

A Validated Measure of No Sexual Attraction: The Asexuality Identification Scale

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Human asexuality has been described as a lack of sexual attraction toward anyone or anything. One percent of the adult population is thought to be asexual, and research suggests that asexuality is best conceptualized as a sexual orientation. A serious limitation in past research on asexuality has been the complete lack of a validated tool to measure asexuality. Due to limitations in recruiting sufficiently powered local samples, most studies have relied on recruiting via online web-based asexual communities. This is problematic because it limits the sample to individuals who have been recruited through established asexuality networks/communities. The present study aimed to develop and validate a self-report questionnaire to assess asexuality. The questionnaire was intended to provide a valid measure independent of whether the individual self-identified as asexual and was developed in several stages, including: development and administration of open-ended questions (209 participants: 139 asexual and 70 sexual); administration and analysis of resulting 111 items (917 participants: 165 asexual and 752 sexual); administration and analysis of 37 retained items (1,242 participants: 316 asexual and 926 sexual); and validity analysis of the final items. The resulting Asexuality Identification Scale (AIS), a 12-item questionnaire, is a brief, valid, and reliable self-report instrument for assessing asexuality. It is psychometrically sound, easy to administer, and has demonstrated ability to discriminate between sexual and asexual individuals. It should prove useful to allow researchers to recruit more representative samples of the asexual population, permitting for an increased understanding of asexuality.

Keywords: asexuality, low sexual desire, sexual orientation, questionnaire development, factor analysis

Sexual attraction has always been thought to be a ubiquitous aspect of the human experience and necessary for propagation of species. However, there is mounting evidence that at least 1% of the adult human population lack any attraction toward others (Bogaert, 2004; Lucassen et al., 2011; Poston & Baumle, 2010). Human asexuality has been defined as a lack of sexual attraction to anyone, or anything, at all (Bogaert, 2004; Brotto, Knudson, Inskip, Rhodes, & Erskine, 2010; Jay, 2008), and has been conceptualized as a sexual orientation (Berkey, Perelman-Hall, & Kurdek, 1990; Brotto & Yule, 2011; Brotto et al., 2010; Storms, 1979). While this definition is the most widely endorsed among asexual individuals, asexuality has been described by others in terms of a lack of sexual behavior (Rothblum & Brehony, 1993), as well as low sexual excitation (Prause & Graham, 2007), and even as a sexual dysfunction (Bogaert, 2004, 2006; Prause & Graham, 2007; Brotto, 2013). More colloquially, there are pervasive stereotypes

that assume all asexual individuals are aromantic (i.e., that they don't experience romantic attraction—described as “a feeling that causes people to desire a romantic relationship with a specific other person” (Asexuality Visibility and Education Network [AVEN] Wiki, 2013), female, afraid of sex, highly religious, disabled, victims of sexual trauma, or as making a conscious choice to be asexual (e.g., celibacy) (Neth, 2011; NextStepCake, 2011; Sloan, 2006; Walters & Geddie, 2006). There is also strong evidence of bias and discrimination against asexual individuals (MacInnis & Hodson, 2012). How asexuality is conceptualized, therefore, has profound clinical, academic, and sociocultural implications.

Although asexuality has appeared sporadically throughout the scientific literature since Kinsey, Pomeroy, and Martin's (1948) *Sexual Behavior in the Human Male*, it is only in the past decade that it began to receive serious academic attention, beginning with Bogaert's (2004) finding that approximately 1% of a large British sample reported a lack of sexual attraction. Researchers then focused on conceptualizing and defining the construct (Bogaert, 2006; Brotto et al., 2010; Prause & Graham, 2007), and a flurry of publications revealed new data on the characteristics of asexual populations. For example, asexual individuals were found to differ significantly from sexual groups on several characteristics, such that they experience poorer health (Bogaert, 2004; Poston & Baumle, 2010), have shorter stature and later age of menarche (Bogaert, 2004), have increased levels of depression and anxiety as well as decreased self-esteem (Nurius, 1983; Yule, Brotto & Gorzalka, 2013), have lower socioeconomic status and higher religiosity (Bogaert, 2004), and decreased levels of sexual func-

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tioning (Brotto et al., 2010; Prause & Graham, 2007). Asexual subjects have been the focus in sexual psychophysiological research aimed at testing whether a deficiency in the capacity for physical sexual response may underlie their reported lack of attraction (Brotto & Yule, 2011). Finally, there has been recent interest in biological markers (e.g., digit ratios, handedness, fraternal birth order), which are associated with the development of homosexuality, in asexual men and women (Yule, Brotto & Gorzalka, 2014a).

Previous research has identified asexual individuals using criteria such as self-identification or agreement with the statement “I have never felt sexually attracted to anyone at all” (Bogaert, 2004; Brotto et al., 2010) or have recruited asexuals through various asexuality online organizations. These methods of recruitment are problematic because those individuals who may lack sexual attraction but who have not yet identified as asexual may be missed. Further, those asexuals recruited via an asexuality website may have different features and experiences than those recruited through other means. In particular for those asexual subjects not recruited through asexuality websites, it has been hypothesized that they may have responded to the question about sexual orientation with either “heterosexual” or “homosexual” as they found that this best fits their romantic attraction (Hinderliter, 2009) but doing so might result in their being miscategorized as sexual. The Asexuality and Visibility Education Network (AVEN; <http://www.asexuality.org>) has been described as an important aspect in the identification process of asexual individuals, as it is a venue for validating one’s experiences, where asexuals can discuss their lack of sexual attraction, and where they can find a sense of community (Brotto & Yule, 2009). Very little is known, on the other hand, about the experiences of individuals who lack sexual attraction, but who have not yet “come out” and adopted the label of “asexual.” In fact, it is unknown what proportion of those individuals might proceed on to self-identify as asexual. Some have speculated that those individuals who report a lack of sexual attraction, but have not yet discovered “asexuality” may be more isolated, distressed, or confused than those who belong to the asexual community (Brotto & Yule, 2009). Certainly, those belonging to AVEN may be a distinct group within the asexual population, as they have already acknowledged their asexuality as an identity, and they may have different motivating factors to join such an online community (e.g., distress) that make them different from those who are not part of an online community (Brotto et al., 2010). Some AVEN members also acknowledge that the recognition of an asexual identity “enables asexuals to form a new self-image” (Radloff, 2008), suggesting that their membership might influence or change the way that an individual lacking sexual attraction might respond to research questions.

Methodologically speaking, research on asexuality should include both individuals from online asexual communities and those who had not yet come across these online communities. However, a serious limitation in past research on asexuality has been the complete lack of a validated tool to identify asexuality. This is problematic because, due to limitations in recruiting sufficiently powered local samples, most studies have relied on recruiting via online web-based asexual communities (e.g., AVEN; Brotto et al., 2010; Brotto, Yule, & Gorzalka, 2014b; Prause & Graham, 2007), and results in participants who already identify as being part of a “community” (Brotto & Yule, 2009; Hinderliter, 2009).

A study by Prause and Graham (2007) provides a good illustration of the problem of asexual identification. In that study, individuals who selected “asexual” from a multiple choice sexual orientation prompt did not consistently choose “asexual” in a free-response question regarding sexual orientation. It has been suggested that this group were likely not recruited from AVEN (Hinderliter, 2009). On the other hand, those who did write *asexual* to the free-response item likely were recruited through AVEN. Based on this hypothesis, asexual activist Hinderliter (2009) has made three suggestions; (a) those individuals who identify as asexual in a free-response query as to their sexual orientation will have spent more time thinking about whether or not they are asexual, (b) asexual individuals recruited from AVEN will more closely fit the definition of asexuality as defined by AVEN, and (c) those recruited from online asexual communities will be strongly influenced by online discourses of asexuality, and the categories used to describe the experiences of asexual individuals. Because asexuality research is still in its infancy, it is crucial that recruitment be as broad as possible to ensure representativeness in the sample and it should not be constrained by whether or not subjects belong to a well-defined online community. The development of a validated self-report measure of asexuality would facilitate the acquisition of representative samples and would overcome previous shortcomings regarding participants having already self-identified as asexual and/or belonging to a community.

The present study was aimed at developing and validating a self-report questionnaire of asexuality, as defined by the researchers as an individual who lacks sexual attraction. While we conceptualize (a)sexuality as a continuous construct (as has been suggested elsewhere [McClave, 2013]), we aimed to create a cut-off score to indicate whether or not a participant was asexual. The questionnaire was intended to provide a valid measure independent of whether the individual self-identified as asexual. Although the measure may be used in future studies to explore correlates of asexuality, this was not deemed to be part of the aim of this study. Instead, our goal was to create a measure that could reliably differentiate an asexual from a sexual individual.

Method

The questionnaire was developed in three Stages: Stage I—development and administration of open-ended questions; Stage II—administration and analysis of 111 items in order to determine which items to retain and which to exclude; Stage III—administration and analysis of 33 retained items, and validity analysis of the final items. Participants were not restricted to taking part in only one of the three stages, nor were participants in early stages targeted to participate in later stages. Because participants in this study identified with a wide range of gender identities (including transgender), we did not analyze the findings according to traditional sex (e.g., male vs. female) categories given that several participants did not identify their gender according to male versus female. Further, due to the large number of different genders that participants identified with (e.g., androgyne, neutrois, gender-queer, pangendered, etc.) we did not conduct analyses by gender. We therefore carried out analyses on the full group of participants (independent of their reported sex or gender). All analyses were carried out using IBM’s statistical software Statistical Package for the Social Sciences (SPSS), version 17.0.

Stage I: Development and Administration of Open-Ended Items

The initial open-ended item pool was generated through discussions between the first two authors. The intent of this initial stage was to generate open-ended questions that might best discriminate asexual from sexual individuals. The resulting eight open-ended questions focused on definitions of asexuality, sexual attraction, sexual desire, and romantic attraction, and included solicitations of asexual individuals' opinions on factors that initially led them to identify as asexual, how they distinguish asexuality from low sexual desire, how they might have described their sexuality before they came across the term *asexual*, and what questions they would use to identify an individual as asexual. There were no space limitations, and participants were encouraged to answer in as much or as little detail as they felt necessary. (See Table 1 for initial item list).

Participants

Two samples were used to identify themes in response to the eight open-ended questions.

Asexual sample. One hundred thirty-nine individuals who self-identified as asexual were recruited from the AVEN website during the months of August and September 2009 and presented with the eight open-ended questions developed above in an online survey. Age ranged from 18–56 years. The mean age was 27.3 ($SD = 2.8$) years. Thirty-six (26%) participants were male, 76 (55%) were female, two (1.4%) were transgendered, 14 (10%) described their gender as being undefined or 'other' (e.g., androgynous, gender neutral, genderqueer, etc.), and 11 (8%) gave no response.

Sexual sample. To identify how responses differ between sexual and asexual participants, a modified version of these eight open-ended questions was administered to 70 sexual individuals (who self-identified as heterosexual, bisexual or homosexual [gay or lesbian]) via online recruitment through Craigslist and Facebook. Age range of sexual participants was 18–75 years. The mean age was 26.0 ($SD = 1.3$) years. Seventeen (24%) sexual participants were male, 51 (73%) were female, one (1%) was transgendered, and one (1%) did not answer.

Responses to the open-ended questions were examined by us (M.A.Y. and L.A.B.) to identify prevalent themes. There was saturation in the themes with the current sample. This information

was used to generate 111 multiple choice items that made up the Asexuality Identification Scale–111 (AIS-111). The items addressed 15 concepts, including: 1–Sexual Attraction/Desire (16 items assessing sexual attraction and sexual desire); 2–Masturbation (five items assessing desire to masturbate and pleasure obtained from masturbation); 3–Sexual Fantasy (seven items assessing presence and frequency of sexual fantasy); 4–Erotica (three items assessing enjoyment and arousal derived from viewing erotic films); 5–Sex-Related Distress (15 items assessing level of distress experienced in relation to the participant's sexuality); 6–Sexual Activity (15 items assessing enjoyment of sexual activity); 7–Sexual Identity (nine items assessing how the sexuality of participants is related to their identity); 8–Sex-Related Disgust (four items assessing repulsion or disgust of sexual activity); 9–Self-Reported Sexual Arousal (five items assessing self-reported sexual arousal or sex drive); 10–Inability to Relate to Others' Sexuality (seven items); 11–Disinterest in Sex (10 items); 12–Religion (two items assessing impact of religiosity on sexuality); 13–Sexual Avoidance (two items); 14–Sex in Relationships (six items assessing beliefs about sexuality within relationships); and 15–Romantic Attraction and Intimacy (five items assessing the beliefs about romantic and sexual attraction as distinct constructs). Each item was scored on a 5-point Likert scale, with higher scores reflecting experiences more typical of asexual respondents than sexual ones. Several items dependent on sexual activity contained an opt-out alternative response (i.e., "I have never experienced sexual activity"). Concept names and item numbers were retained throughout this process to ensure continuity and to simplify discussion.

Stage II: Administration and Analysis of AIS-111

Administration of the AIS-111

Study design. The initial items in the AIS-111 developed during Stage I were administered to 165 individuals who self-identified as asexual and 752 sexual individuals (who self-identified as heterosexual, bisexual, or homosexual [gay or lesbian]) in an online survey. Participants were recruited through several separate avenues, including postings on international websites (e.g., Craigslist), on the AVEN online web-community, through our university's human subjects pool, and through web-

Table 1
Initial Open-Ended Item Pool

Item number	Item
1	How would you define/describe asexuality?
2	How would you define/describe sexual attraction?
3	How would you define/describe sexual desire?
4	How would you define/describe romantic attraction?
5	What are some factors that initially led you to consider yourself as an asexual?/What are some factors that might lead you to think that someone is asexual?
6	How would you distinguish asexuality from a sexual dysfunction such as sexual desire disorder?
7	How might you describe your sexuality BEFORE you came across the term "asexual"?/How might you describe your sexuality?
8	What questions would you use (without describing or using the term "asexual") to identify an individual who might be asexual but has not yet come across the term?

Note. Items modified for sexual participants are included where appropriate.

sites that host psychological online studies (e.g., Hanover College's "Psychological Research on the Net" website).

Participants.

Asexual. Asexual participants ranged from 18 to 69 years old, with a mean age of 26.6 ($SD = 9.5$) years. Eighty-two percent noted that they were not in a relationship, and the majority (87%) had at least some postsecondary education. Most participants reported being Caucasian (85%). Thirty-one (19%) were male, 106 (64%) were female, 13 (8%) reported being transgender, and 15 (9%) described their gender as being undefined or "other" (e.g., androgyne, gender neutral, genderqueer, etc.).

Sexual. Sexual participants ranged from 18 to 80 years old, with a mean age of 24.5 ($SD = 8.8$) years. Six hundred and 10 self-identified as heterosexual, 98 were bisexual, and 44 were gay or lesbian. Thirty-nine percent reported being single and the majority (85%) had at least some postsecondary education. A large proportion of participants reported being Caucasian (52%) or East Asian (28%). Two hundred forty-seven (33%) were male, 495 (66%) were female, five (0.7%) reported being transgendered, and five (0.7%) described their gender as being undefined or "other" (e.g., androgyne, gender neutral, etc.).

Analysis of the AIS-111

Statistical analysis. Exploratory maximum-likelihood factor analysis with direct oblimin rotation was conducted to determine which items should be retained. This method of factor analysis was selected as it is robust to violations of normality and allows factors to correlate (Costello & Osborne, 2005) and is appropriate for analyses that are theoretically grounded (Tabachnick & Fidell, 2001). In maximum-likelihood factor analysis (unlike principal components analysis), unique variance and error variance are excluded so that only shared variance is available for analysis, and the total variance explained is less than in principal components analysis (Costello & Osborne, 2005; Tabachnick & Fidell, 2001). The minimum sample required for the factor analysis was 75, a criterion that was more than satisfied with our sample of 917 participants. This figure is based on the rule-of-thumb that a ratio of at least five times as many respondents should be used to the number of items in the questionnaire for factor analytic purposes (McDowell, 1996), which in this case is the 15 concepts listed above. A priori criteria for domain and item retention were: (a) Eigenvalues >1.0 , and (b) items with factor loadings at least 0.4. A greater amount of information can be gained from questions without an opt-out choice (e.g., those questions that can be answered whether or not the participant has experienced masturbation or other sexual activity). Therefore, most items that necessarily included an opt-out response were removed at this point, leaving 96 items. However, two items (Items 9 and 10), which addressed the concepts of Masturbation and Erotica, necessarily included an opt-out response, and thus were retained as these items were deemed necessary to obtain an accurate measure of these two concepts.

Domain structure. Item scores in each concept were averaged, and an exploratory maximum-likelihood factor analysis with direct oblimin rotation was used to assess the factor structure of the 15 concepts (96 items) for all participants. The technique of averaging item scores used here is known as *parceling*, a recognized technique for use with exploratory factor analysis. There are

several proposed advantages to this method (Little, Cunningham, Shahar & Widaman, 2002). Disadvantages of using item-level data include lower reliability, lower communality, a smaller ratio of common-to-unique factor variance, and a greater likelihood of distributional violations. Further, items have fewer, larger, and less equal intervals between scale points than do parcels. According to MacCallum, Widaman, Zhang, and Hong (1999) models based on parceled data are more parsimonious, have fewer chances for residuals to be correlated or for dual loadings to emerge, and lead to reductions in various sources of sampling error. It may be that subsets of items will share specific sources of variance, and that these are unlikely to be hypothesized by the researcher a priori, which can lead to systematic sources of common variance. It is thought that parceling a large number of items into smaller groups can reduce or even eliminate the number of unwanted sources of variance and lead to a better model fit than if all items were used. Parceling is thought to be particularly effective when the construct is unidimensional, which we believe asexuality to be.

A three-factor solution was produced using the 15 concepts outlined above, and labeled: Traits of Asexuality, Sex-Related Distress, and Masturbation. These three factors together explained 74% of the variance in the model.

Further analysis of the items and their relationship to each other indicated that a one-factor solution may be more appropriate. Factor 1 (Traits of Asexuality) had 12 concepts that loaded above 0.40, an eigenvalue of 8.69, and accounted for 58% of the variance in the model. Factor 2 (Sex-Related Distress) had one concept that loaded above 0.40, an eigenvalue of 1.33, and accounted for 9% of the variance. Factor 3 (Masturbation) also had a single loading concept, an eigenvalue of 1.10, and accounted for 7% of the variance in the model. In addition to the rule of thumb that a factor with three or fewer concepts with a loading greater than 0.40 is generally weak and unstable (Costello & Osborne, 2005), the three factors did not correlate with one another, further suggesting that the instrument may represent a single factor. Additionally, the scree test (Costello & Osborne, 2005) suggested that a single factor should be retained. Further, mean Sex-Related Distress scores for sexual and asexual participants were highly similar to one another (sexual participants: $M = 3.93$, $SD = 0.73$; asexual participants: $M = 4.09$, $SD = 0.78$, $t(912) = -2.53$, $p = .012$, Cohen's $d = .21$). While this finding was significant, the effect size is small. To put this in context, it can be compared to the highly significant difference between mean scores for Concept 1 (Sexual Attraction/Desire), for which sexual participants scored 1.91 ($SD 0.56$), and asexual participants scored 3.88 ($SD 0.44$), $t(911) = -42.13$, $p < .001$, Cohen's $d = 5.51$, which can be considered a very large effect size.

This small difference between mean distress scores may be explained by the observation that asexual individuals do not generally experience distress in relation to their asexuality (Brotto et al., 2010). Lack of distress is fundamental to the conceptualization of asexuality. Thus, it makes theoretical sense that items in this concept would be incapable of distinguishing between sexual and asexual participants. Since the goal of this instrument was to allow for distinction between asexual and sexual individuals, we eliminated all Sex-Related Distress items. The concept of Masturbation was retained at this point, as the data on whether masturbation rates differ between asexual and sexual individuals is equivocal (Brotto et al., 2010). Thus, we wanted to confirm that this concept

was not useful in differentiating between asexual and sexual participants in subsequent analyses. Further, mean Masturbation scores for sexual and asexual participants were significantly different (sexual participants: $M = 2.61$, $SD = 1.17$; asexual participants: $M = 3.55$, $SD = 1.23$, $t(910) = -9.277$, $p < .001$, Cohen's $d = .78$), supporting our decision to retain the Masturbation concept at this stage. Concept 12 (Religion) did not load onto any factor and was thus removed from further analyses.

We next examined the reliability (internal consistency) of each concept, as well as how well each individual item contributed to each concept. Reliability of each concept was clearly demonstrated. Most concepts, with the exception of Self-Reported Sexual Arousal, had good reliability ($\alpha > .50$), with eight concepts demonstrating a high reliability of $\alpha > .80$. For most concepts, the majority of their items contributed strongly to them, with only Concept 6 (Sexual Activity) having less than half of the items contribute. Overall reliability of the AIS-111 was very high ($\alpha > .98$).

Individual items were selected from each concept based on how well they contributed to the concept's reliability. Further, for item pairs that were very closely worded or very similar in meaning, one of the items was removed to increase brevity of the questionnaire. The resulting intermediate version of the Asexuality Identification Scale (AIS-37) retained 13 concepts and contained 37 items: Sexual Attraction/Desire (Items 5, 35, 36, 74, 82, 88, 94), Masturbation (Items 10 and 40), Fantasy (Items 20 and 103), Erotica (Items 9 and 104), Sexual Activity (Items 17, 27, 66, 89, 95), Sexual Identity (Items 50 and 87), Sex-Related Disgust (Items 18 and 51), Self-Reported Sexual Arousal (Items 34 and 38), Inability to Relate to Others' Sexuality (Items 55, 90, 98), Sexual Interest (Items 14, 19, 46, 93), Sexual Avoidance (Items 57 and 100), Relationships (Items 28 and 56), and Romantic Attraction and Intimacy (Items 2 and 110).

Stage III: Administration and Analysis of the AIS-37

Study Design

The 37 intermediate items (AIS-37) developed during Stage II were administered to 316 individuals who self-identified as asexual, and 926 sexual individuals who self-identified as heterosexual, bisexual, or gay or lesbian in an online survey. Participants were recruited through several avenues, including postings on international websites (e.g., Craigslist), on the AVEN online web-community, through the university's human subject pool, and through websites that host psychological online studies (e.g., Hanover College's "Psychological Research on the Net" website). The current sample was comparable to the sample assessed in Stage II above with respect to proportion of participants recruited from each of these sources.

Participants

Asexual. Asexual participants ranged from 18 to 72 years old, with a mean age of 24.8 ($SD = 7.6$) years. Fourteen percent noted that they were in a relationship, either committed or noncommitted, and the majority (88%) had at least some postsecondary education. Most participants reported being Caucasian (88%). Fifty-four (17%) participants were male, 206 (65%) were female,

10 (3%) were transgendered, and 46 (15%) described their gender as being undefined or "other" (e.g., androgyne, gender neutral, genderqueer, etc.).

Sexual. Sexual participants ranged from 18 to 69 years old, with a mean age of 25.0 ($SD = 8.3$) years. Six hundred and 75 self-identified as heterosexual, 130 were bisexual, and 121 were gay or lesbian. Fifty-four percent reported being in a relationship and the majority (84%) had at least some postsecondary education. A large proportion reported being either Caucasian (54%) or East Asian (27%). Two hundred forty-one (26%) were male, 672 (73%) were female, six (0.6%) were transgendered, and seven (0.8%) described their gender as being undefined or "other" (e.g., androgyne, gender neutral, genderqueer, etc.).

Measures

All questions pertaining to sex, gender, and sexual orientation were in a free response format given the finding that asexual subjects respond differently when queried using free response versus forced choice formats (Brotto et al., 2010; Prause & Graham, 2007). Those questions pertaining to ethnicity, education, relationship status, and masturbation frequency, had forced-choice response options.

Statistical Analysis

Defining domains and item retention summary. As in Stage II, exploratory maximum-likelihood factor analysis with direct oblimin rotation was conducted to determine which items from the AIS-37 should be retained, and which should be discarded. The minimum sample for the planned factor analysis was 65 asexual participants based on an ideal 5:1 respondent-to-item ratio (which was the case for the 13 concepts listed above) (McDowell, 1996). As in Stage II, a priori criteria for domain and item retention were: (a) Eigenvalues >1.0 , and (b) items with factor loadings at least 0.4.

Domain structure. Exploratory maximum-likelihood factor analysis with direct oblimin rotation was used to assess the factor structure of the 13 concepts of the AIS-37 for all participants. A two-factor solution was produced using the 13 concepts outlined above. Factor 1 had eight loading concepts, and was labeled Interpersonal Sexuality. Factor 2 contained four loading concepts and was labeled Intrapersonal Sexuality. These two factors together explained 72% of the variance in the model (see Table 2). Again, concept names and numbers were retained throughout this process to ensure continuity and to simplify discussion. The Interpersonal Factor of the AIS-37 consisted of Concept 1 (Sexual Attraction/Desire), Concept 6 (Sexual Activity), Concept 7 (Sexual Identity), Concept 8 (Sex-Related Disgust), Concept 10 (Inability to Relate), Concept 11 (Disinterest in Sex), Concept 13 (Sexual Avoidance), and Concept 14 (Relationships), all of which pertained to sexuality in relation to another individual. The Intrapersonal Factor, on the other hand, consisted of Concept 2 (Masturbation), Concept 3 (Fantasy), Concept 4 (Erotica), and Concept 9 (Self-Reported Sexual Arousal), all of which, it might be argued, are not dependent on presence of a partner. Previous research has found variance in interpersonal behavior (e.g., petting, sexual intercourse) to be independent of variance in intrapersonal behavior (e.g., fantasy, masturbation) (Meston, Trapnell, & Gorzalka,

Table 2
*Maximum Likelihood Analysis With Direct Oblimin Rotation of Concepts of the Asexuality Identification Survey—37: Factor Loadings**

Concept	Number of items	Factor 1 (Interpersonal sexuality)	Factor 2 (Intrapersonal sexuality)
1. Sexual Attraction/Desire	7	.810	.151
2. Masturbation	2	-.089	.760
3. Sexual Fantasy	2	.164	.733
4. Erotica	2	.371	.477
6. Sexual Activity	5	.968	-.001
7. Sexual Identity	2	.941	-.156
8. Sex-Related Disgust	2	.799	-.005
9. Self-Reported Sexual Arousal	2	.212	.695
10. Inability to Relate to Others' Sexuality	3	.747	.127
11. Sexual Interest	4	.971	-.029
13. Sexual Avoidance	2	.610	.128
14. Relationships	2	.940	-.029
15. Romantic Attraction and Intimacy	2	.241	.066
Relative explanatory power of individual factors (Eigenvalue)		8.226	1.124
Percent variance accounted for by individual factors		63.27%	8.65%

* Items with the highest loadings within each factor are in bold type.

1996), which supports our findings here. Concept 15 (Romantic Attraction and Intimacy) did not load onto either factor and was thus removed from further analyses.

Further analysis of the concepts and their relationship to each other indicated that, again, a one-factor solution is more appropriate than a two-factor model. Factor 2 (Intrapersonal) had an eigenvalue very close to 1, and accounted for a relatively small amount of variance, indicating that this factor should be eliminated. Additionally, the scree test (Costello & Osborne, 2005) suggested that a single factor should be retained. Due to evidence that asexual individuals experience genital sexual arousal (Brotto & Yule, 2011), that they experience sexual fantasies (Yule, Brotto, & Gorzalka, 2014b; although these are often not focused on other people), and that they have similar rates of masturbation to their sexual counterparts (Brotto et al., 2010), we would argue that the intrapersonal aspects of sexuality, which map onto Factor 2 in this model, are not unique to asexuality—the latter being conceptualized as a lack of attraction toward others, with perhaps, minimal to no impact on self-sexual behavior. Based on this evidence, as well as the results of our factor analysis, we excluded those items that made up the concepts (2, 3, 4 and 9) that mapped onto Factor 2 from further analyses.

Once it had been determined that the AIS-37 consisted of a single factor we examined the reliability (internal consistency) of the remaining concepts (1, 6, 7, 8, 10, 11, 13, and 14), as well as how well each individual item contributed to each concept. Reliability of each concept was clearly demonstrated (see Table 3). Most concepts, with the exception of Sex-Related Disgust, Inability to Relate, and Sexual Avoidance, had very high reliability ($\alpha > .90$). Many concepts had the majority of their items contribute strongly to them, with only Concept 6 (Activity) having less than half of the items contribute.

Item retention for the 12-item AIS. For those concepts that consisted of two items only (and thus had identical correlations with the total for each item), mean differences were calculated to

determine which item more strongly differentiated asexual from sexual participants (e.g., for the Sexual Avoidance concept, there was a larger difference between mean scores for asexual and sexual participants for item 38 than for item 4, and therefore item 38 was retained and item 4 discarded). Items containing an opt-out alternative were removed whenever there was a choice between an opt-out item and a non-opt-out item. (See the Appendix for the final items included in the AIS-12).

Psychometric analyses then focused on the validity of the AIS-12 total score. Analyses were based on the AIS-12 items, which were completed by the participants in Stage II (i.e., those who completed the AIS-111), as the validity questionnaires were not included in the final stages of the study.¹

In order to demonstrate that the questionnaire items on the AIS-12 were measuring the construct of asexuality, a series of validation techniques were conducted as follows:

1. Known-groups validity. If two groups are known to differ on a given condition, then one would expect differing results on a questionnaire that captures the condition. In this instance, we compared AIS-12 scores between individuals who do and do not self-identify as asexual, and performed *t* tests to determine whether any differences were statistically significant.

One hundred sixty-four asexual participants and 716 sexual participants completed the AIS-12. Levene's test revealed that the sample variances were not equal, thus necessitating the use of an independent samples *t* test in which equal variances was not assumed. The AIS-12

¹ We feel that this is a reasonable estimation of the AIS-12's validity, and acknowledge that these analyses should be repeated in a new sample using only the items on the AIS-12.

Table 3

AIS-37: Individual Items and Concept Reliability*

Concept	Standardized Cronbach's Alpha	Item number	Correlation with total	Cronbach's Alpha if item deleted
1. Sexual Attraction/Desire	.925	5-I know what it is like to experience sexual attraction	.831	.907
		35-I experience sexual attraction towards other people	.907	.898
		36-Compared to most people I know, I would describe my level of sexual attraction to others as being	.767	.915
		74-I have lost the feeling of sexual desire towards others	.379	.947
		82-I find other people to be sexually appealing	.808	.909
		88-I find myself experiencing sexual attraction towards another person	.867	.905
		94-I have never felt drawn toward another person sexually	.837	.906
6. Sexual Activity	.941	17-I would prefer to be sexually inactive	.837	.928
		27-I lack interest in sexual activity	.850	.925
		66-I find sexual activity pleasant	.825	.931
		89-I have never wanted to engage in sexual activity with another person	.809	.932
		95-I would be relieved if I was told that I never had to engage in any sort of sexual activity again	.890	.918
7. Sexual Identity	.703	50-I don't feel that I fit the conventional categories of sexual orientations such as heterosexual, homosexual, or bisexual	.542	n/a
		87-The term "nonsexual" would be an accurate description of my sexuality	.542	n/a
8. Sex-Related Disgust	.921	18-I am repulsed by sex	.854	n/a
10. Inability to Relate	.776	51-The thought of sexual activity repulses me	.854	n/a
		55-I find it hard to understand or relate to terms such as "hot" or "sexy"	.622	.688
		90-I am confused by how much interest and time other people put into sexual relationships	.639	.669
		98-I feel that other people think about sex much more than I do	.579	.734
11. Disinterest in Sex	.919	14-I have always found sex boring	.792	.899
		19-I find sex interesting	.753	.912
		46-I would be content if I never had sex again	.852	.880
		93-Sex has no place in my life	.864	.874
13. Sexual Avoidance	.788	57-I go to great lengths to avoid situations where sex might be expected of me	.651	n/a
		100-I try to avoid situations in which I might be approached for sex	.651	n/a
14. Relationships	.926	28-Given the choice between being in a sexual relationship and not being in a sexual relationship, I would prefer to NOT be in a sexual relationship	.861	n/a
		56-My ideal relationship would not involve sexual activity	.861	n/a

Note. n/a Reliability statistic cannot be calculated as there is only one item for this concept.

* Items included in final AIS-12 are bolded.

Total score differed significantly between sexual and asexual groups, $t(312.8) = 49.60, p < .001$.

2. Convergent validity. To assess whether the questionnaire correlates a construct thought to overlap with asexuality (i.e., sexual desire), summed AIS-12 Total scores were correlated with Dyadic and Solitary scores on the Sexual Desire Inventory (SDI; Spector, Carey & Steinberg, 1996), a measure that captures the cognitive (rather than behavioral) aspect of sexual desire. Many of the items on the SDI refer to desire in response to an "attractive person," or otherwise assume the presence of sexual attraction. Because lack of sexual attraction would very likely lead to a lack of sexual desire, we would expect a

low score on the SDI (indicating low desire) to correspond with a high score on the AIS-12 for asexual individuals. Specifically, we predicted a negative association between the Dyadic, but not the Solitary subscale of the SDI and the AIS-12 given that items pertaining to intrapersonal sexuality were removed from the AIS. For sexual individuals, we would also expect negative correlations between the AIS-12 and the SDI, for the opposite reason; we would expect sexual individuals to obtain low scores on the AIS-12, and high scores on the SDI.

Convergent validity was assessed by correlating total scores of the AIS-12 with scores on the Solitary and Dyadic subscales of the Sexual Desire Inventory. As

expected, for asexual individuals, the SDI Solitary subscale correlated only weakly ($\alpha = -.19$) with total scores on the AIS-12. The SDI Dyadic subscale did have a moderate negative correlation with the AIS-12 Total score ($\alpha = -.57$). Sexual individuals also had weak negative correlations between the AIS-12 and the SDI Solitary Subscales ($\alpha = -.31$), and moderate negative correlations for the SDI Dyadic Subscales ($\alpha = -.76$).

3. Approximated incremental validity. In order to determine whether the instrument is a more accurate measure of asexuality than existing measures of sexual orientation, total scores on the AIS-12 were compared with participant scores on the Klein Scale (Klein, Sepekoff, & Wolf, 1985), which was adapted to allow it to include asexuality as a sexual orientation. While comparison to an adapted measure may not be a true estimate of incremental validity, we wished to demonstrate that the AIS-12 could assess asexuality over and above an easily adapted existing measure. The original Klein scale requires participants to select their “choice partner or associate” (in the past, in the present and their ideal partner) on a number of measures, including sexual attraction, sexual behavior, sexual fantasies, emotional preference and social preference. Participants are given seven choices, ranging from “other sex only” to “same sex only.” An additional category was added to allow the selection of “neither sex” for these items. A second section of the Klein Scale asks participants about their “identity or lifestyle” (again past, present, and ideal), including lifestyle preference, social identity and political identity. Participants are asked to select their choice of seven items, ranging from “heterosexual only” to “homosexual only.” In order to make these items accessible to asexual participants, we added options allowing participants to select an asexual identity for these three items.

Approximated incremental validity was good, as the AIS-12 correlated only weakly with each subscale and the total score of the Klein scale.

4. Discriminant validity. The Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994; Bernstein & Fink, 1998) was included to ensure that endorsement of items that may be construed to indicate asexuality are not, instead, an indicator of negative sexual experiences. The CTQ provides a brief, reliable, and valid assessment of a broad range of potentially traumatic experiences experienced in childhood. Subscales on the CTQ include: Emotional Abuse (EA), Physical Abuse (PA), Emotional Neglect (EN), Sexual Abuse (SA), and Physical Neglect (PN). Higher scores on the CTQ indicate higher rates of abuse. We predicted that Total scores on the AIS-12 would not be strongly correlated with CTQ scores. Further, interpersonal relationships were measured using the Short-Form Inventory of Interpersonal Problems-Circumplex scales (IIP-SC; Soldz, Budman, Demby, & Merry, 1995), a 32-item questionnaire that assesses various interpersonal problems and ways of relating to others (e.g., socially avoidant, vindictive, exploitative). The

Big-Five Inventory (BFI; John, Donahue, & Kentle, 1991; John, Naumann, & Soto, 2008; John & Srivastava, 1999) was also included to assess personality traits. The BFI is a 44-item self-report questionnaire designed to measure the Big Five personality traits; openness, conscientiousness, extraversion, agreeableness, and neuroticism. Both the IIP-SC and the BFI were included to determine whether our measure identified asexuality above and beyond basic interpersonal and personality traits.

Discriminant validity was as expected, as scores on the AIS-12 were not significantly correlated with the Childhood Trauma Questionnaire for asexual individuals. For sexual participants, the CTQ scores were weakly correlated with the AIS-12 total score. Similarly, there were no significant moderate or strong correlations with the AIS-12 and the IIP-SC, or the Big-Five Inventory for asexual or sexual individuals (see Table 4).

Cut-off scores for the AIS-12. A score of 40/60 on the AIS-12 was found to capture 93% of individuals who self-identified as asexual. That is, 93% of asexual participants scored at or above 40 on the AIS-12, while 95% of self-identified sexual participants scored below 40.

Discussion

The objective of the present study was to develop a valid and reliable sex- and gender-neutral self-report measure of asexuality. The AIS-12 (hereafter referred to as the AIS²) was designed to be used as a valid and reliable tool to distinguish asexual individuals from sexual individuals for research purposes, and is considered necessary for researchers to obtain more representative samples than those that have been studied to date, most of whom had been recruited through self-identification as asexual (Hinderliter, 2009).

The AIS was developed in a series of stages, including development and administration of open-ended questions to sexual and asexual individuals, development of initial multiple choice items, and analysis of these items to facilitate selection of final items. Based on discriminant analytic methods, 12 items were retained in the final AIS. Sexual and asexual participants significantly differed in their AIS total score with high statistical significance. Further, a cut-off score of 40/60 was found to identify 93% of self-identified asexual individuals, while excluding 95% of sexual individuals. This suggests that the AIS is a useful tool for identifying asexuality, and could be used in future research to identify individuals with a lack of sexual attraction. We believe that the AIS does not depend on one’s self-identification as asexual; rather, it would also capture the individual who scores high on the AIS but has not yet identified him/herself as asexual.

Psychometric validation of the 12-item AIS was conducted for construct validity. Specifically, the total score of the AIS showed excellent ability to distinguish between asexual and sexual subjects

² AIS is a most appropriate name given that asexuals euphemistically refer to themselves as *aces*.

Table 4
Asexuality Identification Scale-12 Validity

	Asexual participants only	Sexual participants only
Known groups validity		
AIS-Total score, Mean (<i>SD</i>)***	51.45 (6.59)	21.14 (8.83)
Convergent validity (Pearson correlations)		
Sexual Desire Inventory:		
Solitary	-.190*	-.308**
Dyadic	-.567**	-.757**
Approximated incremental validity (Pearson correlations)		
Klein Scale subscales:		
Attraction	-.185*	-.034
Behavior	-.253**	-.116**
Fantasy	-.237**	-.053
Emotional	-.056	-.046
Social	.122	-.065
Lifestyle	-.133	-.159**
Identity	-.163*	-.161**
Political	-.169*	-.168**
Total Score	-.240**	-.131**
Discriminant validity (Pearson correlations)		
Childhood Trauma Questionnaire:		
Emotional abuse	-.032	.147**
Physical abuse	-.078	.135**
Emotional neglect	-.125	.205**
Sexual abuse	-.155	.189**
Physical neglect	-.016	.143**
Total score	-.100	.213**
Short-Form Inventory of Interpersonal Problems-Circumplex Version:		
Domineering	.003	.120**
Vindictive	.142	.195**
Cold	.185*	.280**
Socially avoidant	.186*	.203**
Exploitive	.098	.135**
Nonassertive	.163*	.120**
Overly nurturant	-.001	.159**
Intrusive	-.067	.096*
Total score	.176*	.245**
Big Five Inventory:		
Extraversion	-.219**	-.172**
Agreeableness	-.061	-.165**
Conscientiousness	.100	-.072
Openness	.018	-.155**
Neuroticism	.004	.171**

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

(discriminant validity), while showing only moderate correlations with an adaptation of a previously established measure of sexual orientation (approximated incremental validity). When compared to an existing measure of sexual desire, the AIS was found to correlate highly with scores on the Dyadic subscale of the Sexual Desire Inventory, but not with Solitary sexual desire scores. This finding demonstrates the previously recognized and considerable overlap between the constructs of sexual attraction and sexual desire. The strong correlation between the SDI Dyadic subscale and the AIS also confirms previous research showing that asexual individuals score significantly lower on sexual desire measures than sexual samples (Brotto et al., 2010), but do not differ from others on solitary sexual desire (Brotto & Yule, 2011).

Because of the difficulty disentangling sexual attraction and desire, and the assumption of some level of sexual attraction

implied by many items on the SDI, we would expect low scores on the SDI (indicating low sexual desire) to be correlated with high scores on the AIS (indicating asexuality) if the AIS is indeed assessing a lack of sexual attraction. To what extent does the AIS add value as a measure of asexuality above and beyond that captured by the SDI (or other measures of low desire for that matter)? The items on the SDI focus on desire for sexual behavior, rather than on level of sexual attraction. This may make the AIS more accessible than the SDI for individuals who lack sexual attraction. Further, items on the SDI are worded such that they presume an existing sexual attraction (i.e., "When you first see an attractive person [. . .]"). Also, a number of items address solitary sexual desire, which is not relevant to assessing asexuality because of the finding that patterns of solitary sex do not differ between asexual and nonasexual individuals (Brotto et al., 2010; Prause & Graham, 2007).

There has been previous speculation that asexual individuals may not experience sexual attraction due to a history of childhood trauma or sexual abuse (Brotto et al., 2010; Jay, 2008). Our finding that AIS total scores were not correlated with scores on the Childhood Trauma Questionnaire provides evidence that the AIS is not tapping into an experience of childhood trauma.

This questionnaire was developed with the sole intent of differentiating asexual individuals from sexual individuals, and not to provide any information about the phenomenon of asexuality itself. One inherent challenge in developing such a questionnaire is the need to avoid assuming a strict gender binary (Hinderliter, 2009). In fact, asexual individuals may reject identifying as either male or female in favor of more ambiguous (and inclusive) terms such as *agendered*, *genderqueer*, or *pan-asexual gender-free* to label their gender (Brotto et al., 2010). We believe that the resulting 12-item measure is, indeed, sex- and gender-identity neutral, and thus will be desirable for use. Furthermore, items are worded clearly and the AIS is simple to administer and score. While we view (a)sexuality as likely occurring on a dimensional spectrum, it was necessary to create a cut-off score that allowed researchers to categorize participants as “asexual” or “sexual,” and this categorization may be in conflict with the participant’s identity. The purpose of this questionnaire is not to question an individual’s identity, but allow the recruitment of representative samples of individuals who lack sexual attraction despite how they might identify.

Limitations

There is a possibility that some participants in this study who identified as “sexual” actually lack sexual attraction, and would thus be better categorized as “asexual” in research. Given the relative recency with which the term *asexuality* has been available, it may be that an asexual is misclassifying him/herself as sexual despite having a high AIS score. Instead, such an individual might select heterosexual, homosexual (gay or lesbian), or bisexual (rather than asexual) in response to a query about their sexual orientation. This is problematic, as it means that our asexual category does not include those participants who have not heard of asexuality, which could influence our understanding of asexuality. In fact, as can be seen in Figure 1, there is a subgroup of sexual participants in this study (4%) who received a score

greater than 40 on the AIS, and approximately 1% who scored above 50. While this is a limitation of our study, it could be argued that this confirms that the AIS is functioning as it was designed and is identifying those participants who might be better classified as asexual instead of sexual. Further, because this questionnaire was developed on a sample of well-defined self-identified asexual individuals, who are potentially highly asexual, it is possible that the AIS may have greater sensitivity at higher levels of asexuality, and decreased sensitivity at lower levels. Follow-up research will focus on further development of this scale in large population-based studies to ensure sensitivity across a broader range of individuals who lack sexual attraction. Future research will also attempt to determine sensitivity and specificity of individual items on the AIS.

Another important limitation that should be considered is that the concept of asexuality is relatively new, and thus the construct is still poorly understood (Brotto et al., 2010). While the current and most widely used definition of asexuality is, as noted throughout this manuscript, an individual who does not experience sexual attraction, there appears to be a range of experiences within this group. For example, a sizable number of self-identifying asexual individuals report experiencing low levels of sexual attraction, rather than no sexual attraction at all (Carrigan, 2011). This is reflective of the large amount of diversity present among the asexual community, and is common enough that the term “Gray-A” is used to refer to those who fall in the “gray area” between sexual and asexual. While AVEN describes an asexual individual as being “someone who does not experience sexual attraction,” this definition is seen as a blanket term among asexual individuals themselves (Carrigan, 2011). Several asexual individuals in Scherrer’s (2008) study based their identification as asexual not on a lack of sexual attraction, but on a lack of intent to engage in sexual behavior. As Scherrer (2008, p. 626) points out, “as with other sexual identities, the meaning of an asexual identity varies.” The participants in this study who self-identified as asexual likely represent this variability.

The psychometric analyses used to assess validity in Stage III were conducted on the items that made up the AIS-12 as completed by the participants in Stage II (i.e., those who completed the AIS-111), as the validity questionnaires were not included in the final stage of the study. While we believe this to be a reasonable

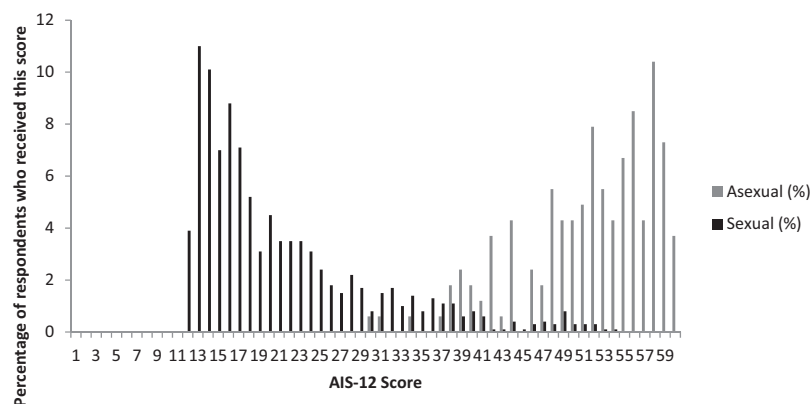


Figure 1. Distribution of scores on the AIS-12 for asexual and sexual participants.

approximation of the AIS' validity, these analyses should be conducted on a new sample using only the items on the final AIS.

Conclusion

The AIS, a 12-item questionnaire, has been developed as a brief, valid, and reliable self-report instrument for assessing asexuality. It is psychometrically sound, easy to administer, and has demonstrated ability to discriminate between sexual and asexual individuals. It should prove useful to allow researchers to cast a wider net when recruiting individuals who lack sexual attraction, and may therefore lead to more representative samples of the asexual population, allowing us to further increase our understanding of asexuality. We hope that researchers interested in the construct of asexuality consider use of the AIS.

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Appendix

Asexuality Identification Scale (AIS) (Yule, M. A., Brotto, L. A., & Gorzalka, B. B., 2014)

These questions ask about your experiences over your lifetime, rather than during a short period of time such as the past few weeks or months. Please answer the questions as honestly and as clearly as possible while keeping this in mind. In answering these questions, keep in mind a definition of sex or sexual activity that may include intercourse/penetration, caressing, and/or foreplay.

What is your sexual orientation? _____

1. I experience sexual attraction toward other people

- 1 = Completely True
- 2 = Somewhat True
- 3 = Neither True nor False
- 4 = Somewhat False
- 5 = Completely False

2. I lack interest in sexual activity

- 1 = Completely False
- 2 = Somewhat False
- 3 = Neither True nor False
- 4 = Somewhat True
- 5 = Completely True

3. I don't feel that that I fit the conventional categories of sexual orientation such as heterosexual, homosexual (gay or lesbian), or bisexual

- 1 = Completely False
- 2 = Somewhat False
- 3 = Neither True nor False
- 4 = Somewhat True
- 5 = Completely True

4. The thought of sexual activity repulses me

- 1 = Completely False
- 2 = Somewhat False
- 3 = Neither True nor False
- 4 = Somewhat True
- 5 = Completely True

5. I find myself experiencing sexual attraction toward another person

- 1 = Always
- 2 = Often
- 3 = Sometimes
- 4 = Rarely
- 5 = Never

(Appendix continues)

6. I am confused by how much interest and time other people put into sexual relationships

- 1 = Completely False
- 2 = Somewhat False
- 3 = Neither True nor False
- 4 = Somewhat True
- 5 = Completely True

7. The term “nonsexual” would be an accurate description of my sexuality

- 1 = Completely False
- 2 = Somewhat False
- 3 = Neither True nor False
- 4 = Somewhat True
- 5 = Completely True

8. I would be content if I never had sex again

- 1 = Completely False
- 2 = Somewhat False
- 3 = Neither True nor False
- 4 = Somewhat True
- 5 = Completely True

9. I would be relieved if I was told that I never had to engage in any sort of sexual activity again

- 1 = Completely False
- 2 = Somewhat False
- 3 = Neither True nor False
- 4 = Somewhat True
- 5 = Completely True

10. I go to great lengths to avoid situations where sex might be expected of me

- 1 = Completely False

- 2 = Somewhat False
- 3 = Neither True nor False
- 4 = Somewhat True
- 5 = Completely True

11. My ideal relationship would not involve sexual activity

- 1 = Completely False
- 2 = Somewhat False
- 3 = Neither True nor False
- 4 = Somewhat True
- 5 = Completely True

12. Sex has no place in my life

- 1 = Completely False
- 2 = Somewhat False
- 3 = Neither True nor False
- 4 = Somewhat True
- 5 = Completely True

Which of the following best describes you?

- Heterosexual
- Bisexual
- Homosexual (Lesbian or Gay)
- Asexual

Scoring

Total AIS scores are calculated by summing responses from all 12 questions. Higher scores indicate greater tendency to endorse traits that may indicate asexuality. A cut-off score of 40/60 has been proposed, such that those participants who score at or above 40 on the AIS are likely to experience a lack sexual attraction. The final item (“Which of the following best describes you?”) is unscored.

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