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ORIGINAL PAPER

Dimensions of Sexuality Among Young Women, With and Without Autism, With Predominantly Sexual Minority Identities

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Abstract
Self-reported sexuality research among people with autism spectrum disorder (ASD) is small but growing. The current study contributes to this field by focusing on the experiences of 18–30 year-old women, with ASD ($n = 248$) and without ($n = 179$), predominantly with sexual minority (i.e., non-heterosexual) identities. Multiple aspects of healthy human sexuality, including sexual desire, sexual behavior, sexual satisfaction, and sexual awareness, were explored. In this study, participants with ASD reported less sexual desire, fewer sexual behaviors, and less sexual awareness than those without ASD; however, the two groups reported comparable rates of sexual satisfaction. Next, relations across sexuality-related variables within each group were explored using partial correlational analyses. In both samples, sexual desire, sexual behavior, and sexual awareness were positively correlated, but sexual satisfaction functioned somewhat differently, correlating negatively and weakly with sexual desire and monitoring in both samples. These findings, alongside future research directions and clinical implications, are discussed in relation to the limited previous research on sexuality among women and young adults with ASD.

Keywords Autism spectrum disorder · Human sexuality · Young adulthood · Sexual behavior · United States–United Kingdom–Canada

Introduction

Regardless of one's ability or disability identity, sexuality is common to all human lives. Sexuality is defined by the World Health Organization (WHO) [1] as:

> … a central aspect of being human throughout life and encompasses sex, gender identities and roles, sexual orientation, eroticism, pleasure, intimacy and reproduction. Sexuality is experienced and expressed in thoughts, fantasies, desires, beliefs,

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> attitudes, values, behaviors, practices, roles and relationships. While sexuality can include all of these dimensions, not all of them are always experienced or expressed. Sexuality is influenced by the interaction of biological, psychological, social, economic, political, cultural, ethical, legal, historical, religious and spiritual factors. (p. 5)

Autism spectrum disorders (ASD) are heterogeneous neurodevelopmental disorders characterized by deficits in social interaction and communication, and restricted and repetitive behaviors, interests, and activities [2]. Multiple sources have reported a dramatic increase in the incidence of ASD, with the Centers for Disease Control and Prevention (CDC) currently estimating the rate of diagnosis at 1 in 68 children [3]. The symptoms of ASD, including but not limited to difficulties with social communication, interpreting others' verbal and nonverbal communication, and the presence of sensory-seeking, sensory sensitivity, or sensory-avoidant behaviors, are likely to impact—and perhaps interfere—with individuals' experiences of sexuality. Similarly, limitations in perceiving others' thoughts and emotions can contribute to missed opportunities for relationships, as well as uneasiness around connecting with others on a sexual level [4]. In light of the definition provided by the WHO and the statistics reported by the CDC, it is evident that ASD touches the lives of many individuals and that sexuality is even more far-reaching, impacting every human life. However, research that explores ASD and sexuality simultaneously, from the perspective of individuals themselves with ASD, remains limited.

While relatively few in number, existing empirical, self-reported sexuality studies consistently have shown that many individuals with ASD are interested in romantic and sexual relationships, and engage in a range of sexual behaviors [5]. However, a number of these studies focus on identifying sexual problems or deficits among individuals with ASD, or identifying how individuals with ASD compare unfavorably to individuals without ASD. In light of findings that suggest that women with ASD may experience sexuality differently from both men with ASD and from women without ASD [6]—and, in turn, may have different educational and therapeutic needs—the aim of the current study is to contribute to the knowledge base by examining multiple dimensions of healthy human sexuality (including sexual desire, sexual behavior, sexual satisfaction, and sexual awareness), assessing for relations across these dimensions, and focusing on the experiences of sexual minority young women (18–30 years old), with and without ASD. In this article, "sexual minority" is used to refer to individuals who have a sexual orientation other than heterosexual, including those with lesbian, gay, bisexual, asexual, and other identities.

Studying Sexuality Among Young Adults and Women with ASD

A significant strength of the existing self-reported ASD and sexuality literature is its robust representation of women. This is particularly notable given that males are currently diagnosed with ASD much more frequently than females, at a rate of nearly five to one [3]. In their large, mixed-gender sample, Gilmour et al. [7] found that adults with ASD were significantly more likely than adults without ASD to report same-sex desire, behavior, and orientation; this finding was particularly pronounced for women with ASD. Similar findings in terms of increased gender fluidity and same-gender sexual attraction among women with ASD, compared to women without ASD, were reported by Bejerot and Eriksson [8]. As asserted in a recent systematic review of the existing ASD and sexuality literature, women with ASD appear to have greater sexual understanding but also less sexual desire and more adverse sexual experiences relative to men with ASD and women without ASD

[6]. While existing studies have allowed for the examination of gender differences in sexuality and ASD, there appears to be only one study that has examined aspects of gender and sexual orientation, among other constructs, in a female-only sample [9]. Findings of this study showed that, relative to women without ASD, women with ASD experience lower rates of heterosexuality (67.9% versus 97.3%), and significantly higher rates of bisexuality (13.2% versus 1.6%), and asexuality (17.0% versus .0%). The emergence of gender differences in the existing ASD and sexuality literature signal educational, therapeutic, and service needs specific to women on the autism spectrum. A main goal of the current study is to increase the knowledge base of sexuality among young women with ASD, as to inform the development of such interventions.

Dimensions of Sexuality in Individuals with ASD

Sexual desire and interest are relatively well-represented constructs in the ASD and sexuality literature; in fact, they were included in the first self-reported sexuality study of its kind among individuals with ASD [10]. In this study, males with ASD reported greater sexual interest than females with ASD. The authors suggested that the mismatch between sexual interest and sexual experience could be a source of frustration and feelings of isolation for individuals with ASD; this work served as emerging evidence to debunk the myth that people with disabilities, particularly those with ASD, are not interested in sexual activity with others. Contemporary self-reported studies clearly demonstrate that many individuals with ASD have a sexual interest [11–13], with some studies suggesting overall comparable levels of sexual desire between individuals with and without ASD [7]. Consistent with these previous findings, it was expected that the young women with and without ASD in the present study would report comparable rates of sexual desire.

Sexual behavior entails a wide range of behaviors and activities with romantic or sexual intent; such behaviors can be solitary (e.g., masturbation, looking at pornography) or interpersonal (e.g., oral sex, penile-vaginal intercourse). Some self-reported sexuality research has suggested that young people with ASD have both less sexual experience and engage in fewer socio-sexual behaviors relative to those without ASD [14]. However, the results of another contemporary study have suggested that adults with and without ASD may engage in comparable rates of sexual behaviors [7]. In light of these mixed findings, an exploratory approach to sexual behavior was taken in the present study.

To date, few empirical studies have gathered self-reported data on sexual satisfaction from individuals with ASD, or have compared sexual satisfaction between individuals with and without ASD. In the absence of a non-spectrum comparison sample, Byers et al. [12] found that sexual satisfaction was positively associated with being in a romantic relationship, and that it was negatively associated with ASD symptoms. Further, they found that sexual satisfaction was found to be a predictor of overall sexual well-being for individuals with ASD. In this study, men with ASD reported greater sexual satisfaction than women with ASD, a finding that has been observed more widely in the existing ASD and sexuality literature [6]. However, in the absence of any previous studies comparing sexual satisfaction between women with and without ASD, an exploratory approach to sexual satisfaction was taken in the present study.

Sexual awareness, a construct coined by Snell et al. [15], captures the tendencies to think and reflect about the nature of one's sexuality, to be aware of the sexual impression one makes on others, to think about sex often, and to be assertive in the sexual aspects of one's life. To date, this construct has been studied in only one other self-reported sexuality

study: in a sample of 20 young adults with ASD and 20 young adults without ASD, Hannah and Stagg [16] found support for their hypothesis that individuals with ASD would report significantly lower levels of sexual awareness. In light of these findings, as well as the well-documented social communication and perspective-taking difficulties frequently associated with ASD [17], it was anticipated that participants with ASD in the present study would report lower levels of sexual awareness than participants without ASD.

Current Study

The current study contributes to the existing self-reported ASD and sexuality literature by assessing the sexualities of young women (including female-bodied individuals with non-binary or more fluid gender identities), between 18 and 30 years old. The following research questions are explored: (1) How do the sexualities of young women with and without ASD compare across multiple domains, including sexual desire, sexual behavior, sexual satisfaction, and sexual awareness? (2) How do these sexuality domains relate to one another, and are these relations comparable between young women with and without ASD?

Method

Participants

Inclusion Criteria

Inclusion criteria for all participants included the following: (1) identity as a woman, or a more fluid gender identity (e.g., agender, transgender, non-binary); (2) between the ages of 18 and 30, inclusive; (3) English language proficiency; and (4) computer access and literacy. To be included in the ASD group ($n = 248$), participants needed to score a seven (clinical cutoff) or higher on the *Autism-Spectrum Quotient* (AQ-10) [18] and self-identify as having ASD. A formal diagnosis was not required for inclusion in the ASD subgroup; this was an intentional decision to account for the fact that individuals with milder forms of ASD are underdiagnosed and that one does not need a formal diagnosis to experience the impact of ASD symptomatology on aspects of daily life. To be included in the comparison sample ($n = 179$), participants needed to score below the clinical cutoff on the AQ-10 [18], not have a formal diagnosis of ASD, and not self-identify as having ASD.

Participant Characteristics

All participants were between 18 and 30 years old; participants in the ASD group, on average, were slightly older (M age = 23.2, $SD = 3.7$) than participants in the comparison group (M age = 21.8, $SD = 3.5$). The majority of participants in both groups were White (89% ASD group versus 81% comparison group). Both samples were internationally diverse, with the most frequently represented countries including the United States (56% ASD group versus 76% comparison group), Canada (10% ASD group versus 6% comparison group), and the United Kingdom (11% ASD group versus 6% comparison group). The majority of participants in both groups were either full-time or part-time students (55% ASD group versus 66% comparison group); a lower percentage of participants with ASD

than participants without ASD had full-time or part-time jobs (38% versus 54%, respectively). Of note, 24% of participants with ASD were neither students nor employees at the time of study participation, versus only 12% of comparison sample participants. The vast majority of participants in both groups had graduated from high school (96% ASD group versus 97% comparison group), and about a third of participants in each group had earned a college degree or higher. Participants in both groups had diverse housing situations, with a number of participants with and without ASD living alone (18% versus 16%, respectively), living with a romantic partner (23% versus 24%), living with a roommate (18% versus 29%), living with a parent or parents (41% versus 31%), living with their child/children (5% versus 3%), living with a sibling or siblings (11% versus 13%), living with other relatives (4% versus 3%), and other housing situations (7% versus 10%). These percentages do not add up to 100% because the categories are not mutually exclusive (e.g., a participant may live both with parents and siblings).

Approximately two-thirds (64%) of the ASD sample reported having received a formal diagnosis of ASD. Seeing that no significant differences were observed between participants with and without a formal diagnosis on any key continuous variable (sexual desire, sexual behavior, sexual satisfaction, and sexual awareness, including consciousness and monitoring), participants with and without a formal ASD diagnosis were grouped together for all subsequent analyses. Among participants with a formal diagnosis, 59% reported a diagnosis of Asperger Syndrome, 30% reported a diagnosis of autism spectrum disorder, 14% reported a diagnosis of autism, 8% reported a diagnosis of Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), and 4% reported other, related diagnoses (e.g., "classic autism"); these percentages add to over 100% due to some participants receiving more than one lifetime diagnosis. The average age of diagnosis was strikingly high, at 17.9 years ($SD = 6.5$ years; range 3–30 years).

Procedure

All procedures described below were approved by the Institutional Review Board (IRB) of the University of Massachusetts Boston. Informed consent was obtained from all individual participants.

Recruitment of Participants

A website and Facebook page were created for the current study. Advocacy and support organizations for individuals with ASD and their families (e.g., Asperger/Autism Network, Autistic Self-Advocacy Network), university and college disability service centers, and research and clinical groups were contacted. Additionally, the study was shared on message boards and forums dedicated to ASD issues (e.g., *Aspergers* subreddit). Comparison group participants were recruited through Facebook advertisements, and Craigslist and Reddit postings (e.g., *SampleSize* subreddit). For both groups, the study was presented as the *Women's Sexuality Study*, an examination of multiple aspects of sexuality and well-being among young women with and without ASD.

Data Collection

Individuals who followed a link to the online survey (hosted by PsychData, a secure survey website) were first required to answer several screening questions to verify their eligibility

for the study. If participants met inclusion criteria, they then proceeded to the informed consent form, and then to the five true-or-false "quiz" items related to informed consent. Upon successful completion of these items, they were permitted to access the battery. Median study completion time was 20 min for the ASD group and 19 min for the comparison group. Participants were offered the opportunity to receive a summary of findings at the conclusion of the study.

Participant Screening

Multiple steps were taken to ensure high data quality in the current study. Individuals who attempted to participate, but did not meet age and gender inclusion criteria, were removed from analyses. Next, data from individuals who met inclusion criteria and attempted the survey, at least partially, were reviewed. Sixty-nine participants were removed from analyses due to significant missing data (i.e., at least 20% of constructs missing) and 10 additional participants were removed because they failed to respond to key items (e.g., whether they identified as being on the autism spectrum). Thirteen responses were removed from analyses because the participants had attempted the survey multiple times, as evidenced by repetitions in IP address. Sixty-four individuals who identified as having ASD were removed from analyses because they scored below the clinical cutoff on the AQ-10; of these, 27 reported having a formal diagnosis and 37 reported that they did not. Seventeen individuals were removed from analyses because they did not identify as having ASD and did not have a formal diagnosis, but scored above the clinical cutoff on the AQ-10. Finally, three participants were removed from analyses because they reported having a formal diagnosis of ASD but not self-identify as being on the autism spectrum.

Measures

Demographics

A 28-item questionnaire was administered to gather demographic information. Items included inquiries about ASD diagnostic status, family history of ASD, age, gender identity (open-ended item), sexual orientation (open-ended item), racial identity, ethnic identity, income, immigration status, languages spoken, education level, employment status, housing situation, relationship status, and parent status.

Autism Symptoms

All participants completed the 10-item *Autism Spectrum Quotient* (AQ-10) [18]. This is an abbreviated version of the 50-item *Autism-Spectrum Quotient* [19], which has been used successfully in recent online studies with adult participants with ASD [9, 13]. The short-form and long-form both have demonstrated good sensitivity and specificity in detecting ASD among adults [20]. Participants were asked to report their level of agreement with each item on a 4-point Likert scale; some items were reverse-coded. Item responses were dichotomized and then summed to obtain a total scale; a score above six has been associated with significant ASD symptomatology [18] and this was the cutoff used for inclusion in the current ASD sample.

Sexual History

Ten items were adapted from the *Sexual History Questionnaire* (SHQ) [21] to collect information about participants' relationship status and sexual history (e.g., age of first sex, number of lifetime sexual partners). The original questionnaire demonstrated good test–retest reliability when piloted among a group of typical undergraduate students (Cronbach's $\alpha = .80$). In the current study, individual items were analyzed separately and a summary score was not calculated.

Sexual Desire

Spector et al.'s [22] *Sexual Desire Inventory* (SDI) was used to assess participants' levels of sexual desire and interest. This measure captures participants' levels of partner-oriented and self-oriented sexual desire, and an earlier version of this measure demonstrated good internal consistency and factor validity [23]. Five of the original 14 multiple-choice items were included in the current battery. Participants responded to items (e.g., "During the last month, how often would you have liked to engage in sexual activity with a partner?") on either an 8- or 9-point scale. Items were converted to z scores and summed to create a composite score. In the current sample, internal consistency for all items was good for both the ASD (Cronbach's $\alpha = .88$) and comparison groups (Cronbach's $\alpha = .85$).

Sexual Behavior

An adapted 19-item version of Trotter and Alderson's [24] *Sexual Experience Questionnaire* (SEQ) was used to assess the sexual activities in which participants engage, and the frequency with which they do so. Participants were asked to report on a 4-point scale (never, once, a few times, many times) the lifetime frequency in which they engaged in different sexual activities. Several items were added to capture lower base-rate sexual activities (e.g., having sex with more than one person at the same time). Versions of the SEQ have been used validly and reliably in recent studies with adults with ASD [7]. In the present study, internal consistency was excellent for both the ASD (Cronbach's $\alpha = .94$) and comparison groups (Cronbach's $\alpha = .94$).

Subsequent analyses revealed a non-normal, multimodal distribution when items were dichotomized (0 = never, 1 = once, a few times, or many times) and summed to create a sexual behavior composite score. An exploratory factor analysis indicated the presence of four factors within sexual behavior: partnered sexual activity, individual sexual activity, low base rate partnered sexual activity, and sexual activity with technology. When analyzing sexual behavior as a continuous variable, the four factors listed above were dichotomized and summed to create an index score (range 0–4), which adequately normalized the sexual behavior data.

Sexual Satisfaction

The 6-item contentment scale of Meston and Trapnell's [25] *Sexual Satisfaction Scale for Women* (SSSW) was used to assess participants' sexual satisfaction. Participants were asked to rate their level of agreement with statements such as, "I feel content with the way my present sex life is," on a 5-point Likert scale. Validation studies on the full

measure with non-spectrum female samples have demonstrated strong construct validity and discriminant validity, as well as good internal reliability and test–retest reliability [25]. In the current study, internal consistency of the contentment scale was very good for both the ASD (Cronbach's $\alpha = .87$) and comparison groups (Cronbach's $\alpha = .87$).

Sexual Awareness

Participants were asked to complete 15 selected items of the *Sexual Awareness Questionnaire* (SAQ) [15]. This measure captures the domains of sexual consciousness (knowledge and awareness of one's own sexuality) and sexual monitoring tendencies (concern about how one presents sexually to others). Participants rated a series of statements (e.g., "I am very aware of my sexual feelings," "I never seem to know when I'm turning others on") on a 5-point Likert scale. The SAQ has shown good internal reliability across all subscales [15], including two that were not included in the current study due to time and space constraints. In both the ASD and comparison groups, internal consistency was very good for both the sexual consciousness subscale (Cronbach's $\alpha = .87$ and .89, respectively) and the sexual monitoring subscale (Cronbach's $\alpha = .88$ and .87, respectively).

Statistical Approach

Chi squared tests and *t* tests were used to compare the ASD and comparison groups across sexuality-related and demographic variables. Partial correlations were used to compare relations across continuous sexuality-related variables within each group. All analyses were performed using IBM SPSS Statistics 19.0.

Results

Data Processing Procedure

All continuous variables were assessed for normality, skewness, and kurtosis. Skewness and kurtosis for each variable fell between − 1.50 and + 1.50, the currently accepted levels [26]. Further, visual inspection of frequency distributions suggested good symmetry and approximate normality. Additionally, continuous data were screened for univariate outliers, and no significant outliers were detected for the vast majority of variables.

Data also were assessed for missingness, which was observed to be low among the key outcome variables across the full sample (sexual desire = 2.8%, sexual behavior = 5.4%, sexual satisfaction = 2.3%, sexual consciousness = 3.7%, and sexual monitoring = 5.6%). Little's Missing Completely at Random (MCAR) test showed that these data were most likely missing completely at random [$\chi^2(38, N = 427) = 47.45$, $p = .14$]. Thus, multiple imputation (MI) was employed in five iterations to estimate sexual desire, behavior, satisfaction, consciousness, and monitoring on the scale level, as to utilize the full sample in the planned analyses. Benefits of MI over listwise deletion include reduced bias and higher statistical power [27, 28].

Analyses for Potential Covariates

First, differences in demographic variables were tested between the ASD and comparison groups. These analyses showed that participants with ASD were slightly older, on average, than comparison sample participants [$t(425) = 4.03$, $p < .001$, Cohen's $d = .40$). Comparison sample participants were significantly more likely than participants with ASD to live in the US or Canada, versus another country [84% versus 71%; $\chi^2(1, N = 427) = 10.95$, $p = .001$; Cramer's $\phi = -.16$]. Comparison group participants also were more likely to be either part-time or full-time students, compared to participants in the ASD group [65% versus 55%; $\chi^2(1, N = 427) = 4.77$, $p = .03$; Cramer's $\phi = -.11$]. Comparison group participants also were more likely to be employed either part-time or full-time, compared to participants in the ASD group [54% versus 39%; $\chi^2(1, N = 427) = 9.35$, $p = .002$; Cramer's $\phi = -.15$]. Participants with ASD were significantly more likely to live with their parents [41% versus 31%; $\chi^2(1, N = 427) = 4.48$, $p = .03$; Cramer's $\phi = -.10$].

Second, the demographic variables identified above (age, nationality, student status, employment status, and living situation) were tested for significant correlations with the key sexuality variables. Since relations were found between age, student status, employment status, and living situation and at least one of the sexuality variables, these demographic variables were covaried in the correlational analyses.

Dimensions of Sexuality Among Women With and Without ASD

Sexual and Relationship History, Gender, and Sexual Orientation

Participants in the ASD and comparison groups reported comparable rates of being single [52% versus 50%, respectively; $\chi^2(1, N = 427) = .19$, $p = .66$, Cramer's $\phi = -.02$], being married [9% versus 8%; $\chi^2(1, N = 427) = .10$, $p = .75$, Cramer's $\phi = -.02$], and being engaged [4% in each group; $\chi^2(1, N = 427) = .00$, $p = .95$, Cramer's $\phi = .00$]. Comparison sample participants were more likely than ASD sample participants to report being in a dating relationship [35% versus 23%; $\chi^2(1, N = 427) = 8.23$, $p < .01$, Cramer's $\phi = .14$], and they were less likely to report being polyamorous [1% versus 7%; $\chi^2(1, N = 427) = 8.05$, $p < .01$, Cramer's $\phi = -.14$] or having a different kind of relationship status [1% versus 5%; $\chi^2(1, N = 427) = 4.54$, $p = .03$, Cramer's $\phi = .10$]. Among those in relationships, participants with ASD were significantly more likely to have a partner also on the autism spectrum than comparison group participants [26% versus 7%, $\chi^2(1, N = 427) = 14.88$, $p = .01$, Cramer's $\phi = .27$].

A substantial minority of participants with and without ASD reported not having partnered sex (37% and 22%, respectively); this difference in rates was statistically significant [$\chi^2(1, N = 427) = 10.59$, $p = .001$, Cramer's $\phi = .16$]. Among those who had had sex with a partner, the median age of first sex was 17 years old for both groups, and the median number of sexual partners was 3 for participants with ASD and 3.5 for participants without ASD. In terms of family status, similar percentages of participants with and without ASD reported having children [6% versus 5%; $\chi^2(1, N = 427) = .20$, $p = .65$, Cramer's $\phi = .02$], or being pregnant with their first child [1 % versus 2%; $\chi^2(1, N = 427) = 1.82$, $p = .18$, Cramer's $\phi = .07$].

An unexpected finding was the large percentage of participants in both groups who described a non-cisgender identity; still, individuals with ASD were significantly more

likely than comparison sample participants to report a non-binary or more fluid gender identity [50% versus 22%, $\chi^2(1, N=427)=34.55$, $p<.001$, Cramer's $\phi=-.29$]. In addition to cisgender, the most frequently reported gender identities among ASD and comparison sample participants were the following: agender, or without gender (17% and 6%, respectively); genderqueer or non-binary, or not identifying as exclusively masculine or feminine and/or not ascribing to traditional gender roles, expectations, and stereotypes (15% and 7%); "demigirl" or somewhat but not entirely feminine (7% and 3%); and genderfluid, or experiencing fluctuation in the extent to which one identifies as masculine, feminine, or other genders (4% and 3%).

Participants with ASD were significantly more likely than comparison group participants to have a non-heterosexual sexual orientation [92% versus 72%, $\chi^2(1, N=425)=29.53$, $p<.001$, Cramer's $\phi=-.26$]. The large percentage of participants in both groups who reported having a non-heterosexual sexual orientation was unanticipated and significantly higher than the rates of sexual minority identity found among women with ASD in other studies [9]. In the present study, the most frequently endorsed sexual orientations among the ASD and comparison groups were: asexual, or not experiencing sexual attraction toward others (13% and 11%, respectively); bisexual, or experiencing sexual attraction toward two genders (12% and 27%); pansexual or polysexual, or experiencing sexual attraction toward all genders (12% and 8%); queer (10% and 4%); and heterosexual (8% and 28%).

Sexual Desire

Participants with ASD reported significantly lower levels of overall desire for sexual activity compared to participants without ASD [$t(76,295)=-2.83$, $p<.01$]; further inspection showed that participants with ASD reported significantly lower desire for partnered sexual activity [$t(216,340)=-4.78$, $p<.001$], but comparable levels of desire for solo sexual activity [$t(8034)=-.21$, $p=.83$]. Participants with ASD indicated that they would be comfortable foregoing sexual activity for a longer period than participants without ASD (Mann–Whitney $U=19{,}142.5$, $n_1=247$, $n_2=179$, $p=.02$); the median response for participants with ASD was several months, and for comparison sample participants, it was 1 month. Descriptive statistics for sexual desire and other continuous sexuality variables are presented in Table 1.

Sexual Behavior

Participants with ASD reported fewer sexual behaviors relative to comparison sample participants. Overall, the median number of sexual activities for participants without ASD was 14, which was significantly greater than the 11 reported by participants with ASD (Mann–Whitney $U=18{,}870$, $n_1=248$, $n_2=179$, $p=.01$). Table 2 presents a breakdown of each sexual activity included in the questionnaire.

Sexual Satisfaction

Participants with and without ASD reported comparable rates of sexual satisfaction [$t(10,383)=-.63$, $p=.53$].

Table 1 Descriptive statistics and between-group differences for major continuous variables

Variable (questionnaire)	*N*	Mean	SD	Range	Between-group difference
Sexual desire (SDI)					
ASD group	241	−.44	4.19	−7.21 to 9.05	$t(393) = -2.79$** Cohen's $d = .28$
Comparison group	174	.66	3.78	−7.21 to 9.05	
Sexual behavior (SEQ)					
ASD group	233	2.73	1.23	0 to 4	$t(402) = -2.86$*** Cohen's $d = .29$
Comparison group	171	3.08	1.17	0 to 4	
Sexual satisfaction (SSSW)					
ASD group	244	19.62	6.61	6 to 30	*n.s.*
Comparison group	173	19.99	6.62	6 to 30	
Sexual consciousness (SAQ)					
ASD group	239	13.24	6.33	0 to 24	$t(409) = -5.44$*** Cohen's $d = .55$
Comparison group	172	16.61	6.01	0 to 24	
Sexual monitoring (SAQ)					
ASD group	235	15.23	8.91	0 to 36	$t(401) = -5.15$*** Cohen's $d = .52$
Comparison group	168	19.82	8.71	0 to 36	

Descriptive analyses presented in this table were performed on the original, non-imputed data set

SDI Sexual Desire Inventory [22], *SEQ* Sexual Experience Questionnaire [24]. *SSSW* Sexual Satisfaction Scale for Women [25], *SAQ* Sexual Awareness Questionnaire [15]

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

Sexual Awareness

Participants with ASD, relative to comparison sample participants, reported lower rates of overall sexual awareness [$t(13{,}696{,}240) = -6.50$, $p < .001$], including lower rates of both sexual consciousness [$t(1{,}109{,}925) = -5.48$, $p < .001$] and sexual monitoring [$t(18{,}831{,}963) = -5.40$, $p < .001$].

Examining Relations Across Dimensions of Sexuality

Partial correlational analyses were performed across the continuous sexuality variables; these analyses were performed separately for the ASD and comparison groups (Tables 3 and 4, respectively). In these analyses, participants' age, student status, employment status, and housing situation were covaried.

Results of the partial correlational analyses were highly consistent between the ASD and comparison samples, with sexual desire, behavior, consciousness, and monitoring sharing significant, positive correlations with one another. For both groups, sexual satisfaction was weakly, negatively correlated with sexual desire and monitoring, and, for participants with ASD, sexual behavior. In both groups, sexual satisfaction and consciousness were not significantly correlated.

Table 2 Differences in sexual behaviors between ASD ($n=248$) and comparison groups ($n=179$)

Activity	% ASD	% Comparison	Difference?
Partnered sexual activity			
Deep kissing	70	82	$\chi^2(1, N=427)=8.46$** Cramer's $\phi=.14$
Touching another's nipples	59	67	*n.s.*
Someone touching your nipples	65	79	$\chi^2(1, N=427)=9.95$** Cramer's $\phi=.15$
Touching another's genitals	62	77	$\chi^2(1, N=427)=9.99$** Cramer's $\phi=.15$
Someone touching your genitals	63	78	$\chi^2(1, N=427)=10.06$** Cramer's $\phi=.15$
Performing oral sex	56	70	$\chi^2(1, N=427)=9.08$** Cramer's $\phi=.15$
Receiving oral sex	56	69	$\chi^2(1, N=427)=7.69$** Cramer's $\phi=.13$
Masturbating with a partner	41	44	*n.s.*
Orgasm with a partner	49	63	$\chi^2(1, N=427)=7.96$** Cramer's $\phi=.14$
Vaginal intercourse	50	62	$\chi^2(1, N=427)=5.67$* Cramer's $\phi=.12$
Solo sexual activity			
Masturbating alone	91	92	*n.s.*
Orgasm alone	78	82	*n.s.*
Looking at pornography	89	92	*n.s.*
Sexual activity with technology			
Phone/internet sex	44	50	*n.s.*
"Sexting"	41	64	$\chi^2(1, N=427)=22.93$*** Cramer's $\phi=.23$
Low base rate activity			
Anal intercourse	29	32	*n.s.*
Sex on a "one night stand"	22	36	$\chi^2(1, N=427)=10.16$** Cramer's $\phi=.15$
Group sex	19	19	*n.s.*
Bondage/S&M activity	42	42	*n.s.*

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

Discussion

Consistent with previous research, the results of the current study show that many young women with ASD have a sexual interest and engage in a wide range of sexual behaviors; some do so in the context of a non-binary gender identity and/or a sexual minority sexual orientation. However, contrary to expectations based on the work of Gilmour et al. [7], participants with ASD overall reported significantly lower levels of sexual desire than those without ASD. Similarly, participants with ASD reported fewer lifetime sexual behaviors (particularly partnered behaviors) than participants without ASD, consistent with the findings of Mehzabin and Stokes [14]. Relative to the comparison sample, participants with

Table 3 Partial correlations among sexuality variables for ASD group ($n = 248$)

Variable (questionnaire)	1	2	3	4	5
1. Sexual desire (SDI)	–				
2. Sexual behavior (SEQ)	.40***	–			
3. Sexual satisfaction (SSSW)	−.32***	−.12*	–		
4. Sexual consciousness (SAQ)	.50***	.20**	−.05	–	
5. Sexual monitoring (SAQ)	.49***	.32***	−.40***	.38***	–

Analyses presented in this table were performed on the imputed data

Participant age, student status, employment status, and housing situation were covaried

SDI Sexual Desire Inventory [22], *SEQ* Sexual Experience Questionnaire [24], *SSSW* Sexual Satisfaction Scale for Women [25], *SAQ* Sexual Awareness Questionnaire [15]

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

Table 4 Partial correlations among sexuality variables for comparison group ($n = 179$)

Variable (questionnaire)	1	2	3	4	5
1. Sexual desire (SDI)	–				
2. Sexual behavior (SEQ)	.46***	–			
3. Sexual satisfaction (SSSW)	−.25***	−.07	–		
4. Sexual consciousness (SAQ)	.50***	.43**	−.01	–	
5. Sexual monitoring (SAQ)	.43***	.37***	−.28***	.33***	–

Analyses presented in this table were performed on the imputed data

Participant age, student status, employment status, and housing situation were covaried

SDI Sexual Desire Inventory [22], *SEQ* Sexual Experience Questionnaire [24], *SSSW* Sexual Satisfaction Scale for Women [25], *SAQ* Sexual Awareness Questionnaire [15]

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

ASD also reported lower levels of sexual consciousness, including awareness of their own sexual thoughts, feelings, and sensations, and of sexual monitoring, including awareness and concern about how they present sexually to other people. These findings, which are consistent with those of previous studies [16], may reflect the limited ability of some individuals with ASD to detect their own sexual feelings and internal experiences, as well as others' sexual and romantic interest in them. This phenomenon has been described by Henault [4] as a potential barrier to achieving desired sexual lives. Explicitly teaching individuals with ASD to become more aware of their internal experiences around sexuality—which may not be intuitive to some—and to accurately recognize others' signals, should be incorporated into sexual education for people with ASD. However, because some young people with ASD have low desire for partnered sexual activity, sexual education programs should acknowledge and normalize this experience too.

Besides desire for solitary sexual activity, sexual satisfaction was the only sexuality construct that was found to be comparable between participants with and without ASD in the current study. The lack of differences between groups could reflect true similarity in the experiences of young women with and without ASD; however, caution should be taken when interpreting these findings, given that sexual contentment was used as a proxy for sexual satisfaction, and sexual satisfaction in individuals with ASD has been conceptualized

by other researchers as having additional components [25]. In the absence of a male comparison sample, it is impossible to determine whether current results align with trends that have emerged in the ASD and sexuality research [6], specifically that women with ASD experience less positivity in their sexualities compared both to men with ASD. Nonetheless, the mechanisms by which women with ASD may experience less sexual satisfaction warrant further investigation, as these may inform strategies and interventions.

Correlational analyses helped illuminate the relations across different sexuality-related variables, and how these patterns differ between young women with and without ASD. For participants in both groups, sexual desire, behavior, consciousness, and monitoring were significantly, positively correlated with one another. This suggests that desiring sexual activity, engaging in sexual activity, and thinking about sexuality are similarly related, regardless of whether one does or does not have ASD. However, sexual satisfaction showed a somewhat different pattern, correlating weakly and negatively with sexual desire and monitoring for participants in both groups. Potentially, individuals who experience higher levels of sexual desire and who think more about the sexual impression they make on others may be less satisfied with their sex lives, perhaps related to preferences around frequency (i.e., desiring sexual contact more often or less often), difficulties finding a partner and establishing a sexual relationship, negative self-evaluations, or, particularly for people with ASD, interfering sensory issues. As to improve the sexual experiences and well-being of young women with and without ASD, more research on predictors of sexual satisfaction is necessary. Further, the relations across sexual desire, behavior, satisfaction, consciousness, and monitoring warrant further explanation among asexual individuals, who were represented in both the ASD and comparison groups.

Although not a main focus of the current study, significant relations between age and multiple aspects of sexuality were observed for participants in both samples. Particularly for participants with ASD, older individuals reported greater sexual desire, sexual behavior, and sexual consciousness. Although the current study was cross-sectional, not longitudinal, these findings do speak to the developmental nature of sexuality. Unexpectedly, age was negatively correlated with sexual satisfaction in the ASD group, but no significant correlation was observed in the comparison group. One potential explanation for this finding may be that women with ASD experience sexual desire later than women without ASD, which increases as they grow older. However, as they experience greater desire, a discrepancy may emerge between their levels of sexual desire and their engagement in sexual behavior, which may result in greater sexual dissatisfaction. Another possibility is that the negative relation between age and sexual satisfaction reflects a cross-sectional issue, in that younger sexual minority individuals, who comprised the majority of both the ASD and comparison groups, might experience more openness and affirmation around their sexuality, relative to older individuals.

In the current study, the rates of non-binary gender identity and sexual minority identity were striking. While it seems likely that individuals with ASD may ascribe less to societal "gender norms", these findings may be partially explained by the study being explicitly open to individuals with diverse gender identities, and by using open-ended items to measure these constructs. Nonetheless, current findings are consistent with those of Strang et al. [29], who observed that youth with ASD were significantly more likely to be described as gender variant, by their parents, relative to youth without ASD, and those of Gilmour et al. [7], who found elevated rates of same-sex attraction and desire among women with ASD. Other studies have hinted at the gender identity and sexual orientation diversity among individuals on the autism spectrum [6]. Also, despite using different methods to measure sexual orientation, rates of asexuality were comparably reported among participants with

ASD in the current study (13%), and participants with ASD in Ingudomnukul et al.'s [9] study (17%). Sexual education professionals need to be aware that some young people with ASD have sexual minority identities, and LGBTQ support organizations should be equipped to meet the needs of individuals with ASD.

Strengths and Limitations

A compelling strength of the current study is its large, community-based sample of young women, including those with more fluid gender identities, on the autism spectrum. The study was strengthened by the inclusion of a non-spectrum comparison sample, which provided a context for understanding the identities and experiences of the ASD sample. The high number of participants in both the ASD and comparison samples who identified as non-cisgender and/or non-heterosexual provided an important opportunity to examine sexuality and sexual well-being among individuals with multiple minority identities. Online survey methodology, which eliminated face-to-face contact with study staff, likely reduced desirability bias among participants. This study expands the existing ASD and sexuality literature by focusing specifically on the experiences of young women, and by moving beyond descriptive analyses to examine relations across human sexuality constructs within this population.

In light of its strengths and contributions to the current literature, the current study also possesses several limitations, which are important to discuss here. For instance, the online nature of the current study, which allowed for the recruitment of an unprecedentedly large and diverse sample, made it impossible to test participants' cognitive functioning or adaptive behavior. However, it is highly likely that all participants possessed average intelligence or greater in order to access and complete the battery successfully. Thus, the findings of the current study cannot be assumed to generalize to individuals who have ASD and concurrent intellectual disabilities.

Given the study's explicit focus on sexuality and its explicit inclusion of individuals with a non-binary gender identity, it likely attracted a self-selected group of individuals who were more likely to identity as sexually diverse and to have greater than average awareness of, or interest in, their own sexualities. Indeed, this was reflected in the thoughtful and often detailed responses participants provided in response to the open-ended items about gender identity and sexual orientation. The rates of non-heterosexual/minority sexual orientation were unexpectedly high in both the ASD and comparison samples. Compared to existing ASD and sexuality studies, participants in the current study were much more likely to have a sexual minority sexual orientation and much less likely to be heterosexual. In turn, the current sample largely reflects the experiences of gender and sexual minority individuals, with and without ASD, and current findings may not generalize to young women with ASD who identify as cisgender and/or heterosexual.

Finally, having a formal diagnosis of ASD was not an inclusion criterion for the ASD group. Instead, inclusion in the ASD sample was determined by scoring above the clinical cutoff on the AQ-10 [18] and self-identifying as being on the autism spectrum. As a result of using a screening measure in this manner, all participants in the ASD sample, regardless of diagnostic status, exhibited a high level of ASD symptomatology. Although the relation between ASD symptomatology and aspects of sexuality has been explored in other studies [11], it was not examined in the current study. Some individuals with a formal diagnosis and an ASD identity, but whose symptoms had been reduced through intervention (e.g., social skills training, occupational therapy with sensory

integration), may have scored below the clinical cutoff on the AQ-10 [18] and thus were not included. In previous studies, some researchers have required participants to have formal diagnoses [7] while others have not [11]. There are benefits and drawbacks to both approaches, as individuals with a formal diagnosis may have been improperly diagnosed, and individuals who believe that they are on the autism spectrum may not actually meet full diagnostic criteria. In the absence of any significant differences between participants with and without a formal ASD diagnosis, who simultaneously identified as having ASD and reported significant ASD symptomatology, no one was excluded from the current study, or the analyses presented in this paper, as a result of not having a formal diagnosis.

Future Directions

Given the limited nature of the existing self-reported ASD and sexuality literature, there are many directions for future research. One of the most surprising characteristics of the current ASD sample was the strikingly high average age, at 17.9 years old, of first diagnosis. According to the latest CDC [3] statistics, the average age of diagnosis for autism and ASD is about 4 years old and for Asperger's Syndrome—the most frequently reported diagnosis in the current sample—it is about 6 years old. Autistic self-advocate and author Simone [30] posited that increasing autism awareness and resources for individuals on the autism spectrum, are leading individuals to question whether they have ASD later in life. Simone argued that this particularly may be the case for women who may have functioned well academically, professionally, or in other areas, and have "flown under the radar" of diagnosis earlier in life. While diagnostic status and average age of first diagnosis were examined in the current study, few other details are known as to how participants came to be diagnosed, and in turn, why the average age of first diagnosis was so high. While this finding requires replication in comparable samples, it does speak to the unique profiles and experiences of some young women with ASD, and to the need for more focused research within this age and gender group.

In light of previous and current findings, it will be important to reexamine gender identity and sexual orientation using open-ended methods, particularly among women with ASD. Little research on asexuality currently exists, and virtually no study has examined asexuality in individuals with ASD, or has attempted to compare individual on the autism spectrum with and without a sexual interest. Seeing that a substantial minority of the current participants reported an asexual or asexuality spectrum sexual orientation, this warrants further investigation. Finally, to date, no self-reported ASD and sexuality study has reported longitudinal data. This represents a significant limitation, given that sexuality is widely accepted as a developmental and somewhat fluid construct. Analysis of longitudinal data would illuminate shifts in identities over time (e.g., gender, sexual orientation), and could empirically test the suggestion that individuals with ASD have different sexual trajectories than those without ASD [11].

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Compliance with Ethical Standards

Conflict of interest The author declares that they have no conflict of interest to disclose.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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