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Challenging Stereotypes: Sexual Functioning of Single Adults with High Functioning Autism Spectrum Disorder

E. Sandra Byers · Shana Nichols · Susan D. Voyer

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Abstract This study examined the sexual functioning of single adults (61 men, 68 women) with high functioning autism and Asperger syndrome living in the community with and without prior relationship experience. Participants completed an on-line questionnaire assessing autism symptoms, psychological functioning, and various aspects of sexual functioning. In general participants reported positive sexual functioning. Participants without prior relationship experience were significantly younger and more likely to be male and identify as heterosexual. They reported significantly higher sexual anxiety, lower sexual arousability, lower dyadic desire, and fewer positive sexual cognitions. The men reported better sexual function than did the women in a number of areas. These results counter negative societal perceptions about the sexuality of high functioning individuals on the autism spectrum.

Keywords Sexuality · Autism spectrum disorder · Asperger syndrome

Introduction

Sexuality is important to most people, part of their self-concept, and an important aspect of their healthy development and overall adjustment (Laumann et al. 1994; SIECUS 2010). Yet, researchers have paid relatively little attention to the sexual functioning of individuals with disabilities in general, and individuals with autism spectrum disorder (ASD) in particular (Aylott 2000; Caruso et al. 1997). This is especially true about individuals with autism (HFA) and Asperger syndrome (AS). This is because almost all of the published studies on ASD and sexuality are characterized by one or more methodological limitations including: small samples; relying on reports of caregivers; focusing on problematic behaviors; excluding individuals with the highest social and sexual functioning by sampling only individuals highly involved with the developmental disabilities or mental health systems; and, confounding the effects of ASD with those of developmental delay by including individuals with intellectual impairments. Thus, the goal of the current study was to investigate how single adults with HFA/AS living in the community experience their sexuality. According to the World Health Organization (2006), sexual health is not restricted to the absence of sexual problems and inappropriate sexual behavior. It also includes positive emotional, psychological, and social sexual functioning. Therefore, we assessed a broad range of positive and negative aspects of the sexual experiences of individuals with HFA/AS including their sexual knowledge, sexual behavior engaged in alone, sexual behavior with a partner, sexual cognitions, sexual affect, and sexual response. Collectively, we refer to these multiple dimensions of sexuality as sexual functioning.

ASD and Relationship Experience

Traditionally it has been assumed that individuals with ASD are not able to form long-term romantic relationships or marry (Engström et al. 2003; Seltzer et al. 2004).

E. S. Byers (✉) · S. D. Voyer
Department of Psychology, University of New Brunswick, P.O. Box 4400, Fredericton, NB E3B 5A3, Canada
e-mail: byers@unb.ca

S. Nichols
Fay J. Lindner Center for Autism, Bethpage, NY, USA

Present Address:
S. Nichols
ASPIRE Center for Learning and Development, Melville, NY, USA

However, many individuals with HFA/AS do desire and enter romantic relationships (Hellemans et al. 2007; Hénault 2005; Renty and Roeyers 2007). Yet, the deficits associated with ASD are likely to affect romantic and sexual functioning for a number of reasons (Howlin et al. 2000; Orsmond et al. 2004; Renty and Roeyers 2007; Tarnai and Wolfe 2008). First, individuals with ASD, including those with HFA/AS, typically have impairments in their social interactions and communication; they also present with repetitive and stereotyped interests and behaviors (American Psychiatric Association 1994; Howlin et al. 2000; Mehzabin and Stokes 2011; Stokes and Kaur 2005). Social interactions, communication, and social thinking are essential for understanding, developing, and maintaining close interpersonal relationships. Second, many individuals with ASD have internalized the social stereotypes and attitudes that have cast individuals with ASD as asexual, undesirable, and uninterested in romantic relationships (Caruso et al. 1997; Hénault 2005; Koller 2000). Third, many individuals with ASD have a history of negative social interactions with peers starting in childhood and continuing into late adolescent and young adult efforts to form romantic attachments (Aylott 2000; Barnhill 2007). Impairment in social interactions and communication, internalization of societal stereotypes, and repeated negative interpersonal experiences are likely to adversely affect the quality of romantic relationships, particularly for those individuals with more symptoms. However, researchers have not examined whether the extent of autism symptomatology impedes the ability of individuals with HFA/AS to form romantic relationships. Therefore, our first goal was to determine whether single individuals with HFA/AS with more autism symptoms are less likely to have relationship experience.

To do this, we compared two groups of single individuals with HFA/AS: those who had been in at least one romantic relationship of 3 months or longer in the past (relationship experience group); and, those who had never been in a romantic relationship of 3 months or longer (no relationship experience group). We also compared the groups on their demographic characteristics (i.e., age, gender, education, employment status, religiosity, sexual identity) and overall psychological functioning. We expected that the relationship experience group would have better psychological functioning and fewer autism symptoms than the no relationship experience group (H1).

Relationship History and Sexual Functioning

The second goal of this study was to describe the sexual functioning of single individuals with HFA/AS. We found only three published studies that directly examined any aspects of sexual functioning of individuals with HFA/AS. Gilmour et al. (2012) found that their sample of 72 individuals with ASD did not differ from their control sample in sexual experience. In contrast, Mehzabin and Stokes (2011) compared 21 young adults with HFA/AS to 39 typically developing youth and found that individuals with HFA/AS reported less sex education/sex knowledge and less sexual experience. Hénault and Attwood (2005) surveyed 26 individuals with AS and found that sexual experience, symptoms, affect, and body image were two standard deviations below the general population norm. Scores related to sexual information and sexual satisfaction were one standard deviation below the population norm. However, participants reported a high level of desire, positive attitudes toward sexuality, and a rich and varied fantasy life (comparable to the general population). Although these results are suggestive, they need to be replicated given the very small sample size. Furthermore, none of these researchers compared the sexual functioning of individuals with and without relationship experience.

There are at least two reasons why individuals who have never been in a romantic relationship are likely to report poorer sexual functioning than would individuals with relationship experience. First, individuals who have more negative attitudes and feelings about sexuality would be less likely to enter into and/or maintain a romantic relationship. Second, being in a romantic relationship provides the opportunity to learn and maintain new skills as well as to develop greater self-awareness and self-confidence related to sexuality. Indeed, among typically developing individuals, people with better relationship functioning tend to report better sexual functioning (Christopher and Sprecher 2000; Lawrance and Byers 1995; MacNeil and Byers 2005). Therefore, we expected that HFA/AS individuals with relationship experience would report better sexual functioning than would those with no relationship experience (H2).

Gender and Sexual Functioning

Society is, in general, more accepting of male sexuality and sexual expression than of female sexuality (Byers 1996). According to the traditional sexual script, men are expected to be highly motivated to engage in sexual activity as well as be agentic in sexual situations (e.g., by initiating sexual activity at every opportunity); in contrast, women are expected to have few sexual needs and to be sexually reluctant and unassertive. In addition, male sexual pleasure and experiences are perceived as enhancing men's reputations whereas female sexual pleasure and experiences are considered to be negative qualities (Byers 1996; Crawford and Popp 2003; Lawrance et al. 1996). Research has supported these gender differences in sexual experience. For example, in their recent meta-analysis, Petersen and Hyde (2010) concluded that among neurotypical men and women, men have more experience with masturbation, and

various partnered sexual activities, pornography and on-line sexual activity (OSA) as well as more permissive sexual attitudes, less sexual fear/anxiety/guilt, and higher sexual satisfaction (see also Baumeister et al. 2001).

A review of the literature revealed only one study that directly compared the sexual functioning of men and women with HFA/AS. Gilmour et al. (2012) compared 55 women and 17 men on the extent of their sexual experience and found no difference. However, the results may have been affected by the small number of men in the sample. In addition, Hénault and Attwood (2005) reported means separately for the 19 men and 9 women in their study but did not compare them statistically; likely due to the small sample size. Nonetheless, based on research with neurotypical individuals, we expected that the men would report better sexual functioning than would the women (H3). In addition, based on a sexual script that puts more limitations on female than on male sexuality outside the relationship context, we expected that the differences in sexual functioning between individuals with and without relationship experience would be greater for women than for men (H4).

The Current Study

The overall goal of this study was to provide information about the relationship experience and sexual functioning of single adults with HFA/AS living in the community. We assessed a wide range of aspects of sexual functioning including sexual knowledge, sexual behavior (solitary, dyadic, and OSA), sexual problems, and cognitive-affective sexual factors (sexual thoughts, sexual desire). All participants scored above the cut-off score (32 or greater) for ASD on the Autism Spectrum Quotient (AQ) recommended by Woodbury-Smith et al. (2005) as resulting in the lowest rate of false positives. We included both individuals who had and who had not received a professional diagnosis because many adults with HFA/AS have never received a professional diagnosis (Barnhill 2007). Diagnosis has traditionally focused on children and only recently have professionals become more inclusive in diagnosing ASD to include individuals who are highly verbal and bright. It is likely that many adults with HFA/AS were not identified as having an ASD during childhood and do not seek a professional diagnosis as an adult because of the cost.

Method

Participants and Procedure

Following ethical review, we contacted approximately 190 national and international autism organizations including professional organizations, professionals who serve clients with ASD, online ASD-related message boards, and support groups to ask for their assistance in recruiting potential participants. A flyer detailing information about the study was provided to each organization or professional. The flyer recruited participants for an Internet study titled *Sexual Well-Being of High-Functioning Adults with Autism Spectrum Disorders*.

Once participants accessed the website, they first read an informed consent page describing the purpose of the study, procedures, potential benefits and risks, confidentiality, and contact information for the researchers. Participants who agreed to participate were linked to an identification number page and the survey. Participants were given an identification number to record or print in order to allow the option of exiting early and returning later. They then completed a screening question that assessed their relationship history. Participants who indicated that they were currently in a romantic relationship or were not in a current relationship but had been in 1 of 3 months or longer in the past completed one set of questionnaires; only the individuals who were currently single were of interest in the current study. Participants who had never been in a relationship of 3 months or longer completed an overlapping yet somewhat different set of questionnaires. In total, 282 single individuals started one of the two surveys. Of these, 153 were dropped from the sample: 17 did not indicate their age or their reported age was younger than 21; 74 did not meet the autism screening cut-off (AQ score of 32 or greater out of 50); 4 did not report their gender or were transgender; and, 58 failed to finish the survey. Participants who did and did not complete the survey did not differ significantly on gender, age, or current relationship status.

Participants first completed the Background Information Form followed by the AQ, Sexual Knowledge Questionnaire, and Sexual Cognitions Checklist (SCC). The remaining measures (including some not relevant to the current study) were then presented in random order. They finished with a debriefing page that explained the purpose of the study and provided further resources on sexuality including suggested websites and books.

The final sample consisted of 61 men and 68 women who ranged in age from 21 to 73 years ($M = 35.3$ years). Most (61 %) reported that they had been diagnosed by a medical or mental health professional. We conducted a 2 (Professional Diagnosis: yes/no) × 2 (gender) MANOVA to determine whether participants with and without a professional diagnosis of ASD differed in their AQ scores. Individuals with a professional diagnosis reported significantly greater symptoms than did individuals without a professional diagnosis, although the difference was small (M's = 40.1 and 38.6, respectively), $F(1, 125) = 4.13$, $p < .05$, $\eta^2 = .03$. We also examined whether individuals

with and without a professional diagnosis differed on the sexual functioning variables. Neither the main effect for Professional Diagnosis nor the interaction was significant.

The sample was largely Caucasian (91 %) and highly educated (54 % had completed an undergraduate or graduate degree). Most participants were living in the United States (47 %), Australia/New Zealand (16 %), United Kingdom (14 %), Europe (13 %), or Canada (9 %). In terms of living situation, 27 % were living with their parents, 21 % with a roommate, and 43 % alone. In terms of sexual identity, 58 % self-identified as heterosexual and 42 % as a sexual minority (15 % as gay, lesbian or homosexual, 9 % as bisexual, 12 % as unlabeled, and 5 % as unsure.)

Measures

None of the measures we used had been validated specifically on individuals with ASD. Therefore, we examined all of the items in order to identify any that might be confusing to this population. We made changes to a small number of items by adding clarifications or expanded definitions. These changes are detailed below. We also examined the internal consistency of each scale in order to identify any bad items for this sample; none were identified.

Nonsexual Measures

The *Background Information Form* assessed demographic information including gender, race/ethnicity, age, education, importance of religion in their life (rated on a 7-point scale ranging from *not at all important* to *very important*), geographic region of residence, living situation, employment status, sexual identity, sexual attraction to men and/or women (on a 7-point scale recoded to range from exclusively same-sex attraction to exclusively other sex attraction), and relationship status. Responses to three of these questions were dichotomized for data analysis including education (less than university/university or greater), employment status (not employed/employed), and sexual orientation (heterosexual/sexual minority). The Background Information Form also included a question about the source of their ASD diagnosis.

Participants completed the 50-item AQ (Baron-Cohen et al. 2001). The AQ is a 50-item self-report questionnaire assessing autistic traits in adults with average intelligence. It consists of 10 items in each of five domains: social skills, attention to detail, communication, imagination, and attention switching. Responses are given on a 4-point Likert scale (strongly agree to strongly disagree) and then dichotomized to indicate presence or absence of the symptom. Responses were summed to yield possible scores ranging from 0 to 50, with higher scores indicating greater symptomatology. In keeping with the recommendation by Woodbury-Smith et al. (2005) to minimize false positives, only participants with a total score of 32 or greater were included in the study. Woodbury-Smith et al. reported good discriminative validity and good screening properties for the AQ using this cut-off score (sensitivity is .77, and specificity .74). The AQ had adequate internal consistency in the current study ($\alpha = .61$).

The *Depression, Anxiety, and Stress Scales-21* (Antony et al. 1998) were used to assess overall psychological functioning. Participants responded to 21 statements about their mood and anxiety (e.g., *I felt that I wasn't worth much as a person; I felt I was close to panic*) on a 4-point scale ranging from *did not apply to me* (0) to *applied to me very much or most of the time* (3). Scores range from 0 to 63, with higher scores indicating poorer psychological functioning. The authors have provided evidence for the reliability and validity of the scale ($\alpha = .92$ in the current study).

Sexuality Measures

The *Sexual Knowledge Questionnaire* is a 23-item true–false questionnaire that was created for the current study in order to assess knowledge of, and misinformation about, aspects of sexuality that could affect sexual well-being (e.g., *It is not emotionally healthy to masturbate every day; The clitoris is a very sensitive area of female genitals*). Correct responses were summed such that scores could range from 0 to 23 with higher scores reflecting greater sexual knowledge.

The short form of the *Sexual Arousability and Sexual Anxiety Inventory* (Hoon et al. 1976) consists of 14 items that describe different sexual situations. We added two items that are likely to be particularly relevant to individuals with ASDs: *When your partner touches you lightly* and *When you are in close physical contact with your partner*. In addition, we changed *pornographic* to *erotic* on two items and added *touches* in parentheses after the term *fondles* in one item. On the arousal scale, participants indicated how sexually aroused they feel or think they would feel in the 16 situations (e.g., *when you have intercourse with a partner*). Responses ranged from *adversely affects arousal; unthinkable, repulsive, distracting* (−1) to *always causes sexual arousal; extremely arousing* (5). On the anxiety scale, participants indicated how anxious they feel or think they would feel in the same 16 situations. Responses ranged from *no anxiety* (0) to *always causes anxiety, extremely anxiety producing* (5). Ratings were summed such that possible scores range from −16 to 80 on the Sexual Arousability scale and from 0 to 80 on the Sexual Anxiety scale. Hoon and Chambless

(2011) reported high test–retest reliability and good construct validity ($\alpha = .93$ for sexual arousability and .94 for sexual anxiety in the current study).

The 14-item *Sexual Desire Inventory* (Spector et al. 1998) assesses the frequency and intensity of sexual desire in different situations (e.g., *when you are in a romantic situation*). Eight items refer to desire for sexual activity with a partner and were summed to form the Dyadic Desire Scale with scores ranging from 0 to 62. Three items refer to desire to engage in solitary sexual activity and were summed to form the Solitary Desire Scale with scores ranging from 0 to 23. Spector et al. (1998) reported high internal consistencies and provided evidence for the scale's validity ($\alpha = .93$ and .86, respectively, in the current study).

The *Sexual Activity Questionnaire* [adapted from the Brief Index of Sexual Functioning for Women (Taylor et al. 1994)] assessed the frequency with which respondents have engaged in the following sexual behaviors with a partner during the previous month: kissing, hugging and cuddling, whole body contact, touching breasts and genitals, oral sex, vaginal intercourse, and anal intercourse. Responses are provided on a 7-point scale ranging from *not at all* (0) to *more than once a day* (6). Most participants reported never having engaged in any of these activities in the previous month. Therefore, responses were dichotomized into a measure of Dyadic Sexual Activity (no/yes). Participants also indicated the frequency with which they *masturbated or engaged in pleasurable stimulation of their own genitals alone* in the previous month on a 7-point scale ranging from *not at all* (0) *to more than once a day* (6). This item was used as the measure of Solitary Sexual Frequency.

The *Sexual Functioning Questionnaire* (Renaud and Byers 2001) measures the frequency of nine sexual problems (e.g., *I have trouble getting sexual aroused*) within the last year on a scale from *never* (1) to *always* (5). Scores range from 9 to 45, with higher scores indicative of more frequent sexual problems. The authors report evidence for the scale's internal consistency and validity ($\alpha = .84$ in the current study).

The *Sexual Cognitions Checklist* (SCC; Renaud and Byers 2011) lists 57 possible sexual thoughts (e.g., *having sex with an anonymous stranger, receiving or giving genital stimulation*). We elaborated on three items: *mouth-genital stimulation* was added in parentheses after *oral sex* on two items; and, *having many casual sexual relationships* was added in parentheses after *being promiscuous*. Participants reported how often they have experienced each sexual cognition as positive on a scale ranging from *I have never had this thought* (0) to *I have this thought frequently during the day* (6). Positive cognitions were defined for participants as thoughts that the participant experienced as acceptable, pleasant, and the type of thought he or she would expect to have (i.e., egosyntonic). Items were summed to create a total score for Positive Cognitions, with possible scores ranging from 0 to 342. Renaud and Byers (2011) provide evidence for the reliability and the validity of the scales ($\alpha = .97$ in the current study).

We used the 7-item *Online Sexual Experience Questionnaire* (Shaughnessy et al. 2011) to examine participants' experience with OSA by themselves (4 items, e.g., *watched sexually explicit videos/photos on-line alone*) and with a partner (3 items; e.g., *engaged in a conversation with someone* via *computer typing/microphone in which you share sexual fantasies*). Participants rated the frequency with which they had engaged in each behavior during the past month on a 6-point Likert scale, ranging from *never* (0) to *once a day or more* (5). We collapsed across response options to account for the positive skew in the data. Thus, responses were recoded into *never* (0), *once* (1), and *more than once* (2). The seven items were summed to create an overall frequency of OSA score, with possible scores ranging from 0 to 14. Shaughnessy et al. have demonstrated that the scale has acceptable internal consistency and provided evidence for the scale's validity ($\alpha = .73$ in the present study).

Results

Of the 129 participants, 53 (41 %) reported that they had never been in a romantic relationship of 3 months or longer (no relationship experience group) and 76 (59 %) reported that they were not currently in a romantic relationship but had been in at least one in the past (relationship experience group). We used a one-way MANOVA to investigate whether the groups differed in their demographic characteristics (gender, age, education, importance of religion, employment status, sexual attraction, sexual identity, ASD symptomatology, and psychological symptoms (H1). The analysis was significant, $F_{mult}(9, 119) = 4.86$, $p < .001$, $\eta^2 = .269$. Follow-up ANOVAs indicated that the groups differed on gender, age, and sexual identity but not on their sexual attraction, education, religiosity, employment status, ASD symptomatology, or psychological symptomatology. Participants in the no relationship experience group were significantly more likely to be male (36 % female vs. 64 % male) whereas participants in the relationship experience group were significantly more likely to be female (64 % female vs. 36 % male). In addition, participants in the no relationship experience group were significantly younger (M age = 30.0 vs. 38.8) and more likely to identify as heterosexual (70 vs. 50 %). Overall, participants reported significant ASD symptomatology ($M = 39.5$, $SD = 4.3$) and low psychological symptoms ($M = 27.4$, $SD = 13.6$). In order to determine whether individuals' self-identified

sexual orientation was representative of their sexual attraction, we correlated sexual orientation with sexual attraction. The two variables were significantly correlated, indicating that people who self-identified as a sexual minority were reported greater attraction to individuals of the same gender, $r = -.73$, $p < .000$. Only 45 % of the sample identified themselves as exclusively attracted to the other gender; the remainder identified as having at least some attraction to both men and women.

Sexual Functioning

In order to characterize the sexual functioning of our sample, we examined the scale means (see Table 1). On average, participants showed good sexual knowledge, answering about 81 % of the questions correctly. In terms of sexual behavior, most participants (79 %) had not engaged in any sexual activity with a partner in the previous month but on average had masturbated between once and three times per week and engaged in on-line sexual activities between never and once in the previous month. In terms of cognitive-affective factors, on average participants reported *possibly* to *sometimes experiencing* sexual anxiety and *sometimes* experiencing sexual arousal from the various activities, moderate desire for partnered and solitary sexual activities, and having each of the sexual thoughts *once or twice ever*. On average, participants reported having experienced sexual problems *rarely* to *sometimes* in the previous month.

Examination of the zero-order correlations among the sexuality variables indicated that most (with the exception of sexual knowledge) were correlated in the expected direction (see Table 1). For the most part, sexual identity and sexual attraction were not associated with sexual functioning with the exception that individuals with a heterosexual identity reported significantly greater dyadic desire and fewer sexual problems; individuals reporting greater attraction to the other gender reported greater solitary sexual desire and fewer sexual problems.

We examined whether the men and women in the two relationship groups differed in their sexual functioning using a 2 (gender) × 2 (group) MANOVA with the 10 sexual functioning variables (Sexual Knowledge, Sexual Anxiety, Sexual Arousability, Solitary Desire, Dyadic Desire, Solitary Sexual Frequency, Dyadic Sexual Activity, OSA Frequency, Sexual Problems, Positive Sexual Cognitions) as dependent measures. In keeping with predictions (H2 and H3), the main effects for group and gender were significant, $F_{mult}(10, 116) = 2.90$, $p = .003$, $\eta^2 = .20$ and $F_{mult}(10, 116) = 8.75$, $p < .001$, $\eta^2 = .43$, respectively. Contrary to H4, the interaction was not significant. Follow-up ANOVAs indicated that, compared to the relationship experience group, the no relationship experience group reported significantly higher sexual anxiety, lower sexual arousability, lower dyadic desire, and fewer positive sexual cognitions (see Table 2). The groups did not differ in their sexual knowledge, solitary desire, frequency of solitary, dyadic, or OSA, or frequency of sexual problems.

Follow-up ANOVAs to the gender main effect indicated that the men and women differed significantly on all of the sexual functioning variables except Sexual Knowledge and Dyadic Sexual Activity (see Table 3.) Compared to the men, the women reported significantly higher sexual anxiety; lower sexual arousability, solitary desire, and dyadic desire; less frequent solitary and OSA, and positive sexual cognitions; and, more frequent sexual problems.

Discussion

This study contributed to the literature by providing information about how single men and women with HFA/AS living in the community experience their sexuality across a wide range of positive and negative domains. These included sexual knowledge, sexual behavior (solitary, dyadic, and OSA), sexual problems, and cognitive-affective responses. In general, the individuals who participated in our study showed good sexual functioning. These results counter the pervasive societal perception that individuals with ASD, especially those who are not in a relationship, are asexual and/or express their sexuality primarily in problematic ways (Caruso et al. 1997; Hénault 2005; Koller 2000). The results also challenge prevalent assumptions that individuals with ASD are not able to maintain romantic relationships by showing that, at least in our sample, even most single individuals with HFA/AS (59 %) have been in at least one romantic relationship lasting 3 months or longer at some point in the past.

Although both individuals with and without relationship experience were on average in their 30's, the no relationship experience group was significantly younger. This is in keeping with findings that individuals with ASD are delayed in their social development (Bauminger et al. 2008; Rao et al. 2008). Thus, it is possible that many of these individuals will develop a romantic relationship at some time in the future. This interpretation is also consistent with our finding that the two groups did not differ in their psychological functioning (i.e., both had low psychological symptoms) or extent of ASD symptoms. That is, contrary to predictions, we did not find evidence that lack of relationship experience was due to psychological factors and/or skill deficits, suggesting it may be a developmental issue.

Sexual Functioning

Our results demonstrate that single individuals with HFA/AS who are living in the community experience positive

Table 1 Zero-order correlations among the sexual functioning variables and sexual identity

Variables	*M* (*SD*)	1	2	3	4	5	6	7	8	9	10	11
1. Sexual knowledge	18.52 (2.26)											
2. Sexual anxiety	27.37 (19.59)	−.20*										
3. Sexual arousability	35.58 (20.88)	−.07	−.30***									
4. Solitary desire	12.64 (6.64)	−.07	−.23*	.45***								
5. Dyadic desire	33.93 (17.30)	−.09	−.23*	.68***	.51***							
6. Solitary sexual frequency	3.39 (1.77)	−.02	−.19*	.53***	.69***	.57***						
7. Dyadic sexual activity	.21 (.41)	−.01	−.29**	.16	.07	.19*	.09					
8. OSA frequency	2.79 (3.01)	−.14	−.11	.35***	.44***	.36***	.47***	.09				
9. Sexual problems	22.27 (7.38)	−.15	.31***	−.37***	−.14	−.38***	−.29**	−.07	−.12			
10. Positive sexual cognitions	68.94 (50.80)	−.11	−.13	.50***	.49***	.56***	.53***	.07	.55***	−.05		
11. Sexual identity	–	.04	.12	−.12	.14	−.23**	−.07	.08	−.00	.21*	.05	
12. Attraction to other gender	5.29 (2.17)	−.01	−.11	.10	−.17	.19*	−.02	−.08	−.03	−.21*	−.09	−.73***

Table 2 Sexual functioning of individuals with and without relationship experience

Sexual functioning variables	No relationship experience group *M*	Relationship experience group *M*	*F*(12, 112)	η^2
Sexual knowledge	18.9	18.3	3.84	.03
Sexual anxiety	30.2	25.4	3.93*	.03
Sexual arousability	35.0	36.0	4.65*	.04
Solitary desire	12.1	13.0	3.68	.03
Dyadic desire	33.1	34.5	5.65*	.04
Solitary genital frequency	3.7	3.2	.01	.00
Dyadic sexual activity	.2	.3	2.72	.02
OSA frequency	3.1	2.5	.41	.00
Sexual problems	21.6	22.7	.00	.00
Positive sexual cognitions	60.2	75.0	11.16***	.08

$N = 53$ in the no relationship experience group and 76 in the relationship experience group

* $p < .05$; ** $p < .01$; *** $p < .001$

solitary sexual functioning for the most part. For example, despite concerns that individuals with ASD have less sexual knowledge because of social isolation and failure to receive the appropriate sexual health education at home or at school (Aylott 2000; Barnhill 2007; Hénault 2005; Koller 2000; Nichols and Blakeley-Smith 2010), our participants showed good sexual knowledge. This is important because our measure of sexual knowledge assessed information that could directly affect sexual functioning. Nonetheless, sexual knowledge itself does not appear to be sufficient for positive sexual functioning since it was not correlated with most of the sexual functioning variables. Participants reported a moderate desire for solitary sexual activities. Further, as in research with neurotypical populations (Laumann et al. 1994; Renaud and Byers 1999; Shaughnessy et al. 2011), on average our participants masturbated between one and three times a week and had each of the sexual thoughts and engaged in on-line sexual activities fairly infrequently. Participants' frequency of solitary sexual activity, including OSA, appears to

Table 3 Men's and women's sexual functioning

Sexual functioning variables	Men *M*	Women *M*	*F*(11, 113)	η^2
Sexual knowledge	18.2	18.8	3.44	.03
Sexual anxiety	24.9	29.6	4.88*	.04
Sexual arousability	45.5	26.7	42.89***	.26
Solitary desire	14.8	10.7	16.58***	.12
Dyadic desire	42.0	26.7	42.24***	.25
Solitary genital frequency	4.3	2.6	37.39***	.23
Dyadic sexual activity	.3	.2	2.5	.02
OSA frequency	4.5	1.3	44.26***	.26
Sexual problems	20.4	23.9	7.71**	.06
Positive sexual cognitions	89.6	50.4	31.20***	.20

$N = 61$ men and 68 women

* $p < .05$; ** $p < .01$; *** $p < .001$

represent an avenue of non-problematic sexual expression in that it was not so frequent that it is likely to interfere with other aspects of their lives.

As expected, we found that sexual expression with a partner was more adversely affected than was solitary sexual activity. That is, despite on average reporting moderate desire for dyadic sexual activity, most of our participants had not engaged in any sexual activity with a partner (including kissing and touching as well as sexual intercourse) in the previous month. These results are in keeping with Byers et al.'s (2012) finding that sexual frequency among individuals with HFA/AS is largely determined by the availability of a partner. Similarly, Hénault and Attwood (2005) found that their participants had had little sexual experience with a partner in the previous 2 months and Mehzabin and Stokes (2011) found that their participants reported less lifetime sexual experience than did the normative sample. It may be that many of our participants were not strongly motivated to find a partner given their moderate desire for dyadic sexual activity, some sexual anxiety, and only moderate levels of sexual arousability. Indeed, participants with greater sexual anxiety were significantly less likely to have engaged in dyadic sexual activity. In contrast, higher dyadic desire was associated with lower sexual anxiety, higher sexual arousability, greater solitary and dyadic sexual frequency, more frequent sexual thoughts, and fewer sexual problems. For others, the social skills deficits associated with HFA/AS may make it difficult for them to establish and maintain sexual and romantic partnerships even when motivated to do so (Barnhill 2007; Orsmond et al. 2004; Renty and Roeyers 2007; Tarnai and Wolfe 2008). If so, it appears that these deficits do not typically result in problems with the sexual response; participants reported few sexual problems.

Relationship Experience and Sexual Functioning

As predicted individuals without relationship experience showed poorer sexual functioning than did those with relationship experience in several areas. This included higher sexual anxiety, lower sexual arousability, lower desire for sexual activity with a partner, and fewer positive sexual thoughts (although not more sexual problems). It may be that some of the individuals in the no relationship experience group were less interested in entering a romantic relationship because of their lower level of dyadic desire and arousability. If so, solitary sexual activities provide an alternative outlet for sexual expression. Indeed, the two groups did not differ in their desire for or frequency of solitary activity and/or frequency of engaging in OSA. This suggests that the individuals who had no relationship experience were not less sexual per se, just less interested in engaging in sexual activity with a partner, possibly because of the sensory issues associated with ASD for some individuals (e.g., undersensitivity and tactile defensiveness). Alternately, the lower desire of individuals in the no relationship experience group may be a result of their significantly higher levels of sexual anxiety and lower levels of sexual arousability. Indeed, examination of the zero-order correlations indicates that dyadic desire was negatively correlated with sexual anxiety and positively correlated with sexual arousability. That is, individuals with higher sexual anxiety and who expect dyadic sexual activity to be less pleasurable may be less likely to enter into a romantic relationship. For these individuals, an intervention that reduced their sexual anxiety might help them feel comfortable in engaging in sexual activity with a partner should they choose to do so. In turn, being in a romantic relationship might provide the opportunity to learn new skills, develop more self-confidence related to sexuality, and increase pleasure and arousability associated with sexual activities.

Gender and Sexual Functioning

We found a number of gender differences that are consistent with traditional gender roles that cast men as relationship initiators and prescribe greater sexual interest in and social acceptance of male sexuality than female sexuality (Byers 1996). For example, whereas participants with no relationship experience were also almost twice as likely to be male than they were to be female, the reverse was true for individuals with relationship experiences. This may be because it takes more skills and confidence to initiate a relationship (the male role) than to respond to an initiation (the female role). Thus, it may be more difficult for men with HFA/AS to initiate and thus form a romantic relationship. Also in keeping with traditional gender roles, the men reported better

sexual functioning than did the women across a wide range of sexual domains, although the men and women were equally likely to have engaged in dyadic sexual activity and did not differ in their sexual knowledge. Specifically, the women reported higher sexual anxiety, lower sexual arousability, lower desire for solitary and dyadic sexual activity, less frequent solitary sexual activity and OSA, fewer positive sexual thoughts and more sexual problems. These findings demonstrate that the gender differences found with neurotypical individuals (Baumeister et al. 2001; Petersen and Hyde 2010; Renaud and Byers 1999, 2001; Nicolosi et al. 2004; Sanchez and Kiefer 2007; Shaughnessy et al. 2011; Spector et al. 1998) also characterize this group of individuals with HFA/AS. This is important because, with the exception of Gilmour et al. (2012), there has been little or no research examining gender differences in any aspect of sexual functioning among individuals with ASD. Contrary to predictions, we found no differences in the magnitude of gender differences for individuals with and without relationship experience. This suggests that relationship experience is not sufficient to counter the gender-specific messages related to sexuality.

Sexual Orientation and HFA/AS

The results extend previous research by providing information about the percentage of individuals with HFA/AS who identify as being attracted to both genders and as a sexual minority. Specifically, 30 % in the no relationship experience group and 50 % in the relationship experience group identified as gay, lesbian, homosexual, bisexual, unlabeled, or unsure. An even greater percentage (55 %) indicated that they had at least some level of attraction to both men and women. This is significantly greater than the rates found in the general population (Mosher et al. 2005; Tjepkema 2008). Similarly, Gilmour et al. (2012) found that their sample of individuals with ASD living in the community scored significantly lower on measures of heterosexuality and significantly higher on measures of bisexuality and homosexuality than did the neurotypical control group. These results are in keeping with anecdotal information from practitioners that indicates that many individuals with HFA/AS identify gender as less relevant than characteristics of the individual in selecting a partner (Lai et al. 2011; Mandy et al. 2012). Thus, it is important that sex education with HFA/AS individuals normalize attraction to both genders and empower individuals to adopt the sexual identity that best fits their self-concept. Alternately, given that many of the participants in our study had little or no relationship experience, some participants may not have had a clear understanding of what is meant by sexual orientation and sexual attraction in general and/or of their sexual orientation and sexual attraction in particular. If so, it may also be that these responses were inflated by social desirability—for example, by perceptions that their peers are attracted to both men and women or that it is socially desirable to be non-heterosexual. Qualitative research in which individuals are probed about their understanding of their sexual identity and sexual attraction would help to clarify this issue.

We found that individuals with relationship experience were more likely to identify as a sexual minority. The reasons for this are not clear. It is possible that sexual minority individuals with HFA/AS find it easier to find a romantic partner. If so, this appears to be due to their sexual identity rather than their sexual attraction because the two groups did not differ in their level of attraction to same-sex versus other-sex individuals. Alternately, it may be that individuals become more desirous of and open to a variety of experiences, including the possibility of sexual experiences with a same-sex partner, as a result of their relationship experience. This, in turn, may cause some individuals to adopt a sexual minority identity. This explanation is made less likely by the fact that individuals who identified as a sexual minority reported lower dyadic sexual desire and more sexual problems. It is important to note that, for the most part, sexual identity and attraction were not related to sexual functioning. Qualitative research is needed to fully understand how individuals with HFA/AS arrive at their sexual identity, and how this affects their involvement in romantic relationships.

Conclusion

These results must be interpreted in light of both the limitations and strengths of the study. First, because some participants had never received a professional diagnosis, we cannot be sure that all participants met the criteria for a diagnosis of ASD. However, most (61 %) participants had received a professional diagnosis. Further, all participants had significant autism symptoms and score above the recommended cut-off on the AQ to produce the lowest rate of false positives. Indeed, the mean AQ score for the sample fell considerably above the recommended cut-off and the scores of participants without a professional diagnosis were comparable to those with a diagnosis. The AQ is well-validated as a research screening instrument that discriminates individuals with ASDs from individuals without ASDs. As such, it is likely that the participants retained in the study fell on the autism spectrum. Second, the results may have been affected by volunteer bias. For example, the sample was highly educated and disproportionately female (53 %) compared to estimates of the gender ratio of individuals with HFA/AS of 4 males to 1 female (Fombonne 2003). This may reflect our recruitment from self-help groups. Men are less likely than are women to use the

Internet to interact with similar others, to seek self-help, and to volunteer to participate in research (Addis and Mahalik 2003; Santor et al. 2007; Sax et al. 2003; Weiser 2000). In addition, individuals with the poorest sexual functioning might have been less likely to volunteer for a study on sexual well-being (Strassberg and Lowe 1995; Wiederman et al. 1994). Nonetheless, our approach of recruiting participants through ASD organizations and on-line communities, including individuals without a professional diagnosis, and administering the survey on-line likely resulted in a more representative sample than in many studies of individuals with ASD (e.g., individuals who were not known to mental health and developmental disability systems; individuals who would be unwilling to complete a questionnaire in a research setting that lacked anonymity.) Research is needed with different samples to determine the extent to which the results are generalizable to all individuals with HFA/AS.

This research represents an important step in characterizing the sexual functioning of men and women with HFA/AS. This contribution is particularly noteworthy because there has been so little research to date on sexuality and ASD. The results also provide some highly needed information on gender differences in the relationship experience and sexual functioning of individuals from this population, documenting that women with HFA/AS exhibit poorer, although not poor, sexual functioning in a number of areas. The findings that many single individuals with HFA/AS nonetheless had been in a romantic relationship of 3 months or longer and that the likelihood of being in a relationship was not associated with symptomatology counter stereotypes that hold that the skill deficits associated with ASD preclude the possibility of forming romantic attachments. That is, a lower level of functioning and skills is not necessarily a detriment to forming romantic and sexual relationships. Our emphasis on assessing positive aspects of sexuality, including cognitive affective aspects, allow us to say with confidence that on average single individuals with HFA/AS experience positive and non-problematic sexual functioning across a range of domains even when they do not currently have the opportunity to engage in sexual activity with a partner.

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