), how much time did he/she spend on the topic of special interest? (For example: reading, memorizing, drawing or talking connected to the topic)

☐ Sometimes (less than 25% of the time)
☐ Quite a bit (between 25%–75% of time)
☐ Almost always (more than 75% of time)

How much of your preschool child’s interaction and conversation with his/her own family was related to the topic of special interest? (Followed by same 3 response choices shown above)

How much of your preschool child’s interaction and conversation with peers/friends was related to the topic of special interest? (Followed by same 3 response choices shown above)

How much of your preschool child’s interaction and conversation with other adults (such as when meeting new people or with parents’ acquaintance) was related to the topic of special interest? (Followed by same 3 response choices shown above)

References


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