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Understanding Differences in Neurotypical and Autism Spectrum Special Interests Through Internet Forums

Chloe Jennifer Jordan and Catherine L. Caldwell-Harris

Abstract

Special interests are frequently developed by individuals with autism spectrum disorder, expressed as an intense focus on specific topics. Neurotypical individuals also develop special interests, often in the form of hobbies. Although past research has focused on special interests held by children with autism spectrum disorder, little is known about their role in adulthood. The current study investigated differences in the content, number, and specificity of the special interests held by adult individuals with autism spectrum disorder and neurotypical individuals, using Internet discussion forums as a data source. Quantitative analysis of forum posts revealed significant differences between the diagnostic groups. Individuals with autism spectrum disorder reported having more interests in systemizing domains, more specific interests, and a greater number of interests overall than neurotypical individuals. Understanding special interests can lead to the development of educational and therapeutic programs that facilitate the acquirement of other important social and communication skills.

Key Words: *autism spectrum disorder; Asperger syndrome; special interests; Internet discussion forums; adults*

Special Interests in Autism Spectrum Disorder

Autism spectrum disorder (ASD) is characterized by abnormalities in social communication, social interaction, and repetitive behaviors (American Psychiatric Association, 2000). ASD has also been described as a “neurological variation,” which includes different sensory perception, a need for consistency, and atypical learning styles, language expression, and social behavior (Autism Self Advocacy Network, 2011). Among individuals with high-functioning autism and Asperger syndrome, repetitive behaviors frequently manifest as an intense focus on specific topics pursued with intensity (Asperger, 1991; Attwood, 2003; Bodfish, Symons, Parker, & Lewis, 2000). Interviews revealed that these interests range from the atypical (deep-fat fryers, toilet brushes), to those that are unusual in the intensity of their circumscribed focus (frogs, World War I biplanes, *Star Wars*), to topics that overlap with the hobbies of typically developing children, such as trains, horses, swimming, role-playing games, and sculpting (Winter-Messiers,

2007). Traditionally, special interests among those with ASD were considered to be repetitive behaviors; we propose that interests are qualitatively different from repetitive behaviors and indeed lie on a continuum with the focused interests of scientists, college professors, collectors, hobbyists, and others.

Several terms have been used to describe the interests developed by individuals with autism. *Restricted interests* is a term used by the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV-TR; American Psychiatric Association, 2000) to describe one component of the repetitive behaviors that occur in autism. *Circumscribed interests* refer to interests focusing on an inclusive topic, such as World War I biplanes (e.g., Attwood, 2003; Sasson, Elison, Turner-Brown, Dichter, & Bodfish, 2011), whereas *obsessions* describe the intense nature of autism spectrum interests (e.g., Baron-Cohen & Wheelwright, 1999). These latter terms have been more frequently used to describe the interests of low-functioning individuals. Following Winter-Messiers (2007), Bashe and Kirby (2001), and the Autism Self Advocacy Network (2011; ASAN), we

use the term *special interests* because it does not prejudice the extent of topic restriction and it is also the term most frequently used by ASD individuals themselves on the discussion forums analyzed in the current study. Similar terms have been used by other prominent members of the autism community. For example, Jackson (2002) coined the term *speciality subject* in describing special interests, and Grandin (2011) emphasizes the importance of finding a child's "area of strength" (p. 16), which can be cultivated into important skills that can even serve as the basis for a career. Such terminology promotes a strength-based understanding rather than the historically deficit-focused framework. The ASAN (2011) describes special interests as "narrow but deep," resulting from highly focused thought patterns. Individuals with high-functioning autism and Asperger syndrome posting on Internet discussion forums often describe the intensity of their interests as "almost an addiction" and that they have the ability to "spend hours reading and talking about them" to the extent that they "feel in love when engaging in an obsession."

Past studies have focused on the role of special interests in youth with autism (e.g., Baron-Cohen & Wheelwright, 1999; Winter-Messiers, 2007). Interests can develop as early as 2–3 years of age and are usually manifested in efforts to collect objects and information relevant to the interest topic (Bashe & Kirby, 2001). Special interests are primarily developed by individuals with high-functioning autism or Asperger syndrome, with over 99%–100% of individuals with Asperger syndrome reporting one or more special interests (Bashe & Kirby, 2001; Bodfish et al., 2000). However, special interests have also been reported among low-functioning individuals with autism (Bartak & Rutter, 1976), as well as individuals with pervasive developmental disorders (PDDs) other than Asperger syndrome or high-functioning autism, including PDD not otherwise specified (PDD-NOS; Sturm, Fernell, & Gillberg, 2004) and Rett syndrome (Mazzocco et al., 1998). The intensity associated with special interests has led some researchers to suggest that such interests may serve as precursors to the remarkable skills displayed by individuals with savant syndrome (e.g., Heaton & Wallace, 2004).

Special interests often reflect the heightened and exceptional abilities that are unique to ASD, such as *systemizing*, which is the drive to analyze, explore, and construct a system (Baron-Cohen, Richler, Bisarya, Gurunathan, & Wheelwright,

2003). Systemizable domains, which are characterized as predictable and amenable to rule-extraction and outcome prediction, are heavily represented in the special interests of children with autism, such as those that involve mechanical, technical, and factual details (e.g., Attwood, 2003; Baron-Cohen & Wheelwright, 1999). Perceptual features of an object, such as high spatial frequency, may also dispose that object to becoming the focus of a special interest (DeLoache, Simcock, & Macari, 2007), an observation that is consistent with the finding that individuals with ASD have heightened attention to detail (Frith, 2003).

The emergence of special interests has also been explained as a result of social deficits and lack of salience attributed to social information (Carruthers, 1996; Sasson, Turner-Brown, Holtzclaw, Lam, & Bodfish, 2008). Sasson and colleagues (2008) found that children with ASD demonstrated circumscribed attention while viewing a visual array, manifested as decreased exploration, decreased gaze time at social objects such as faces, and increased gaze time at objects that are frequently the subject of ASD special interests ("high-autism-interest" stimuli) such as trains, vehicles, and electronics. The exploration of a visual array of nonsocial objects by individuals with ASD correlated with the severity of social impairment, suggesting that a relationship between social ability and special interests exists.

Little research currently exists on special interests in adulthood. Among adults with Asperger syndrome, special interests may focus on specific concepts, such as computers, media, and art, and most adults hold interests in more than one area (Bashe & Kirby, 2001). DeLoache and colleagues (2007) suggested that the development of adult interests may depend on the degree of social acceptability that is experienced for childhood interests. Consistent with this suggestion, Winter-Messiers (2007) observed that individuals with ASD are often hesitant to discuss a special interest, out of fear of peer ridicule or rejection. If an interest is socially acceptable, as is often the case for high-functioning individuals, parents, caregivers, and peers can provide support, thus effectively shaping children's interests in socially approved directions.

Neurotypical Special Interests

Following Attwood (1998), we use the term *neurotypical* to refer to individuals who do not have ASD. Neurotypical (NT) children also develop

intense interests, which emerge primarily between 1–2 years of age and last 22 months on average (DeLoache, Simcock, & Macari, 2007). Special interests in NT children are less frequent than in children with ASD. In the study by DeLoache and colleagues (2007), about 30% of typically developing children exhibited an intense interest, whereas over 90% of individuals with ASD develop special interests (Attwood, 2003).

Although systemizing is the drive to analyze and construct systems, *empathizing* refers to the motivation to understand other peoples' mental states and the ability to predict an individual's behavior and respond appropriately based on that understanding (Baron-Cohen & Wheelwright, 2004). The special interests of NT children tend to focus on domains that are most accessible via empathizing, such as interests in people, imaginative play, and the social environment more broadly (Attwood, 2003; DeLoache et al., 2007). Consistent with the "extreme male brain" hypothesis of autism (Baron-Cohen, 1999), the interests of NT boys are more similar to those of children with ASD than to NT girls' interests. Among NT children, boys more frequently hold interests in systemizable domains such as vehicles, trains, and machines, whereas girls reported more interests in pretend play, imagination, dress-up, and other stereotypically female topics that are more amenable to empathizing (DeLoache et al., 2007). Boys were also twice as likely as girls to develop an "extremely intense interest" (DeLoache et al., 2007).

Importance of Understanding Special Interests

Special interests are often sources of enthusiasm and pride for individuals with ASD (Winter-Messiers, 2007) and serve to reduce stress and anxiety (Attwood, 2003). The expertise attained in areas of special interest can lead to employment (Attwood, 2003; Grandin & Duffy, 2008). Although preoccupation with special interests can be a burden on parents, Winter-Messiers (2007) reported that deficits in communication and social interaction were reduced when children with ASD engaged in discussion about their interest (Winter-Messiers, 2007).

The few existing studies have focused on special interests in children, and thus, little is known about their role in adulthood. Understanding special

interests in adulthood is important in illuminating the positive role that interests play in adult life. This is especially important for those with ASD, because the expertise attained in areas of special interest can lead to unique skills and rewarding careers (Attwood, 2003; Grandin & Duffy, 2008; Jackson, 2002). The current study will examine the content, number, and specificity of special interests in adults, as reported by both NT individuals and individuals with ASD on public Internet discussion forums. Discussion forums represent a novel source of autobiographical data, as ASD participants on such forums are able to weave a personal narrative without requiring the resources of traditional publishing facilities. Utilizing discussion forums for data collection allows researchers to learn from individuals with autism themselves, without the risk of influencing participant responses. This may provide a more enriched understanding of the interests of individuals on the autism spectrum as well as of the NT population, and it may aid in promoting a strength-based view of special interests and ASD more broadly.

Following Baron-Cohen and Wheelwright (1999), we expect the interests held by individuals with ASD will be primarily in systemizing domains, such as machines and technology, information and mechanical systems, and the sciences. In contrast, NT interests are likely to lie in domains that function as mechanisms for socializing and rely on empathizing ability, such as interests in people, sports, belief systems, history and culture, and the creative arts. We also expect that adults with ASD will report a larger number of interests on average and have interests of higher specificity, as observed in children by Bashe and Kirby (2001).

Methods

Data Collection

Special interests were collected from posts on WrongPlanet.net, a popular online discussion forum used by individuals with ASD. Created in 2004, WrongPlanet forums now have over 36,131 unique members who have collectively made, at this writing, over 2,816,964 posts, indicating a large and very active discussion board (Plank, 2010). Special interests of NT individuals were collected from a separate popular online general discussion forum, GoLiveWire.com. LiveWire forums were created in 2000 and now have over 237,340 active members who have made several million discussion

posts (Jones, 2010). The ASD and NT discussion forums were identified through a Google Internet search using the criteria “Asperger autism discussion forums” and “teen and college discussion forums,” respectively. The WrongPlanet and LiveWire Web sites were selected because they were the first and largest boards listed in the Google search results. Sampled discussion forums were public and did not require a subscription or personal account to be viewed.

Collection criteria required that the post include language about specific interests or obsessions. Relevant posts were identified using the Web sites’ search query options with the criteria “interests,” “hobbies,” and “obsessions.” For example, discussion threads returned by the WrongPlanet search query included the titles “What is your special interest?” and “Likes and hobbies.” Examples of discussion threads returned by the LiveWire search query included “My current obsessions” and “What are your interests and hobbies?” Posts were sampled from discussion topics that had been created within 1 year of the date of data sampling. If listed in a public user profile, the individual’s age, diagnostic category, and gender were recorded to ensure that the ASD and NT samples were comparable. Although it was not possible to determine whether individuals with ASD or other disorders frequented the sampled NT discussion board, the LiveWire Web site includes subforums designed specifically for individuals with ASD and those with other disorders or health issues, such as a “Living with Disability” forum and a “Teen Depression and Emotional Imbalance” forum; these were excluded from data collection. Similarly, it was not possible to verify the diagnoses reported by individuals on the ASD discussion board; however, recent research on Internet forum user profiles indicates that most users accurately describe themselves online (Back et al., 2010). Individuals on the forums were unaware of our research at the time of data collection.

Because no interaction occurred between researchers and forum posters, this study was deemed not to involve human subjects research and was thus exempt from further review by the Boston University Charles River Campus Institutional Review Board. Clearly, caution must be exercised to avoid violating individuals’ privacy, and we followed the recommendations of Brownlow and O’Dell (2006) and Seale, Ziebland, and Charteris-Black (2006) by only analyzing public

forums and not referring to user names or other identifying information.

Measures

Interest categories. Interests were coded into 18 categories derived from the Cambridge University Obsessions Questionnaire designed for people with ASD (Baron-Cohen & Wheelwright, 1999). We reviewed the collected data to ensure the categories included in the Obsessions Questionnaire encompassed all the interests reported on the forums. If a sizable proportion (> 5%) of the reported interests did not fall into any of the existing Obsessions Questionnaire categories, a new category was agreed on by coders and was added to the coding scheme. Interest categories of nature, history and culture, and psychological disorders were thus added to the coding scheme. The existing category of plants was included under the broader nature category. The categories of item attachment and item collection were collapsed into a single category because many individuals who reported attachment to specific objects also reported collecting the objects. Similarly, the categories of creative arts and crafts were collapsed into the overarching creative arts category. The category of numerical systems was collapsed into the factual information category, because interest in numerical systems was often expressed as fascination with statistical and trivial information, which can be considered as interests in facts. The spinning objects interest category was excluded because no individuals expressed this type. The 18 special interest categories in our study were defined as shown in Table 1.

Four coders labeled each reported interest into one of the 18 categories. Coders were volunteer undergraduate students and were unaware of the age, gender, and diagnostic category of the individual who wrote the post. Interrater agreement on the categories of special interests was 93%, confirming the integrity of the coding criteria.

Google search frequency and total number of interests. The Google search frequency (expressed as logarithm values) of each reported special interest was recorded using Query Google (Ma, 2007). Interests consisting of multiple-word phrases were entered into Query Google surrounded by quotation marks. Individuals’ described interests were also modified when necessary to reflect the nature of the actual interest; for example, an interest

Table 1
Descriptions of the 18 Special Interest Categories

Category	Description
Machines and technology	Computers, radios, television, clocks, etc., or expresses interest in how things work, not including watching or listening to movies, television, music, etc.
Information and mechanical systems	Plumbing, light switches or electrical wiring, maps, city planning, subway maps and/or schedules, businesses and organizations, etc., or an interest in creating systems (such as languages or maps).
Sorting, categorizing, and organizing	Making lists, lining objects up, arranging objects in certain orders or categories, planning, or obsession with neatness or organization.
Belief systems	Religions or mythologies, political systems, philosophies, alternative beliefs (such as conspiracy theories), etc.
Sports and games	Football, tennis, walking, biking, tennis, playing cards, chess, board games, puzzles, video games, etc.
Factual information	Reading or memorizing lists; reading encyclopedias, dictionaries, newspapers, etc.; or memorizing statistics and trivial information.
Sensory	Touching or feeling certain things, or mentions fascinations with texture, specific sounds, lighting, colors, smells, etc.
Creative arts	Movies, television shows, artwork, painting, playing an instrument, music, writing and reading fiction, creating media (e.g., online films), performing arts, knitting, sewing, carpentry, etc.
Sciences	Astronomy, chemistry, biology, physics, engineering, mathematics, logic, economics, psychology, meteorology, specific diseases or conditions, etc.
Animals	Pets, wild or farm animals, insects, fish, birds, etc., also includes animal-related activities (e.g., bird watching), but not mythical creatures.
Nature	Plants, interacting with nature (e.g., hiking, gardening, exploring, etc.), and natural phenomena (e.g., volcanoes, tsunamis, lightning, etc.).
Item attachment	Focusing on a particular item or type of object, as well as certain words or phrases, or expresses interest in acquiring collections of particular items (e.g., bottles, keys, caps, stamps, rocks, etc.).
People	A particular person, in types or groups of people, or in interacting with people, including participation in online communities.
Vehicles	Trains, airplanes, buses, boats, cars, etc.
Food and drink	Consuming or creating a particular food or drink, cooking, baking, etc.
History and culture	Existing languages, particular countries or civilizations, time periods or eras in history, etc.
Psychological disorders	Expresses interest in any psychological disorder.
Other	Interests that did not fit within a specific category.

in *House*, the television show, was entered into Query Google as “House TV” to ensure that a frequency corresponding to the television show was obtained. Google search frequencies were collected to characterize special interests as either common/general or infrequent/specific. A high Google search frequency generally indicated an interest that was common and broad, such as “movies,” whereas a low Google search frequency may indicate an

uncommon or specific interest, such as a specific movie title. The total number of interests reported by each individual was also recorded.

Participants (Forum Posters)

Of the NT individuals sampled ($n = 213$), the mean age was 24.1 years (range = 14–41, $SD = 11.1$). The male to female ratio was 14:25 (68 male, 121 female, 24 unreported). Of the individuals with

Table 2
Mean and Maximum Number of Interests Identified in Each Special Interest Category for NT Individuals and Individuals with ASD

Category	Average no. of interests per category		Maximum no. mentioned		Statistical comparison		Percentage with at least one interest	
	ASD	NT	ASD	NT	Mann-Whitney, z stat	Significance (p)	ASD	NT
Sciences	0.39	0.04	5	3	−5.67	.001	20.4	2.8
Psychological disorders	0.13	0.00	2	0	−5.39	.001	12.8	0
History and culture	0.36	0.06	7	3	−5.22	.001	21.8	4.7
Belief systems	0.34	0.05	7	3	−4.91	.001	17.1	2.8
Animals	0.15	0.01	3	1	−4.69	.001	13.3	1.4
<i>Sports and games</i>	<i>0.24</i>	<i>0.52</i>	4	6	−4.20	<i>.001</i>	<i>17.5</i>	<i>35.2</i>
Information and mechanical systems	0.12	0.01	3	1	−3.97	.001	9.5	0.9
Machines and technology	0.25	0.06	7	2	−3.64	.001	16.6	5.6
<i>Food and drink</i>	<i>0.05</i>	<i>0.12</i>	4	2	−2.90	<i>.010</i>	3.8	<i>11.3</i>
Vehicles	0.09	0.04	2	2	−2.29	.050	8.5	3.3
People	0.21	0.25	5	4	−1.47	n.s.	15.6	21.6
Sensory	0.03	0.02	1	2	−1.01	n.s.	2.8	1.4
Creative arts	1.12	0.99	9	7	−0.66	n.s.	54.5	51.6
Factual information	0.06	0.07	1	1	−0.57	n.s.	5.7	7
Nature	0.08	0.07	3	2	−0.54	n.s.	5.2	6.6
Item attachment	0.18	0.19	3	3	−0.43	n.s.	14.2	16
Sorting, categorizing, and organizing	0.02	0.03	1	2	−0.33	n.s.	1.9	2.3

Note. Italicized categories are those for which the neurotypical (NT) posters mentioned significantly more interests than the autism spectrum disorder (ASD) posters. n.s. = not significant.

ASD ($n = 211$), the mean age was 25.5 years (range 14–72, $SD = 9.5$). Although NT and ASD individuals ranged in age from teenagers to adults, the number of teenagers in the sample was few in number and did not significantly differ from young adults in reported interest categories. The male to female ratio was 1:1 (106 male, 105 female). Note that posts were not selected for gender; rather, the 1:1 ratio reflects the average gender ratio of posters on social networking Web sites, which is 47% male and 53% female (Pingdom, 2009). Of the individuals with ASD, 58% ($n = 123$) reported having been diagnosed with Asperger syndrome (AS), whereas 24% ($n = 51$) judged themselves to have AS although they had never received an official diagnosis; 11% ($n = 23$) reported not being sure whether they had an ASD, and 7% ($n = 14$) reported being diagnosed with an ASD other than Asperger syndrome.

Results

For each category of special interest, we compared number of interests reported by ASD and NT individuals. We also analyzed the total number of interests reported by each individual, and the mean log Google search frequency of each individual's reported interests.

The number of interests reported in each category appear in Table 2, listed in order of how strongly they differed between the ASD posters compared to the NT posters. The Mann-Whitney U test for independent samples revealed that 10 of the 17 interest categories differed significantly between the groups. Two of these 10 interests that were more frequently mentioned by NT individuals—sports and games—were mentioned by 35% of NT individuals and by only 17% of ASD individuals. Food and drink were mentioned as interests by

Table 3
Differences in Log Google Search Frequency and Total Number of Interests Between NT Individuals and Individuals with ASD

Variable	ASD <i>M (SD)</i>	NT <i>M (SD)</i>	<i>t</i> (422)	η^2
Log Google Search Frequency	16.8 (2.6)	17.7 (1.9)	4.3*	.04
Total Number of Interests	3.9 (4.2)	2.6 (2.1)	-4.1*	.04

Note. ASD = autism spectrum disorder; NT = neurotypical.

**p* < .001.

11% of NT individuals but by only 4% of ASD individuals. In contrast, ASD individuals mentioned more interests than did NT individuals in the categories of sciences, history and culture, belief systems, animals, information and mechanical systems, machines and technology, and vehicles. The strongest difference (as indicated by the size of z statistic) was for sciences; 20% of ASD individuals mentioned an interest in science whereas only 3% of NT individuals did so. In the psychological disorders category, individuals with ASD reported having more interests than NT individuals, however, this occurred because the majority of interests in psychological disorders were of autism spectrum disorders (24 of 28 interests), reported by individuals in the ASD diagnostic categories.

Table 3 shows that the interests of NT individuals had higher Google search frequencies on average than the interests of individuals with ASD. For example, one NT individual reported an interest in the television show *Sex and the City*, which produced a log Google search frequency of 8.1, representing the data point for that individual's interest. An individual with Asperger syndrome reported an interest in the television show *Happy Tree Friends*, corresponding to a log Google search frequency of 7.5, indicating a markedly more specific interest. Individuals with ASD also reported having, on average approximately four interests, whereas neurotypicals reported having, on average, between two and three interests (see Table 3).

Discussion

The aim of the current study was to determine how the content, number, and specificity of the special interests held by teenagers and adults with ASD differed from NT teenagers and adults. Consistent with previous studies on children with ASD (e.g., Bashe & Kirby, 2001), adults from the ASD forums

expressed a greater number of interests than NT individuals.

Qualitative observations of individuals with Asperger syndrome have found that their interests often reflect their cognitive strengths. Science, machines and technology, and information and mechanical systems have been identified as the domains most amenable to systemizing (e.g., Baron-Cohen & Wheelwright, 1999). Interests in these systemizing domains are common among children with ASD, whereas interests in people, culture, and the arts are less frequent (Attwood, 2003; Winter-Messiers, 2007). The special interests of NT children in general also appear to reflect cognitive strengths, focusing on domains that are most accessible via empathizing, such as interests in people (Attwood, 2003; DeLoache et al., 2007). In the current study, adults with ASD reported having more interests in sciences, history and culture, animals, information and mechanical systems, belief systems, machines and technology, and psychological disorders. NT individuals reported more interests in sports and games. Individuals with ASD reported having more interests overall and expressed interests with a lower average Google search frequency than NT individuals.

Given the observation that NT individuals have higher empathizing ability (Baron-Cohen & Wheelwright, 2004), we expected interests collected from the NT discussion forums to occur more often in the sports and games, belief systems, history and culture, people, and creative arts categories, which may be more amenable to empathizing than to systemizing. As predicted, NT individuals expressed more interests in sports and games compared to individuals with ASD. Sports and games can serve as medium for social bonding among NT individuals (e.g., Mueller, Agamanolis, & Picard, 2003) and are thus an interest category that relies on some empathizing ability. Individuals with ASD may be less

motivated to pursue sports and games interests because of reduced social motivation and decreased empathizing ability relative to NT individuals. Alternatively, it might be expected that sports would be attractive to individuals with high-systemizing ability and greater attention to detail because of game rules and the associated team and player statistics. However, sports and games interests are stereotypically treated as neurotypical and socially normative—as Jackson (2002) writes, “When is an obsession not an obsession? When it is about football”—although such interests may share a similar degree of intensity with those of individuals with ASD.

Although NT individuals did report more interests in sports and games than individuals with ASD, our expectations regarding the other neurotypical interest categories were not confirmed. Individuals with ASD reported more interests than NT individuals in belief systems and history and culture. Contrary to our predictions, this finding has the potential to expand current understanding of what constitutes a systemizable domain. For example, the belief systems category, which included philosophical and political systems, could be amenable to systemizing because these types of systems can be highly rule-governed. Furthermore, belief systems may be particularly attractive to individuals with high-systemizing ability because of the cognitive drive to explore and construct systems. Consistent with this notion, individuals with ASD identifying as religious were more likely to construct their own religious belief systems compared to NT individuals (Caldwell-Harris, Murphy, Velazquez, & McNamara, 2011). Interests in history and culture may likewise be attractive to individuals with heightened systemizing ability and attention to detail due to a high level of detail in these categories in the form of specific historical events and dates.

We did not observe a difference in the number of people interests between NT individuals and those with ASD. This may be a result of a higher desire to socialize among individuals with ASD who participate in online communities, compared to the general ASD population. Some individuals with autism are reported to experience anxiety in face-to-face conversations (e.g., Happé, 1991; Mitchell, 2003). The use of online communication can circumvent these anxieties and allow individuals with autism to express themselves more comfortably (Jordan, 2010). Wing and Gould (1979)

discuss subtypes of autism, one of which consists of a group of individuals who desire social interaction but who experience difficulty achieving rewarding communication because of anxiety. The individuals from the ASD forums may be in this group, fulfilling a desire for social interaction online and concurrently circumventing the anxiety of real-life conversations. This explanation accounts for interests in people in numbers comparable to the NT group. The proposal that posters from the ASD forums constitute a specific subgroup may be the reason that we found no group differences in sorting and categorizing, an interest domain very strongly associated with the ASD cognitive and behavioral profile. Future research could determine whether sorting and categorizing are interests that are more representative of lower-functioning ASD individuals, as suggested in Baron-Cohen’s (2009) discussion about the nature of systematizing.

Individuals posting on the ASD forum also displayed interests in creative arts at levels comparable to individuals posting on NT forums, contrary to our expectations. We anticipated that interests in creative arts would be less attractive to individuals with ASD because the arts are not governed by clear rules that are amenable to systemizing (Simonton, 2009). One explanation for our finding that ASD and NT individuals reported similar levels of interests in creative arts is that the primary group difference in the creative arts category lies in the specificity of the interest, rather than the general content. For example, one NT individual reported creative arts interests in playing guitar, which has a log Google search frequency of 8.3. An individual with ASD reported creative arts interests in playing the mandolin, which has a log Google search frequency of 6.8, indicating it is a less common interest. In this example, although the NT and ASD individuals’ interests were in the same category, the ASD interest was less common than the NT interest.

The interests of individuals with ASD had lower Google search frequencies than the interests of NT individuals. A high Google search frequency generally indicates a high frequency, common interest, or a broad, nonspecific interest category. Conversely, a low Google search frequency indicates a less common interest or a more specific interest. For example, a broad interest in “computers” corresponds to a log Google search frequency of 8.4, whereas the specific interest in “G1 Heatseeker Transformers” corresponds to a log

Google search frequency of 4.1. Our finding that individuals with ASD have interests of a lower Google search frequency, and thus may be more specific, is consistent with previous research suggesting that high specificity is a characteristic of the special interests of children with autism (Attwood, 2003; Sasson et al., 2011; Winter-Messiers, 2007). The finding that ASD interests had lower Google search frequencies than NT interests could also suggest that individuals with ASD may be choosing interests that are less common or less popular than interests chosen by NT individuals. This interpretation is consistent with Bodfish's (2009) suggestion that individuals with ASD are less likely to use their interests as a medium for socializing, because uncommon interests are less effective in initiating or sustaining social interactions. One NT forum user wrote, "[My interest is] theatre ... you become close to the people involved even if you had never met them before; it's good socially." Recognizing the social value of common interests, an individual with ASD described modifying his interests to be more socially normative: "[W]ithin the last two years I have taken a new interest in cars ... it helps me talk more too because computers are too geeky and socially unacceptable, but it's cool to talk about cars." The latter quote also reflects the desire to engage in meaningful social interactions, expressed by many ASD forum members. Although some interests, such as a type of instrument, may be more common to specific cultures, many individuals with ASD pride themselves on holding different, even unusual interests. As Grandin (2011) writes, "every person with autism is unique," and while autism holds many challenges for the diagnosed individual and family, it also offers "great talents and unique abilities" that should be nurtured and celebrated.

Use of Internet Forums in Research

The use of online forum posts as a medium for data collection is an innovative technique that offers both benefits and limitations. Large-scale communities of individuals with ASD congregate on Internet discussion boards, where special interests are a frequent conversation topic. Using these discussion boards as a research resource allows access to a large, ecologically valid data sample. Individuals are prompted by their peers and are responding from a familiar setting such as their own home, which may facilitate more accurate and detailed assessments of

individuals' interests because of a reduction in the anxiety experienced in face-to-face interactions and unfamiliar environments.

One limitation of collecting data from online forums is that there is no way to verify that users on the ASD forums are on the autism spectrum or that users on the NT forums are indeed neurotypical. However, prior work has fruitfully analyzed Web sites created by parents of children with autism and on chat groups for individuals with ASD without verification of an autism diagnosis (see discussion in Brownlow & O'Dell, 2006; Fleischmann, 2004, 2005). In our study, those who reported having ASD showed significant differences on each variable from NT individuals, and the observed differences accorded with our hypotheses and with existing literature on special interests. This is consistent with the report of Back et al. (2010) that most users of online forums accurately describe themselves.

Another limitation is that we analyzed postings of individuals who are on the high-functioning end of the spectrum, although special interests occur in both low- and high-functioning individuals with autism (Bartak & Rutter, 1976). Our results are thus primarily generalizable to individuals with good social, verbal, and computer skills. More information about the likely characteristics of individuals who frequent WrongPlanet.net comes from a survey we conducted following the reported forum analysis. We recruited survey respondents from WrongPlanet.net and obtained 70 individuals who self-reported an ASD diagnosis, with 96% of them labeling themselves as having Asperger syndrome (Jordan & Caldwell-Harris, 2011). These respondents had higher scores than did our NT sample on the autism quotient (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001) and the systemizing quotient (Baron-Cohen et al., 2003). The ASD scores in that study were generally beyond the suggested cutoff range for people with Asperger syndrome. Although these are not the same individuals as studied in the current forum analysis, they were from the same discussion forum, and it is thus plausible that many of the individuals whose posts we analyzed also had elevated autism quotient and systemizing quotient scores.

Overall Clinical and Research Implications

Understanding the nature and development of special interests offers considerable therapeutic

value. The importance of special interests for individuals with ASD is illustrated in many posts on the reviewed discussion forums; as one user wrote, “[My interests] don’t control me; they define me.” Special interest expertise can serve as springboards for rewarding and successful careers (Attwood, 2003; Grandin & Duffy, 2008; Robison, 2008). Individuals on the ASD discussion boards often demonstrated the opportunities their special interests provided them by writing posts such as, “I’m a singer, and I’m getting a scholarship for it” and “I am able to incorporate it [my interest] into most of my activities. If things go well, I’d like to turn pro.” Special interests can also serve as a basis for companionship among individuals with ASD who have interests in common (Attwood, 2003), and the comparison of neurotypical and autism spectrum interests may promote tolerance for individual differences more broadly.

Our finding that the interests reported by adults with ASD were more specific, more numerous, and more frequently in systemizing domains than the interests of NT individuals suggests that defining characteristics of special interests in adulthood are similar to those occurring in childhood. Special interests offer manifold benefits for both individuals with ASD and NT individuals. Unfortunately, special interests are also frequently obsessive and time-consuming (Attwood, 2003) and can alienate an individual from peers (Frith, 1991). Families of individuals with ASD often find obsessive special interests difficult to accommodate (Mercier, Mottron, & Belleville, 2000). Clinicians and family members thus need to better understand the origin and function of special interests. Although the prevailing explanation for special interests has focused on their function in reducing anxiety, our findings in conjunction with observations reported by Attwood (2003), Baron-Cohen and Wheelwright (1999), and Winter-Messiers (2007) suggest differences in cognitive abilities, such as systemizing and empathizing, may lead to the development of interests of varying content and specificity. Family members of individuals with ASD can benefit from an explanation of special interests as existing on a continuum that depends on individual cognitive abilities, as this promotes a strength-based model of interests rather than the prevailing deficit-focused model (Winter-Messiers, 2007). Understanding special interests may also help families in accepting interests that appear to be obsessive.

In children, special interests may impede development because of their time-consuming nature (Attwood, 2003). By developing an understanding of adult interests, new methods of treatment and education can be developed to utilize special interests as channels for learning, facilitating development in other areas such as language and communication. For example, one individual on the forums reported nine interests, including an interest in urban planning, which was categorized under the information and mechanical systems category. His reported interests had an average log Google search frequency of 18.3. This individual’s interests were thus relatively specific and were categorized in highly systemizable domains. A tailored educational program for this individual might introduce material related to his interests that is similarly systemizable and specific, then it can progressively introduce topics that are closer toward the mid-range of the continuum, helping the individual develop other desirable skills. Special interests can additionally serve as scaffolding for shaping social behaviors, as interests shared between individuals can facilitate social interactions and engagement in an interest can be used as a reward (Attwood, 2003). The more numerous interests found in individuals with ASD may also provide more options for introducing educational material, as there are several domains with which to relate new material and broaden individual achievements in a general education curriculum. An understanding of special interests, on both the neurotypical and autism spectrum, can be used to encourage the development of unique skills and abilities that will ultimately improve an individual’s quality of life, by focusing on cognitive strengths and celebrating individual differences.

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