Cognitive processing of sexual cues in asexual individuals and heterosexual women with
desire/arousal difficulties

by

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Cognitive Processing of Sexual Cues in Asexual Individuals and Heterosexual Women with Desire/Arousal Difficulties

Submitted by Natalie Bellman Brown in partial fulfillment of the requirements for the degree of Master of Arts in Psychology

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Abstract

Asexuality is defined as a lack of sexual attraction to others. Though scholars have classified it as a sexual orientation, this has been challenged, with some experts positing that it is better explained as a sexual dysfunction. Sexual Interest/Arousal Disorder (SIAD) is characterized by absent/reduced sexual interest/arousal paired with personal distress, with two subtypes: acquired and lifelong. Research suggests that while asexuality and acquired SIAD are distinct entities, there may be overlap between asexuality and lifelong SIAD. Findings from studies of visual attention to and appraisals of sexual cues suggest that these methodologies might differentiate these two groups on the basis of their neural mechanisms. However, no study has compared these groups’ cognitive processing of sexual cues, and the literature on lifelong SIAD is minimal. The current study aimed to test differences between asexuality and SIAD (both lifelong and acquired) on cognitive processing of sexual cues. Forty-two asexual individuals and 25 heterosexual women with SIAD (16: acquired; 9: lifelong) completed three study components: a visual attention task, a sex SC-IAT, and the Sex Semantic Differential Scale. One-way ANOVAs examined group differences in: 1) visual attention to erotic cues, 2) implicit appraisals of sexual words, and 3) explicit appraisals of sex. Women with SIAD displayed a controlled attention bias for erotic images and areas of sexual contact, making a greater number of fixations and having longer dwell times to these areas relative to asexual individuals, who did not gaze preferentially at erotic cues. There were no differences in gaze behavior between women with different SIAD subtypes. For implicit appraisals, there were minimal group differences, with asexual individuals and women with both SIAD subtypes demonstrating negative – neutral implicit associations with sexual words. For explicit appraisals, women with acquired SIAD reported more positive evaluations of sex relative to asexual individuals and
women with lifelong SIAD, with no notable differences between the latter groups. This project sheds light on key differences between asexuality and low desire, and has important implications for best clinical practice guidelines for the assessment of lifelong SIAD.
Lay Summary

This study examined asexuality and sexual desire disorders by exploring these groups’ cognitive processing of sexual cues via visual attention to and appraisals of sexual words and images. Forty-two asexual individuals and 25 heterosexual women with Sexual Interest/Arousal Disorder (SIAD; 16 acquired, 9 lifelong) completed three study components: a visual attention task, a SC-IAT that measured implicit appraisals of sexual words, and the Sex Semantic Differential Scale, a questionnaire that assessed explicit appraisals of sex. My findings showed that heterosexual women with lifelong and acquired SIAD preferentially gazed at erotic cues, whereas asexual persons did not. For appraisals, the results revealed that while all groups displayed negative – neutral implicit associations with sexual words, women with acquired SIAD reported more positive attitudes towards sex. This project sheds light on key differences between asexuality and low desire, and has important implications for clinical practice guidelines for the assessment of lifelong SIAD.
Preface

This thesis is the culmination of work conducted in three laboratories: 1) UBC Sexual Health Research; 2) Brain, Attention, and Reality Laboratory, both located at the University of British Columbia, Vancouver campus; 3) Biopsychosocial Investigations of Gender Laboratory located at the University of Toronto, Mississauga Campus. The project and associated methods were approved by the University of British Columbia’s Behavioural Research Ethics Board (certificate #H18-03236) and the Institutional Ethics Board at the University of Toronto (certificate #38252). None of the text of the thesis is taken directly from previously published articles.

I was the lead investigator and was responsible for project conceptualization, study design, recruitment, data collection, data analysis, and the preparation of the final thesis. Drs. Lori Brotto and Alan Kingstone were supervisory authors on this project and were involved throughout the process in concept formation, data analysis and interpretation, and manuscript composition. Diana Peragine and Dr. Doug Vanderlaan facilitated data collection at the University of Toronto and provided feedback on this thesis.
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Chapter One: Introduction

Asexuality

Human asexuality is generally defined as a lack of sexual attraction to others (Brotto & Yule, 2017). There has been a recent surge of academic interest in asexuality in response to large-scale national probability studies of British residents that suggest approximately 0.4 – 1% of the population identifies as asexual (Aicken, Mercer, & Cassell, 2013; Bogaert, 2004, 2013). The Asexuality Visibility and Education Network (AVEN; www.asexuality.org), the world’s largest online asexual community, has experienced a similar rate of growth in the past decade, with 126,802 registered members as of June 2020 (AVEN, 2020). Despite the explosion of research on asexuality and increase in social advocacy for asexual people’s representation in the LGBTQ+ community, there has not been a corresponding shift in societal acknowledgement or acceptance of those who do not experience sexual attraction towards others.

Researchers have found compelling evidence suggesting that asexual individuals are stigmatized by their sexual peers (Gupta, 2017; MacInnis & Hodson, 2012). For instance, when college students were given definitions of various sexual groups, asexual people were rated as less likely to possess human nature traits (i.e., conscientiousness, friendliness) or to experience emotions (i.e., guilt, affection) than their allosexual (non-aseexual) counterparts (MacInnis & Hodson, 2012). Even more disconcerting, these students expressed that they wanted the least future contact with asexual people relative to heterosexual and same-sex attracted individuals, providing evidence for a strong negative bias against those who do not experience sexual attraction to others (MacInnis & Hodson, 2012). Additionally, asexual people describe pathologization when they disclose their sexual identity to others, with friends and family often
expressing disbelief that asexuality exists or characterizing it as “unnatural” (Gupta, 2017; Robbins, Low, & Query, 2016).

AVEN aims to reduce the marginalization experienced by this sexual group by facilitating open and honest communication about asexuality, which they conceptualize as a unique sexual orientation (AVEN, 2020). However, the viewpoint that asexuality is a sexual orientation in its own right has been contested, with scholars arguing that the line between asexuality and sexual desire disorders is not clearly defined (Gupta, 2017). Certain clinicians and researchers suggest that individuals who identify as asexual suffer from sexual dysfunction (Davidson, 2009; Duenwald, 2005). Specifically, the psychological community continues to struggle with the distinction between asexuality and Sexual Interest/Arousal Disorder (SIAD), given that both groups share a disinterest in sexual activity (Bogaert, 2015; Childs, 2009).

**Asexuality Spectrum**

There is considerable diversity within the asexual community, and the umbrella term “ace” is used to encompass members’ heterogeneous experiences of attraction, relationships, and arousal (Chasin, 2013). Research findings support the idea that asexuality is a spectrum, as asexual-identifying people differ in their sexual behaviours and the types of relationships they pursue (Carrigan, 2011; Scherrer, 2008). On one end of this continuum are individuals who do not report ever experiencing attraction to others, referred to simply as asexual. Gray-As can also be found on this spectrum, and this label is used by people who experience sexual attraction infrequently, experience sexual attraction but have no corresponding desire to engage in sexual behaviour, or experience sexual attraction only with certain people or in specific situations (Carrigan, 2008; Chasin, 2013). For example, demisexuals are a subset of Gray-As, and these individuals experience sexual attraction only with people with whom they share a strong
emotional bond (Chasin, 2013). It is important to note that the terminology used to describe these asexual identities is deeply personal. In addition to considerable variation in sexual attraction (or lack thereof) in the ace community, there is also evidence of substantial gender diversity (Chasin, 2011). Research suggests that a large number of asexual people do not identify as women or men, and thus do not fit the gender binary (Brotto, Knudson, Inskip, Rhodes, & Erskine, 2010; Gazzola & Morrison, 2012). For example, Antonsen, Zdaniuk, Yule, and Brotto’s (2020) recent study of 1,268 asexual participants revealed that 16.2% of their sample listed a gender identity other than man/woman (i.e. agender, androgynous, intersex, genderqueer/genderfluid, pangender, transgender, or other). Moreover, results from the 2016 Asexual Community Census indicated that only 74% of the sample of 9,331 ace participants self-reported that they were “woman/female” or “man/male” (Bauer et al., 2018). Further, approximately 33% of ace individuals who completed the census reported a gender identity that was not congruent with their sex at birth (Bauer et al., 2018), suggesting higher rates of trans experience within this group relative to the general population. This diversity has not been well-represented in academic literature. In contrast, the sex bias within the ace community should also be noted, as the majority of 2016 Asexual Community Census respondents (i.e., 89%) disclosed that they were female at birth (Bauer at al., 2018).

**Sexual Interest/Arousal Disorder (SIAD)**

SIAD is a sexual dysfunction characterized by absent or reduced sexual interest or arousal paired with significant personal distress. Although estimates vary, some studies indicate that as many as 34% of women report low sexual desire within the past year (Mitchell et al., 2013). SIAD is included in the *Diagnostic and Statistical Manual of Mental Disorders (5th ed.)*; *DSM-5*; American Psychiatric Association [APA], 2013), and there is considerable variability in
this presentation of sexual concerns. Symptoms must be present for at least six months and include at least three of the following: absent/reduced interest in sex, absent/reduced sexual thoughts/fantasies, absent/reduced responsive sexual desire, reduced initiation of or receptivity to sexual activity, absent/reduced sexual pleasure, and absent/reduced physical sexual sensations (APA, 2013). There are two subtypes of SIAD based on onset: acquired and lifelong. Women with acquired SIAD report having previously experienced satisfactory levels of sexual desire/arousal, followed by a reduction they associate with significant distress (APA, 2013). Conversely, women with lifelong SIAD report always having experienced distressing sexual concerns. My review of the empirical literature on low desire/SIAD indicates that the majority of research focuses on women with acquired rather than lifelong SIAD, resulting in a paucity of data on the latter group and what characteristics differentiate those with lifelong vs acquired SIAD.

**Comparing Asexuality and SIAD**

Given that asexual individuals and women with SIAD both report a lack of sexual desire (and often reduced sexual activity; Brotto, Yule, & Gorzalka, 2015), one might be tempted to conclude that they are the same entity. However, scholars have challenged this interpretation (Bogaert, 2006; Brotto et al., 2015; Brotto & Yule, 2017; Hinderliter, 2013). Importantly, those who identify as asexual do not experience their lack of sexual interest as personally distressing, one of the hallmarks of sexual desire disorders (Brotto et al., 2010; Brotto et al., 2015; Prause & Graham, 2007). Further, women with SIAD are more likely to seek treatment for their sexual concerns, whereas asexual people do not view their orientation as ‘lesser’ than other types of sexuality, but rather as a nonpathological, alternative way-of-being (Gupta, 2017). Put more simply, the existing data indicate that asexual persons have no interest in having their desire
“fixed” (Brotto et al., 2010; Westfall, 2004). A group of asexual advocates convened to create an AVEN DSM Task Force, designed to inform the DSM-5 working group as they formulated the definitions of sexual dysfunctions. Their report, *Asexuality, HSDD, and the DSM: A Collaborative Report* (AVEN DSM Task Force, 2008) was based on interviews with seven human sexuality experts as well as personal statements from AVEN members, who brainstormed ways to create accurate diagnostic criteria for sexual desire disorders without contributing to the stigma surrounding asexuality. Two recommendations were made. First, they asked that “attraction to neither males nor females” be added as a sexual orientation category. Second, they requested that a clause be included for any new desire disorder, specifying that this diagnosis applies only to those who do not identify as asexual (AVEN DSM Task Force, 2008).

Another key area of difference is the onset and duration of disinterest in sex. Specifically, findings from qualitative research reveal that asexual people report “always feeling this way” and “never relating to those who were turned on by others during puberty”, whereas those with acquired low desire describe a period of satisfying sexual desire before the onset of low or absent interest in sex (Brotto et al., 2010). On the other hand, those with lifelong low desire bear some similarities with asexual persons in that both describe a more longstanding pattern to their absent sexual interests. Only one study to date has compared women with lifelong low desire and asexual individuals (Brotto et al., 2015), and no studies have used psychophysiological measures to examine differences in participants’ sexual arousal responses.

In an effort to further test differences between asexuality and sexual dysfunction, Brotto and associates (2015) conducted a quantitative study examining differences between asexual persons and those with a sexual desire disorder on several sex-related variables. The researchers found that asexual individuals reported fewer sexual partners, sexual fantasies, lower frequencies
of sexual activities, lower levels of desire and sex-related distress, and fewer depressive symptoms than women meeting the diagnostic criteria for clinically low desire (Brotto et al., 2015). The researchers then carried out a follow-up analysis of the subgroup of low desire participants who had the lifelong variant of the condition. They found that although women with lifelong SIAD reported more sexual behaviours and higher levels of desire than asexual persons, these differences were smaller in magnitude than those observed between asexual individuals and women with acquired SIAD. When comparing the two subtypes, women with lifelong SIAD reported less frequent sexual activity and lower desire than women with acquired SIAD, but disclosed similar levels of sex-related distress (Brotto et al., 2015). Taken together, this pattern of findings and the similar duration of disinterest in sex reported by asexual individuals and women with lifelong sexual concerns suggest possible overlap between these groups. This small study ($n = 14$ participants with lifelong SIAD) is the only one I am aware of that has systematically attempted to compare SIAD with asexuality; therefore, this represents a significant gap in the literature.

**Cognitive Processing of Sexual Cues**

Researchers have posited that differences in sexual orientation arise from variations in biological processes that affect the organization of sites in the fetal brain, with indirect evidence supporting the notion that prenatal biological influences (e.g., hormones) affect the neural development of non-heterosexual individuals in a way that differs from their heterosexual counterparts (Bogaert & Skorska, 2020). Research programs investigating biological origins of sexual orientation focus on biomarkers/correlates (e.g., height, menstruation patterns, and handedness) of early neural development (Bogaert, 2015; LeVay, 2010; Wilson & Rahman, 2005). Specifically, handedness is a strong indicator of prenatal development, and research
findings demonstrate that handedness patterns are associated with sexual orientation (Lalumière, Blanchard, & Zucker, 2000). In support of early biological influences on asexuality, researchers found that asexual women were of shorter stature, had more atypical menstrual patterns, and were more likely to be left-handed than their allosexual counterparts (Bogaert, 2004, 2012, 2013; Yule, Brotto, & Gorzalka, 2014). Brain-imaging research exploring the neural correlates of low desire revealed that women with a sexual desire disorder exhibited different patterns of brain activation when viewing erotic stimuli compared to sexual controls, suggesting group differences in the cognitive processing of sexual cues (Demicheli, Cojan, & Waber, 2011). Taken together, these findings provide support for the possibility that unique neural mechanisms underlie asexuality and low desire.

According to Dewitte’s (2016) cognitive-motivational model of sexual response (CMM; see Figure 1), visual attention to and appraisal of erotic cues are prerequisites for sexual arousal. Initial and controlled attention towards sexual stimuli initiates and sustains the sexual response. Initial attention to erotic cues may involve the automatic processing of sexually-relevant features in the environment, whereas controlled attention involves the explicit processing of a cue’s meaning and awareness of sexual arousal (Janssen, Everaerd, Spiering, & Janssen, 2000). Visual attention to a stimulus (i.e., looking at a spatial area) can be quantified by the total amount of time (i.e., dwell time) or number of times (i.e., number of fixations) an individual looks at an item (Dawson & Chivers, 2016). Researchers using viewing time in eye-tracking paradigms have found that sexual orientation affects controlled attention, such that gaze patterns to sexual cues vary in a manner that is consistent with one’s sexual attractions (Dawson & Chivers, 2016; Dawson, Fretz, & Chivers, 2016; Ebsworth & Lalumière, 2012; Israel & Strassberg, 2009; Lippa, 2012; Rullo, Strassberg, & Miner, 2014).
Eye-tracking allows for the direct assessment of initial and controlled attention through the acquisition of visual fixation data. The results of eye-tracking studies suggest that individuals allocate their controlled attention to a greater degree to stimuli depicting their sexually preferred rather than nonpreferred gender (Dawson & Chivers, 2016; Dawson et al., 2016). For example, studies employing a forced attention paradigm – the simultaneous presentation of two distinct stimuli that differ on a variable of interest – revealed that heterosexual women spent longer periods of time looking at and made more fixations toward images of men (i.e., preferred gender) relative to women (i.e., nonpreferred gender; Dawson & Chivers, 2016). Dawson and associates (2016) replicated these findings in a follow-up study, and also found that lesbian women displayed significantly longer gaze times towards images of women relative to men, and thereby exhibited a controlled attention bias for their preferred gender (i.e., women). Additionally, these authors found that women’s gaze times to the images presented were positively correlated ($r = .47-.49$) with their self-reported attraction to these stimuli (Dawson & Chivers, 2016). Taken together, these findings provide support for the use of controlled attention to sexual stimuli as an indicator of women’s preferred sexual targets (e.g., men, women). Following this logic, given that asexual persons do not experience sexual attraction to others, I predicted that asexual individuals would not gaze preferentially (i.e., looking more often or for a longer period of time) at an image depicting a sexual interaction between actors relative to a non-sexual image. In contrast, Lykins, Meana, and Minimi (2011) found that opposite-sex attracted women with no sexual concerns and women who endorsed low desire demonstrated a controlled attention bias for erotic cues. Specifically, these authors recorded women’s eye movements as they viewed images showing nude men and women engaging in non-penetrative sexual activity, and observed that both the control sample and women with low desire looked more often and for a longer
period of time at the actors’ bodies than the background, with no group differences in gaze behavior towards these areas (Lykins et al., 2011). Based on these results, I anticipated that heterosexual women with SIAD would behave similarly to their symptom-free counterparts, such that they would demonstrate a controlled attention bias to sexual images, exemplified by a greater number of and longer dwell times to erotic relative to neutral scenes. Given that both lifelong and acquired subtypes of SIAD affect women who do have sexual attractions, I predicted no differences in visual attention patterns between these two groups of women.

Appraisal of an erotic cue is another prerequisite of sexual responding identified by Dewitte’s (2016) CMM. Appraisal represents our subjective evaluation of a stimulus or concept, incorporating both implicit and explicit processes (DeWitte, 2016). Within the CMM, implicit appraisals involve encoding and matching stimuli in memory, are based on past experience, and are not part of conscious awareness. Importantly, implicit appraisals give stimuli emotional meaning (Brauer et al., 2012; DeWitte, 2016; Janssen et al., 2000). For example, if a person has had several sexual encounters they considered rewarding in their lifetime, they would likely display strong positive implicit appraisals of sexual cues. Given that asexual persons reported less frequent engagement in sexual activities compared to an allosexual comparison sample who had a sexual desire disorder with mostly the acquired subtype (Brotto et al., 2015), it is logical that sexual cues hold less positive meaning for asexual individuals than heterosexual women with acquired SIAD (Brotto et al., 2010). Since asexual individuals and women with lifelong SIAD had similar low levels of sexual activity, it is possible that these two groups share similar responses to erotic cues.

It is crucial to understand the appraisal stage of sexual arousal, as implicit appraisals of erotic stimuli lead to changes in attention, subjective experience, and genital response (Snowden
The Implicit Association Task (IAT; Greenwald, McGhee, & Schwartz, 1998) is the most widely used measure of implicit appraisals, relying on reaction times within a dual classification task to assess the strength of associations held in memory (Brauer et al., 2012). Researchers have used the IAT to distinguish women of different sexual orientations. Specifically, Snowden and Gray (2013) used an IAT to assess sex-related implicit appraisals of gender/sex, asking heterosexual and lesbian women to classify images as either male or female and words as either sexually-related or not sexually-related. The study revealed that heterosexual women were quicker at the classification task when sexual words (i.e., arousing, sensual) and images of men were paired, compared to conditions when these words were paired with images of women. Lesbian women showed the opposite pattern. Thus, both heterosexual and lesbian women demonstrated stronger positive implicit associations between erotic cues and their preferred gender relative to their nonpreferred gender.

In the first study examining differences between asexual and heterosexual participants’ implicit evaluations of erotic cues, Bulmer and Izuma (2018) used a Single Category-IAT (SC-IAT) to examine implicit appraisals of sex. One limitation of the traditional IAT is that it measures attitudes towards two related but separate concepts (e.g., male and female), making it difficult to measure implicit appraisals of concepts with no logical alternative category (e.g., sex). The SC-IAT circumvents this issue by capturing negative or positive associations with a single concept (Bluemke & Friese, 2008; Karpinski & Steinman, 2006). Participants completed a sex SC-IAT, and classified generally positive, negative, and sexual words as “good”, “bad”, or “sexual”, with “good” and “sexual” paired in half of the trials, and “bad” and “sexual” paired in the others. Asexual participants completed trials more quickly when “bad” and “sex” were paired relative to when “good” and “sex” were paired, whereas heterosexual participants exhibited the
opposite pattern. Specifically, heterosexual men and women performed the classification task more efficiently when “good” and “sex” rather than “bad” and “sex” were paired. Thus, those who identified as asexual had less positive implicit appraisals of erotic stimuli than the allosexual comparison group.

Focusing on women with sexual desire disorders, one study to date used an IAT to examine differences in implicit appraisals of sexual cues between heterosexual controls and women with clinically low desire, and found that women with acquired sexual desire concerns exhibited moderately less positive associations with sexual imagery than controls (Brauer et al., 2012). However, this difference was smaller in magnitude than that observed for asexual and heterosexual women without sexual concerns (Bulmer & Izuma, 2018). Thus, considering asexual individuals’ lower levels of sexual activity and the aforementioned findings from IAT studies, I expected that asexual participants would have less positive implicit appraisals of sexual stimuli compared to heterosexual women with acquired SIAD. However, it is important to note that Brauer and associates’ (2012) IAT study did not include women with lifelong sexual desire concerns in their sample. Considering evidence that women with lifelong low desire report levels of sexual (in)activity and desire similar to asexual individuals (Brotto et al., 2015), I predicted that implicit appraisals of erotic cues would be similar between those with lifelong SIAD and asexual participants, and would be less positive than the implicit appraisals of women with acquired SIAD.

According to the CMM (Dewitte, 2016), from a temporal perspective, the aforementioned unconscious activation of implicit sexual memory by a sexually-competent stimulus is followed by the explicit appraisal of this erotic cue (refer to Figure 1). Explicit appraisals are deliberate evaluations of concepts or stimuli, commonly referred to as attitudes (Brauer et al., 2012). This
type of appraisal is requisite for the subjective experience of arousal to emerge (Spiering, Everaerd, & Laan, 2004). While asexual individuals report a range of attitudes towards sex, from being relatively neutral to finding sex aversive or disgusting, their evaluations of erotic cues are more negative overall than those of allosexual participants (Bulmer & Izuma, 2018; Carrigan, 2011; Van Houdenhove, Gijs, T’Sjoen, & Enzlin, 2015). Bulmer and Izuma (2018) asked asexual and heterosexual participants to complete a Sex Semantic Differential Scale (SSDS), which required them to place the word sex on 11 separate 7-point scales, with a positive word (i.e., pleasant) on one end of each scale and a negative word (i.e., unpleasant) on the opposite end. Asexual participants consistently placed the word sex closer to the negative words than the heterosexual participants, providing evidence that asexual individuals held more negative associations with sex than their heterosexual counterparts. Conversely, the heterosexual women displayed generally positive associations with sex, frequently positioning the word closer to the positive attributes. Shifting to women with sexual concerns, Brauer and associates (2012) examined discrepancies between the explicit appraisals of erotic cues for participants without sexual desire concerns and women with acquired low desire, with mixed findings. Specifically, in response to one set of erotic images, women with acquired sexual desire concerns reported more disgust and less desire than heterosexual controls, but there were no group differences observed for responses for a separate, albeit similar, set of pictorial stimuli. Given these results, I expected that asexual individuals would report less positive explicit appraisals of sexual stimuli than heterosexual women with acquired SIAD. Unfortunately, there are currently no published studies examining women with lifelong low desire’s attitudes towards sex, representing a significant gap in the literature.
Researchers have found that participants’ explicit appraisals of sexual stimuli are often affected by social norms and related self-presentation goals (DeWitte, 2014). For example, DeWitte (2016) used an IAT and a measure of explicit appraisals to evaluate men and women’s implicit and explicit evaluations of sex. Although men reported greater liking and wanting of sex relative to women when asked via questionnaire (i.e., explicit measure), they performed similarly on an IAT that measured positive impressions of sex (i.e., implicit measure), revealing no gender difference in implicit evaluations of sex. DeWitte (2016) reasoned that the sexual double standard in Western culture may have biased participants’ self-reported attitudes towards sex, causing women to underreport how much liked the activity/concept. Thus, societal context appears important in the formation, or at least the reporting, of explicit evaluations of erotic cues.

In regard to Western society, the term compulsory sexuality (Gupta, 2015) describes the widespread assumption that all people are sexual and the corresponding assertion that non-sexual relationships are inferior to sexual ones. The asexual community rejects this stance, normalizing a lack of sexual attraction to others and highlighting the value found in platonic forms of intimacy (Chasin, 2013). Thus, it is logical that individuals who have self-identified as asexual, and are likely part of an ace community, would be more comfortable self-reporting negative opinions about sex compared to women with lifelong SIAD. Even though women with lifelong SIAD describe experiencing longstanding sexual disinterest, they remain embedded in a culture that views sex as an integral part of primary relationships. Therefore, I expected that asexual participants would report less positive explicit appraisals of erotic cues than the two SIAD groups, who would not differ from one another.

**Current Study**
The current study aimed to test differences between asexuality and sexual desire disorders on cognitive processing of sexual cues. I employed a quasi-experimental design to assess the cognitive processing of sexual cues in three groups: asexual individuals, heterosexual women with lifelong SIAD, and heterosexual women with acquired SIAD. Specifically, I examined group differences in visual attention to and appraisal of sexual cues. All participants completed three study components: a visual attention task, a sex SC-IAT, and the SSDS (Bulmer & Izuma, 2018).

Although I acknowledge the considerable diversity in experiences of sexual attraction in the ace community, given that this is the first project of its kind to use psychophysiological measures to examine cognitive mechanisms underlying asexuality and sexual desire concerns, I adopted a narrow view of asexuality for this project. Specifically, I recruited individuals who used asexual as their primary sexual identity descriptor, rather than Gray-A or demisexual. Considering the heterogeneity in gender identity within the ace community, I invited asexual individuals of any gender to participate in this study. Therefore, the pronoun ‘they’ will be used throughout the remainder of this manuscript when referring to asexual participants.

Hypotheses

**Hypothesis 1: Visual Attention**

I hypothesized that asexual individuals would not display a controlled attention bias for erotic cues, whereas women with lifelong and acquired SIAD would exhibit a sex-specific bias. First, I predicted that asexual individuals would have no differences in number of fixations or dwell times to different stimulus types, whereas women with lifelong and acquired SIAD would make more fixations and have longer dwell times to sexual relative to non-sexual images. Second, I anticipated that asexual individuals would make fewer fixations and have shorter dwell
times to the area of sexual contact (i.e., penile-vaginal penetration, cunnilingus, or fellatio) within sexual images relative to women with lifelong and acquired SIAD. Third, I expected that asexual individuals and women with lifelong and acquired SIAD would make a similar number of fixations and have similar dwell times to the background. I did not expect any differences in gaze behaviour to the aforementioned regions of interest (i.e., sexual and non-sexual images, area of sexual contact, and background) between heterosexual women with different SIAD subtypes.

Hypothesis 2: Implicit Appraisals

I hypothesized that asexual individuals and women with lifelong SIAD would display less positive implicit appraisals of sexual stimuli compared to women with acquired SIAD. I predicted no differences in asexual individuals’ and women with lifelong SIAD’s implicit appraisals of erotic cues. Implicit appraisals were assessed by D-scores, which were calculated using a standard algorithm (Greenwald, Nosek, & Banjali, 2003) and data from individuals’ performance on the SC-IAT, with positive D-scores representing strong positive associations with sexual cues, and negative D-scores representing strong negative associations (see Method for more detail). Specifically, I predicted that asexual individuals and women with lifelong SIAD would have lower D-scores relative to women with acquired SIAD.

Hypothesis 3: Explicit Appraisals

I hypothesized that asexual individuals would report less positive explicit appraisals of sex relative to women with lifelong and acquired SIAD. I predicted no differences in explicit appraisals of sex between women with different SIAD subtypes. Specifically, I predicted that asexual individuals would have lower scores on Bulmer & Izuma’s (2018) SSDS relative to
women with both lifelong and acquired SIAD, indicating that they hold more negative evaluations of sex than women with SIAD.
Chapter Two: Method

Participants

A convenience sample of 42 asexual individuals ($M_{age} = 26.67$, $SD = 5.31$), 9 heterosexual cisgender women with lifelong SIAD ($M_{age} = 24.78$, $SD = 4.52$), and 16 heterosexual cisgender women with acquired SIAD ($M_{age} = 29.06$, $SD = 4.64$) were recruited from the Vancouver and Toronto communities. Specifically, 10 ($M_{age} = 27.00$, $SD = 6.99$) of the 42 asexual individuals were recruited in Toronto and participated in the study at the University of Toronto Mississauga campus. There were no notable differences in age across groups.

Participants were required to meet the following inclusion criteria, which was assessed via telephone self-report: (1) between 19-45 years of age; (2) had normal or corrected-to-normal vision; (3) identified as asexual or heterosexual; (4) able to read and write English fluently.

Participants were excluded if they reported eye diseases (e.g., macular degeneration) or colour blindness. Heterosexual women met DSM-5 diagnostic criteria for SIAD. Women who reported that their sexual concerns were present since their first sexual encounter were classified as having the lifelong subtype, whereas women who disclosed that their sexual difficulties began following a period of satisfactory sexual functioning were allocated to the acquired SIAD group. Three participants who identified as demisexual were excluded from analyses. The eye-tracking data for three asexual participants could not be used due to poor calibration (i.e., the eye-tracker was not able to recognize/track the participants’ eye movements). The SC-IAT data for three participants (one asexual individual, one woman with lifelong SIAD, and one woman with acquired SIAD) was not collected due to technical difficulties with the program.

Procedures
Participants were recruited through the following channels: 1) online advertisements posted on the Asexuality Visibility and Education Network website (AVEN; www.asexuality.org), UBC Sexual Health Research website (www.brottolab.com), and various social media platforms including Facebook, Instagram, and Twitter; 2) tear-off ads placed around UBC and University of Toronto Mississauga (UTM) campuses and nearby public locations; 3) email advertisements distributed through the Vancouver Coastal Health email broadcast; 4) email invitations sent to participants of past UBC Sexual Health Research studies who indicated interest in being re-contacted for future participation. I consulted with an asexuality advisory group, which consisted of asexual-identifying individuals who regularly act as representatives of the ace community, when planning my recruitment strategy and throughout the duration of this project, especially in regard to the preparation and dissemination of study findings.

Interested participants contacted the study coordinator directly via phone or email to schedule a phone screen that was conducted to assess eligibility and explain the study procedures in detail. During the phone screen, the study coordinator inquired about sexual orientation (i.e., self-identified asexual vs. heterosexual), and conducted a brief, standardized interview to screen for major mental disorders, genital/sexual pain, and assess symptoms of SIAD. Women endorsing symptoms of SIAD were asked whether they experienced these symptoms since their sexual activity debut (i.e., lifelong) or whether there was a period preceding their current symptoms when they experienced no difficulties with sexual desire or arousal (i.e., acquired). Participants were assigned to one of three groups according to their answers to these questions (asexual with no sexual distress, heterosexual with lifelong SIAD, heterosexual with acquired SIAD).
Following the phone screen, the study coordinator emailed eligible participants a copy of the consent form. Individuals who were interested in proceeding with study participation contacted the study coordinator to schedule their in-lab appointment. Questionnaires were completed using an online survey tool (Qualtrics), and participants were provided with an individualized link to online questionnaires via email. Questionnaires were finished at home prior to the lab session and took approximately 45 minutes.

Upon arrival to the laboratory located at either Vancouver General Hospital or the University of Toronto Mississauga campus, participants were given an overview of study procedures by the coordinator and provided written consent. Participants were seated in front of a laptop and were asked to complete a brief cognitive task. The study coordinator started the computer program that presented the SC-IAT, asked participants to communicate via intercom if they had questions or concerns, and left the room to allow the participants privacy. Instructions appeared on the screen, informing participants to press the “e” key (left response key) or the “i” key (right response key) to categorize words into groups (good, bad, sex) as quickly as possible without making errors. The first block (practice) familiarized participants with the task and asked them to classify words using the response keys, with “sex” and “good” mapped onto the “i” key, and “bad” mapped onto the “e” key. The second (experimental) block had the same format. The third (practice) block’s instructions informed participants that the labels changed sides, with “good” mapped onto the “i” key, and “bad” and “sex” mapped onto the “e” key, but that the task had not changed. The fourth (experimental) block had the same format. After participants completed the last block, a message appeared on the screen telling them that they had finished the task.
The study coordinator entered the room with permission from the participant via intercom. She removed the laptop and the eye-tracker system was set-up and calibrated in the private room in preparation for the visual attention task. Calibration of the device entailed having participants follow a circle that moved around the video display screen with their eyes. After set-up was complete and a verbal explanation of the task was provided, participants were left alone in the private testing room. The study coordinator communicated with them through an intercom system connected to the adjacent room for the duration of the task.

The forced-attention paradigm presented 20 experimental trials. Each experimental trial presented a pair of images, including one explicit erotic and one non-erotic, neutral image. Erotic images depicted a nude heterosexual couple engaging in a sexual act, whereas non-erotic images showed a clothed man and woman engaging in a non-sexual, non-romantic activity. Each stimulus pair were presented side-by-side on the computer monitor (e.g., erotic image: middle-left; non-erotic image: middle-right), equidistant from the center of the screen. The stimuli were matched for size, brightness, contrast, and colour to limit biased patterns of attention induced by low-level image features (Dawson & Chivers, 2016; Dawson et al., 2016). Participants were instructed to view the images as they would naturally in situations outside the lab. For each stimulus display, a fixation cross appeared on the screen and was followed by the presentation of the image pair for 10 seconds. After viewing each pair of images, participants used a computer mouse located on a table beside the testing chair to rate their sexual attraction to each erotic and non-erotic image (see Figure 2 for a trial overview).

Following the eye-tracking task the study coordinator re-entered the testing room, seated participants in front of a laptop computer away from the eye-tracking equipment, and informed them that they would be completing an image classification task. The study coordinator started
the computer program that presented this task and left the room to allow the participants privacy. Instructions appeared on the screen informing participants to press the “z” key if they recognized the image presented from the eye-tracking task (i.e., it is an old image) and to press the “/” key if they did not recognize the image (i.e., it is a new image). Participants viewed and classified 80 images (40 erotic, 40 neutral). Half of the images were selected from the eye-tracking task, and the remaining 40 were not included in this task but had a similar visual style (i.e., erotic images depicted a heterosexual couple engaging in sexual activity, and non-erotic images showed a man and woman in casual clothes engaging in a non-sexual, non-romantic activity). The results of the image classification task are part of a larger research project and were not analyzed in the present study.

When the laboratory session was finished (1hr), participants were provided with a debriefing form and a verbal explanation of the purpose of the study, and given a remuneration of $25. This study was approved by the Behavioural Research Ethics Board at the University of British Columbia, #H18-03236, the Vancouver Coastal Health Hospital Research Ethics Board, and the Institutional Ethics Board at the University of Toronto, #38252). The study was pre-registered and is available online at the Open Science Framework (doi:10.17605/OSF.IO/ZYS86).

Measures

Phone Interview

During the initial phone interview conducted by the study coordinator, participants were assessed for SIAD symptoms. Participants were asked whether they experienced an absence/reduction in the following: sexual interest, sexual thoughts/fantasies, initiation of sexual activity or receptivity to sexual advances, responses to erotic cues (e.g., sex scene in a movie),
sexual excitement/pleasure, and genital/nongenital sensations. A diagnosis of SIAD was made if women endorsed at least three of these six symptoms for a duration of six months or longer, and reported that these symptoms caused significant personal distress. Participants were also assessed for symptoms of Genito-Pelvic Pain/Penetration Disorder (GPPPD), and were asked whether they experienced difficulties with vaginal penetration, pain in their genitals or lower abdomen, penetration pain-related anxiety, or tensing/tightening of pelvic floor muscles. A diagnosis of GPPPD was given if they endorsed any of these criteria for a duration of six months or longer, and reported that these symptoms caused personally significant distress.

**Visual Attention**

**Apparatus.** Eye movements were recorded by different instruments depending on the testing site. For the Vancouver site the SensoMotoric Instruments (SMI; Teltow, Germany) RED 500 desktop eye-tracking system was used in conjunction with the SMI’s Experiment Suite Software program. The SMI is a remote sensor contact free eye-tracker that measures eye movements via bright and dark pupil tracking. The apparatus consists of inconspicuous external tracking hardware attached to the bottom of a stand-alone 22-inch computer monitor with a screen resolution of 1920 x 1080 pixels. The eye-tracking system works at a sampling rate of 120 Hz, has a spatial resolution of 0.03°, and a gaze position accuracy of 0.4°. The SMI automatically compensates for small head movements, so it is unnecessary to use a chin rest to immobilize the head. The apparatus is compatible with use with most eyeglasses and contact lenses.

For the Toronto site the experiment was designed and presented in SR Research Experiment Builder software and eye movements were recorded by the SR Research Eyelink Portable Duo tracking system (SR Research Ltd. Mississauga, Ontario, Canada). The Eyelink
Portable Duo can be used in either a head stabilized or remote, head free-to-move mode and measures eye movements via cornea reflection. For the current study, the head stabilized mode was employed and the participants used a chin rest for the duration of the visual attention task. Stimuli were presented on a 20-inch monitor with a resolution of 1920 x 1080 pixels. Eye movements were recorded via a second computer at 500 Hz with a spatial resolution of 0.01°, and a gaze position accuracy of 0.15°. A standard 9-point calibration and validation procedure was used, and the eye with the best spatial accuracy was selected for tracking. The apparatus is compatible with use with most eyeglasses, but not with contact lenses.

**Implicit Appraisals**

**Single-Category Implicit Association Task (SC-IAT).** Participants completed Bulmer and Izuma’s (2018) SC-IAT on a laptop computer. The SC-IAT is a computer-based assessment tool that uses a classification task to measure the strength of associations held in one’s memory. IATs are widely endorsed measures of implicit associations that have consistently outperformed alternative implicit measures with regards to effect size and reliability (DeWitte, 2016). The underlying logic of the task is that people will respond more quickly to concepts that are strongly associated in memory than those that are weakly associated. Participants classified two types of stimuli: sexual words and words representing positive or negative constructs to the corresponding superordinate category (i.e., sex, good, bad) by pressing response keys as quickly as possible. The category labels were located in the upper left- and right-hand corners of the screen for the duration of the task. The SC-IAT included two practice blocks and two experimental blocks. The experimental trials consisted of one congruent and one incongruent block of trials. For the congruent block “good” and “sex” were mapped onto the “i” key, and “bad” was mapped onto the “e” key. For the incongruent block “bad” and “sex” were mapped
onto the “e” key, and “good” was mapped onto the “i” key. Practice blocks consisted of 24 trials, and experimental blocks included 72 trials, with responses divided equally over the two response keys. The word stimuli included seven generally positive (i.e., peace, glorious, joy, sunshine, smile, happy, and wonderful), seven generally negative (i.e., evil, failure, awful, horrible, terrible, agony, and nasty), and seven sexual (i.e., oral sex, penetration, erection, erotic, foreplay, climax, and fondle) words controlled for frequency and length (see Figure 3).

Questionnaires

Demographic Information. Participants were asked to provide typical demographic information including age, education, ethnicity, romantic orientation, relationship status, and relationship length. Participants also completed self-report measures of various sexual (i.e., sexual desire, sex-related distress, sexual aversion, genital self-image) and psychological (i.e., depressive symptoms) characteristics, but these data were not analyzed in the present study.

Sexual Orientation. Participants were invited to answer the question, “What is your sexual orientation?” and were provided with the following response options: asexual, bisexual, demisexual, heterosexual, lesbian/gay, pansexual, and prefer not to answer. Participants who selected asexual or heterosexual were included in all analyses presented in this manuscript.

Asexual Identity. Participants’ scores on the Asexuality Identification Scale (AIS; Yule et al., 2015) were used to confirm their asexual status. Respondents used a Likert scale to rate the applicability of various statements (e.g., I would be content if I never had sex again) to their experience, with responses ranging from 1 (completely false) to 5 (completely true). A total AIS score (12-60) was calculated by summing individual responses, with higher scores indicating a greater likelihood that the participant identifies as asexual. The AIS demonstrated excellent internal consistency in the current sample (α = 0.94). This measure has differentiated asexual
from allosexual participants, with a minimum score of 40/60 capturing 90-93% of participants who self-identified as asexual, demonstrating strong criterion validity (Bulmer & Izuma, 2018; Yule et al., 2015). The AIS demonstrates strong convergent validity, with large negative correlations with the Dyadic Subscale of the Sexual Desire Inventory (Spector, Carey, & Steinberg, 1996; Yule et al., 2015), and divergent validity, showing no relationship with scores on the Childhood Trauma Questionnaire (Bernstein & Finke, 1998; Yule et al., 2015).

**Data Analysis**

**Power Calculations**

I adopted appraisal paradigms developed by Bulmer & Izuma (2018) to test my second and third hypotheses, who found large differences between asexual and heterosexual participant’s implicit ($d = 1.72$) and explicit ($d = 3.34$) attitudes towards sex. However, Brauer and associates (2012) examined differences in performance between heterosexual women with no sexual concerns and women with acquired low desire on a similar sex SC-IAT, and found that women in the latter group displayed significantly less positive associations with sexual stimuli, with a medium effect size ($f = 0.25$). Their findings also revealed that the women with acquired sexual difficulties reported more negative evaluations of a subset of erotic images used in the task than controls. Given these results, for my second and third hypotheses I predicted effects that were large in magnitude, but smaller than those observed by Bulmer & Izuma (2018). A priori power analyses for one-way Analyses of Variance (ANOVAs) examining group differences in implicit and explicit appraisals revealed that to achieve the predicted large effect size ($f = 0.40$) with power set at .80, an N of 66 ($n = 22$ per group) would be needed to observe differences. Additional a priori power analyses revealed that a smaller sample size would be needed to detect hypothesized group differences in visual attention ($f = 0.25$). Given that the
SIAD samples <22 (lifelong SIAD n = 9, acquired SIAD n = 16)\(^1\) I interpreted null effects with caution, considering that I may have lacked sufficient power to detect group differences. All power analyses were conducted using G*Power 3 software (Faul, Erdfelder, Lang, & Buchner, 2007). Regarding indices of effect size, I reported eta-squared and Cohen’s \(d\) for all group comparisons presented in this manuscript.

**Hypothesis 1: Visual Attention**

**Data Reduction.** The stimulus display (i.e., screen) for each trial was coded based on four regions of interest (ROIs): 1) the erotic image; 2) the non-erotic image; 3) the area of sexual contact (i.e., penile-vaginal penetration, cunnilingus, or fellatio); 4) background (i.e., white space surrounding the erotic and non-erotic images; see Figure 4). To examine my first set of hypotheses related to visual attention, six dependent variables were calculated (three using total number of fixations to various ROIs, and three using dwell times to various ROIs). Number of fixations represents the number of times a participant’s gaze landed in a ROI, and dwell time represents the total amount of time spent (in seconds) in the ROI across the total stimulus presentation time.

First, to examine biases to erotic relative to the non-erotic images, I calculated the proportion of fixations to the erotic image vs. the non-erotic image (i.e., number of fixations to erotic image/total number of fixations to both image types), and the proportion of dwell time to the erotic image relative to the non-erotic image (i.e., dwell time to erotic image/total dwell time to both image types). Second, to evaluate group differences in gaze behavior towards the area of sexual contact, I calculated the proportion of fixations to the area of sexual contact relative to the total number of fixations made to the screen and the proportion of dwell time to the area of

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\(^1\) Data collection was abruptly halted due to COVID-19, resulting in a smaller sample than anticipated
sexual contact relative to the total dwell time to the screen. Third, to explore group differences in visual attention to the background I calculated the proportion of fixations to the background relative to the total number of fixations to the screen, and the proportion of dwell time to the background relative to total dwell time to the screen. For each trial, every participant had a score for each of the six aforementioned proportion variables. These scores were averaged across the 20 experimental trials to result in mean scores for the proportion of fixations and proportion of dwell time for relevant ROIs (i.e., erotic image vs. non-erotic image, area of sexual contact vs. screen, and background vs. screen). It is important to note that a greater number of fixations and longer dwell times towards a target are indicative of a controlled attention bias for said target.

**Data Analysis.** To test my hypothesis that asexual individuals would non-preferentially view sexual and non-sexual stimuli (i.e., no differences in number of fixations or dwell times to different stimuli types), whereas women with lifelong and acquired SIAD would make more fixations and have longer dwell times to sexual relative to neutral images, I conducted two separate one-way ANOVAs using group (asexual, lifelong SIAD, acquired SIAD) as the independent variable and mean proportion of fixations and dwell time to the erotic image as the dependent variables. To test my hypothesis that asexual individuals would make fewer fixations and exhibit shorter dwell times to the area of sexual contact relative to women with lifelong and acquired SIAD, I conducted two separate one-way ANOVAs with group as the independent variable and mean proportion of fixations and dwell time to the area of sexual contact as the dependent variables. To explore group differences in visual attention to the background, I performed two separate one-way ANOVAs using group as the independent variable and mean proportion of fixations and dwell time to the background as the dependent variables. For all ANOVAs, I followed up main effects with Tukey HSD post-hoc comparisons. When I detected
violations of homogeneity of variance, I reported Welch’s F and conducted Games-Howell post-hoc comparisons to further evaluate group differences in gaze behavior.

**Hypothesis 2: Implicit Appraisals**

**Data Reduction.** SC-IAT effects were operationalized by D-scores, which range from -2, representing a strong negative association with the construct of interest, and +2, indicative of a strong positive association. D-scores were calculated in INQUISIT using the standard IAT scoring algorithm (Greenwald et al., 2003). For this study, positive D-scores indicated stronger positive associations with sexual stimuli, whereas negative D-scores suggested more negative associations.

**Data Analysis.** To test my second hypothesis that asexual individuals and women with lifelong SIAD would exhibit less positive implicit appraisals of sexual stimuli than women with acquired SIAD, such that they would have lower D-scores relative to women with acquired sexual desire concerns, I conducted a one-way ANOVA using group (asexual, lifelong SIAD, acquired SIAD) as the independent variable and SC-IAT effect (i.e., D-score) as the dependent variable. I performed Tukey HSD post-hoc comparisons to further evaluate group differences.

**Hypothesis 3: Explicit Appraisals**

**Data Reduction and Analysis.** To test my third hypothesis that asexual individuals would display less positive explicit appraisals of sex than women with lifelong or acquired SIAD, such that they would have lower SSDS scores relative to the other groups, I first averaged participants’ ratings on the 11 questions of the SSDS. Then, I subjected these scores to a one-way ANOVA with group (asexual, lifelong SIAD, acquired SIAD) as the independent variable and mean SSDS scores as the dependent variable. I followed up the main effect with Tukey HSD post-hoc comparisons.
Chapter Three: Results

Sample Characteristics

Asexual individuals, women with lifelong SIAD, and women with acquired SIAD were similar on several demographic characteristics, including age, relationship length, education, and ethnicity. Table 1 presents the demographic characteristics of the sample. A one-way ANOVA revealed that asexual individuals had higher scores on the AIS relative to women with lifelong and acquired SIAD, $F(2,64) = 62.84, p<.001, \eta^2 = 0.66$. Regarding gender and sex, five asexual participants identified as non-binary and disclosed trans experience (i.e., their gender identity did not align with their sex at birth), whereas all participants in the SIAD groups identified as cisgender women. A greater number of asexual participants reported being single (75.6%) relative to women with lifelong SIAD (11.1%) and women with acquired SIAD (12.5%), $\chi^2 = 25.16, p<.001$. The majority of participants were white, with no significant group differences in the distribution of individuals across ethnicity categories. Although, one person in the asexual group self-identified as Southeast Asian, with no women in the SIAD groups identifying in this way. Similarly, one woman with lifelong SIAD self-identified as Hispanic, and one woman with the acquired subtype self-identified as First Nations. Considering educational attainment, the majority of the sample had either attended some college (28.4%) or completed a college degree (50.7%). Regarding socioeconomic status, the median annual income across groups was $40,000 - $59,999. Notably, more women in the acquired SIAD group reported an annual income >$60,000 (80%) relative to asexual individuals (36.4%) and women with lifelong SIAD (37.5%), $\chi^2 = 6.12, p = .047$. 
Hypothesis 1: Visual Attention

Erotic vs. Non-Erotic Image

Total number of fixations is the sum of fixations in a ROI, with more fixations suggesting a greater controlled attention bias towards a stimulus. Table 2 shows the group means for total number of fixations to the erotic image, non-erotic image, area of sexual contact, and background. The one-way ANOVA revealed a main effect of group, and a Welch correction was used to account for a homogeneity of variance violation, Welch’s $F(2, 22.32) = 19.09, p<.001, \eta^2 = 0.30$. Games-Howell post-hoc tests revealed that asexual individuals made fewer fixations to the sexual image ($M = .45, SD = .13$) relative to women with lifelong SIAD ($M = .59, SD = .09; p = .005, d = 1.25$) and acquired SIAD ($M = .61, SD = .05; p<.001, d = 1.62$). There were minimal differences between SIAD subtypes for proportion of fixations to the erotic image ($p = .759, d = 0.27$).

Table 3 shows the group means for dwell times to the erotic image, non-erotic image, area of sexual contact, and background. For the mean proportion of dwell time to the erotic image, the one-way ANOVA revealed a main effect of group, and a Welch correction was used to account for a homogeneity of variance violation, Welch’s $F(2, 21.40) = 18.17, p<.001, \eta^2 = 0.31$. Games-Howell post-hoc tests revealed that asexual individuals had shorter dwell times to the erotic image ($M = .44, SD = .16$) relative to women with lifelong SIAD ($M = .63, SD = .13; p = .005, d = 1.30$) and acquired SIAD ($M = .63, SD = .07; p<.001, d = 1.54$). Women with different SIAD subtypes exhibited similar dwell times to the erotic image ($p = .997, d = 0.00$). See Figure 5 for mean proportions of fixations and dwell time to the erotic image for all groups.

Area of Sexual Contact
For the proportion of fixations to the area of sexual contact, the one-way ANOVA revealed a main effect of group, $F(2,61) = 19.92$, $p<.001$, $\eta^2 = 0.40$. As shown in Figure 6, Tukey HSD post-hoc tests reflected that asexual individuals made fewer fixations to the area of sexual contact ($M = .08$, $SD = .04$) relative to women with lifelong SIAD ($M = .14$, $SD = .05$; $p<.001$, $d = 1.33$) and acquired SIAD ($M = .14$, $SD = .04$; $p<.001$, $d = 1.50$). There were no differences in the proportion of fixations to this ROI between women with different SIAD subtypes ($p = .991$, $d = 0.00$).

For the proportion of dwell time to the area of sexual contact, the one-way ANOVA revealed a main effect of group, $F(2,61) = 18.50$, $p<.001$, $\eta^2 = 0.38$. As shown in Figure 6, Tukey HSD post-hoc tests reflected that asexual individuals had shorter dwell times to the area of sexual contact ($M = .09$, $SD = .05$) relative to women with lifelong SIAD ($M = .18$, $SD = .09$; $p<.001$, $d = 1.24$) and acquired SIAD ($M = .18$, $SD = .05$; $p<.001$, $d = 1.80$). Women with lifelong and acquired SIAD spent a similar proportion of time attending to the area of sexual contact ($p = .975$, $d = 0.00$).

**Background**

For the proportion of fixations to the background, the one-way ANOVA did not reveal a main effect of group, $F(2,61) = 1.43$, $p = .247$, $\eta^2 = 0.03$. As seen in Figure 7, all three groups made a similar number of fixations to the background, with minimal differences on this measure between asexual individuals ($M = .06$, $SD = .02$), women with lifelong SIAD ($M = .05$, $SD = .03$), and women with acquired SIAD ($M = .05$, $SD = .01$; $ps = .217 – .920$, $ds = 0.40 – 0.63$).

For the proportion of dwell time to the background, the one-way ANOVA did not reveal a main effect of group, $F(2,61) = 0.80$, $p = .452$, $\eta^2 = 0.03$. As seen in Figure 7, all three groups had similar dwell times to the background, with minimal differences on this measure between
asexual individuals \((M = .04, SD = .02)\), women with lifelong SIAD \((M = .04, SD = .04)\), and women with acquired SIAD \((M = .03, SD = .01; ps = .458 – .992, ds = 0.00 – 0.34)\).

**Hypothesis 2: Implicit Appraisals**

The one-way ANOVA did not reveal a main effect of group, \(F(2,61) = 1.35, p = .268, \eta^2 = 0.04\). As shown in Figure 8, Tukey HSD follow-up comparisons indicated that D-scores were comparable between asexual individuals \((M = -0.19, SD = 0.37)\), women with lifelong SIAD \((M = -0.15, SD = 0.25)\), and women with acquired SIAD \((M = -0.01, SD = 0.38; ps = .239 – .973, ds = 0.13 – 0.48)\).

**Hypothesis 3: Explicit Appraisals**

For SSDS scores, the one-way ANOVA revealed a main effect of group, \(F(2,62) = 18.12, p<.001, \eta^2 = 0.37\). As seen in Figure 9, Tukey HSD follow-up comparisons reflected that women with acquired SIAD \((M = 5.23, SD = 0.98)\) had higher average SSDS scores relative to asexual individuals \((M = 3.86, SD = 0.72; p<.001, d = 1.59)\) and women with lifelong SIAD \((M = 4.10, SD = 0.54; p = .002, d = 1.43)\). There were minimal differences between the average SSDS scores for the asexual and lifelong SIAD groups \((p = .680, d = 0.38)\).
Chapter Four: Discussion

Summary of Findings

This study is the first to explore group differences in the cognitive processing of sexual cues between asexual individuals, heterosexual women with lifelong SIAD, and heterosexual women with acquired SIAD by evaluating their visual attention to and appraisals of sexual stimuli. Regarding visual attention, I found a main effect of group consistent with my hypotheses. Women with both SIAD subtypes exhibited a preferential bias for erotic images, such that they made more fixations and demonstrated longer dwell times to erotic relative to non-erotic images, whereas asexual individuals did not exhibit this bias. Further, women with lifelong and acquired SIAD committed their attention to areas of sexual contact within erotic images to a greater degree than asexual individuals, who made fewer fixations to and had shorter dwell times toward this ROI compared to SIAD groups. In line with my hypotheses, I did not detect differences in gaze behavior towards sexual cues (i.e., erotic images or areas of sexual contact) between women with different SIAD subtypes. Consistent with my predictions, there were no meaningful group differences in gaze behaviour towards the background, with all three groups making similar numbers of fixations and exhibiting similar dwell times to this area. For implicit appraisals of erotic cues, the findings did not support my hypotheses in that there were no notable group differences in performance on the sex SC-IAT. For explicit appraisals of sex, my hypotheses were partially supported in that I found the predicted difference between the acquired SIAD and asexual groups with the former showing higher average SSDS scores, indicative of more positive attitudes towards sex. However, contrary to my predictions, I found no differences between the explicit appraisals of sex between asexual individuals and women with lifelong SIAD.
Interpretation

Visual Attention

Consistent with my first hypothesis, asexual individuals did not exhibit a controlled attention bias for erotic cues whereas women with lifelong and acquired SIAD demonstrated a sex-specific bias, preferentially gazing at erotic images and areas of sexual contact. These findings are in line with a body of eye-tracking research suggesting that controlled visual attention to sexual cues is influenced by the direction of one’s sexual attractions (Dawson & Chivers, 2016; Dawson, Fretz, & Chivers, 2016; Ebsworth & Lalumière, 2012; Israel & Strassberg, 2009; Lippa, 2012; Rullo, Strassberg, & Miner, 2014). Given that asexual persons do not experience sexual attraction to others in the same way as their allosexual counterparts, it is likely that the images depicting men and women engaging in sexual activity were not as motivationally salient to this group, which may have resulted in asexual individuals allocating less controlled visual attention to these cues.

When interpreting these findings, it is important to consider the substantial variability in both asexual individuals’ experiences of sexual attraction and self-described attitudes towards sex, ranging from disinterest to disgust (Carrigan, 2011; Chasin, 2013; Van Houdenhove et al., 2015). This diversity in experiences of sexual attraction and evaluations of sex was reflected in the sizeable range of fixations and dwell times to erotic images and areas of sexual contact. Focusing on sexual attraction, asexual participants’ location on the ace spectrum may have influenced their visual attention to erotic cues. To clarify, individuals who have never experienced sexual attraction to others, and likely used asexual as their sole sexual identity descriptor, may have found the erotic images unappealing and shifted their gaze to the neutral images. On the other hand, if any of the asexual participants experienced sexual attraction, albeit
more infrequently or to a lesser degree than allosexual persons, they may have directed their attention more to the erotic than the neutral images. Shifting to attitudes, it is possible that asexual individuals who were disinterested in but not repulsed by sexual activity distributed their attention relatively evenly between the image types, whereas asexual participants who were sex-repulsed may have actively avoided the erotic images. Future studies should investigate whether attention to erotic cues is affected by membership to subcategories of the ace umbrella (i.e., asexual, Gray-A, demisexual) and evaluations of sex.

In line with my predictions, there were negligible differences in gaze behavior to sexual cues between women with different SIAD subtypes. It is likely that these groups’ heterosexual orientation accounted for their similar patterns of controlled visual attention to sexual stimuli, given that all erotic images presented in the task depicted men and women engaging in various sexual acts, the self-reported desired interactions for these groups. Alternatively, despite differences in the duration of sexual concerns between women with lifelong and acquired SIAD, sex may be an activity that these women engage in to strengthen their romantic partnerships. As a result, this physical expression of intimacy may hold emotional importance for members of both groups. To illustrate, the majority of women in my sample with lifelong SIAD (88.9%) and acquired SIAD (87.6%), reported that they were dating or in a committed partnership. Thus, it is possible that engaging in sexual activity is a way that these women enhance feelings of love, closeness, and/or commitment with their partners. A comprehensive study conducted by Meston and Buss (2007) examined allosexual men and women’s motivations for engaging in sex. These authors identified 237 reasons people listed for engaging in sex, and a follow-up study of 327 sexual women aged 18–45 revealed that reasons for sex encompassed by two subfactors, pleasure and love/commitment, were rated as describing a high proportion of sexual experiences.
for all women (Meston, Hamilton, & Harte, 2009). Focusing on sexual desire disorders, Jabs and Brotto (2018) evaluated disruptions in the sexual response cycle for women with SIAD, and asked them to self-report their reasons for sex. They found that 70% of the women reported emotional closeness as a reason for sex, aligning with Meston and associates’ (2009) findings. Considering these results, it is possible that emotional closeness and sexual activity are interconnected for women with lifelong and acquired SIAD, whereas these domains may be independent for asexual individuals, particularly those asexual individuals who are not romantically inclined (Antonsen et al., 2020). Therefore, it may be the case that women with SIAD’s attention was drawn to the erotic images due to their emotional, rather than purely sexual, qualities.

Implicit Appraisals

Contrary to my hypotheses, asexual individuals and women with lifelong SIAD did not exhibit markedly less positive implicit appraisals of sexual cues relative to women with acquired SIAD. However, it should be noted that both asexual individuals and women with lifelong SIAD displayed slightly negative implicit appraisals of erotic cues, whereas women with acquired SIAD demonstrated relatively neutral appraisals of these stimuli. Put more simply, asexual individuals and women with lifelong SIAD performed the SC-IAT word classification task slightly more efficiently when “bad” and “sex” were paired than when “good” and “sex” were paired, whereas women with acquired SIAD performed similarly in both conditions. These findings stand in contrast to research studies whose IAT results have distinguished participants from different sexual orientation groups (Bulmer & Izuma, 2018; Snowden & Gray, 2013).

In particular, Bulmer & Izuma (2018) used the same SC-IAT paradigm featured in the present study to compare implicit appraisals of sex between asexual individuals and heterosexual
men and women without sexual concerns, and observed large differences between groups. Notably, their asexual sample showed more negative implicit appraisals of sexual word stimuli than the asexual participants featured in this study. Importantly, these authors excluded asexual participants with AIS scores<40, whereas I included all individuals who self-identified as asexual, regardless of their score on this measure. It is therefore possible that Bulmer & Izuma’s (2018) sample fell closer to the asexual pole of the ace spectrum, with few or no Gray-A’s, which may explain the more negative implicit attitudes towards sex seen in this group. Upon a closer examination of my data, six of the 42 asexual participants had AIS scores<40. However, even when these subjects were removed, the mean D-score for the asexual sample did not change. Thus, there is no obvious explanation for the discrepancy in the magnitude of negative implicit appraisals of sexual cues between these asexual samples. As a result, further research is needed to improve our understanding of implicit evaluations of sex in individuals on the ace spectrum.

Focusing on women with SIAD, it is not surprising that these groups displayed relatively negative – neutral implicit appraisals of sexual words, given their sexual difficulties. Women in both SIAD groups disclosed that their sexual concerns were a source of significant distress in their lives. Thus, the sexual words may have triggered negative affective reactions in several women with lifelong and acquired SIAD. Further, given that these words (i.e., oral sex, penetration, erection, erotic, foreplay, climax, and fondle) did not offer the same contextual cues as the images featured in the eye-tracking task, they likely did not have positive associations with emotional intimacy for these women. Considering that women with acquired SIAD were more neutral in their implicit appraisals of erotic cues than their counterparts with lifelong SIAD, it is possible that their history of rewarding sexual encounters previous to the onset of their sexual
concerns acted as a buffer against the development of unconscious negative associations with sex. However, further research is required to determine whether a relationship exists between the quality and number of past sexual experiences and implicit appraisals of sex.

**Explicit Appraisals**

Consistent with my hypothesis, asexual individuals held less positive attitudes towards sex than women with acquired SIAD, shown by lower mean scores on the SSDS. However, not consistent with my hypotheses, women with lifelong SIAD also held less positive evaluations of sex than women with acquired SIAD, and their scores on the SSDS were similar to those of asexual individuals. With regards to the asexual sample, my findings suggest that asexual individuals hold somewhat negative or neutral impressions of sex and were comfortable reporting these attitudes in a survey, replicating Bulmer and Izuma’s (2018) findings. This result is in line with the asexual community’s rejection of compulsory sexuality, the widespread assumption in Western society that all people are sexual and that sexual relationships are of greater importance than non-sexual forms of intimacy (Gupta, 2017). Importantly, there was substantial variability in asexual individuals’ mean SSDS scores, and they ranged from somewhat sex negative to sex positive, reflecting the diversity in opinions about sex seen in asexual communities (Bulmer & Izuma, 2018; Carrigan, 2011; Van Houdenhove et al., 2015).

I originally hypothesized that women with lifelong and acquired SIAD would report similarly positive explicit appraisals of sex, given that 1) women in both groups are embedded in a culture that views sex as an essential component of romantic partnerships, and 2) previous research has shown that self-reported attitudes towards sex are vulnerable to societal influence (DeWitte, 2014). However, my results revealed that women with lifelong SIAD reported attitudes towards sex that were neither positive or negative, with their SSDS scores falling near
the midpoint of the scale, whereas women with acquired SIAD were sex-positive. Moreover, women with acquired SIAD’s mean SSDS score was similar to that of heterosexual men and women without sexual concerns in Bulmer and Izuma’s (2018) investigation. Thus, it might be the case that the SSDS is tapping into holistic attitudes towards sex developed over the lifespan, which may be shaped by the number and tone of past sexual experiences, as well as the widespread assumption in Western society that sex is a key element of intimate relationships. However, it should be noted that the variability in SSDS scores for women with acquired SIAD was similar to that of the asexual sample, indicating that while many women in this group reported positive attitudes towards sex, this was not the case for all women.

Implications for Classification

The results of the current study have notable implications for the classification of asexuality and SIAD. My findings provide support for the first hypothesis that asexual individuals would not preferentially gaze at erotic images, whereas women with SIAD would commit their attention to visual sexual cues. Importantly, given previous research demonstrating that controlled attention to an erotic stimulus is indicative of sexual attraction to that cue, this pattern of findings provides empirical support for asexual persons’ lack of sexual attraction to others, distinguishing them from women with both SIAD subtypes. Nevertheless, there is some evidence of similarity between asexuality and SIAD regarding these groups’ appraisals of sexual stimuli. The area of greatest overlap between the three groups appears to be implicit appraisals of sexual cues, as asexual individuals and women with both SIAD subtypes demonstrated negative – neutral implicit associations with sexual words. Regarding explicit appraisals of sex, my findings suggest that while women with acquired SIAD may describe positive attitudes towards sex, asexual individuals and women with lifelong SIAD express more negative or neutral
feelings towards the topic of sexual activity. One the one hand, my findings with respect to gaze behavior add to the growing evidence that asexuality is better characterized as a unique sexual orientation, rather than an extreme form of a sexual desire disorder (Brotto et al., 2017). Nonetheless, the comparable implicit and explicit appraisals of sexual cues shown by asexual participants and women with lifelong SIAD highlight difficulties in separating these groups.

**Clinical Implications**

Given my findings related to implicit appraisals, it appears that sexual cues have been de-incentivized for women with acquired SIAD, and perhaps were never incentivized for women with the lifelong variant. This pattern of results highlights the (re)incentivization of sexually-relevant cues as a treatment focus for women with both SIAD subtypes. Considering my findings alongside the longstanding disinterest in sex reported by asexual individuals and women with lifelong SIAD, as well as Brotto and associates’ (2015) results suggesting that these groups have similarly low frequencies of sexual behaviour and levels of desire, differentiating asexuality and lifelong SIAD poses a challenge to clinicians.

Importantly, clinicians treating individuals presenting with lifelong desire/arousal concerns must tread with caution, carefully assessing the possibility that the client might identify better with an asexual identity. Encouragement of the client to read information about asexuality on AVEN is recommended for those who have never heard of asexuality. Many self-identified asexual persons describe a time in their past when they found their disinterest in sex to be distressing and considered medical treatment for their low desire until they became aware of the asexual label, which better fit their experience (Gupta, 2017). I have two clinical recommendations. First, when conducting an intake interview, clinicians treating low desire should contemplate administering the AIS (Yule et al., 2015) in addition to their standard battery
of assessment tools, given that it is one of the only measures that has distinguished women with lifelong sexual concerns from asexual individuals (Brotto et al., 2015). Second, if the client is distressed by their lack of sexual interest, the clinician should carefully ascertain the source of this discontent. Specifically, clinicians should query to discover whether the client’s distress emerges from their desire to be more sexual, or is a response to a perceived need to meet partner or societal expectations of sexuality. This is an important skill for clinical practice, as mistaking asexuality for lifelong SIAD and providing treatment for this sexual concern may cause asexual individuals further distress, potentially harming these clients.

Limitations and Future Directions

A major limitation of this research is the small sample size, particularly with respect to heterosexual women with lifelong SIAD (n = 9).\(^1\) However, it should be noted that women with this variant of SIAD are often not included in research studies given the low prevalence of this presentation of low desire. To my knowledge, other than the current study only Brotto and associates’ (2015) investigation differentiated women with acquired and lifelong SIAD, with the latter group making up only 28% of the sample. When considering my findings, minimal differences between women with lifelong SIAD and other groups must be interpreted with caution given insufficient power. Future studies should aim to identify characteristics that distinguish women with lifelong SIAD from other groups, namely their counterparts with acquired SIAD, to better identify their treatments needs.

I did not measure or account for implied social presence (i.e., participants’ knowledge that their eye movements were being recorded by an eye-tracker), presenting another limitation. Although the effects of implied social presence on visual attention is an emerging research area,\(^1\)

\(^{1}\) Data collection was abruptly halted due to COVID-19, resulting in a smaller sample than anticipated
Recent studies have revealed that the knowledge that one is being “watched” influences gaze behavior towards erotic stimuli. Risko and Kingstone (2011) compared gaze behavior between participants who were told an eye-tracker they were wearing was turned on (i.e., implied presence condition) and individuals who were told that the device was turned off (i.e., no presence condition). In the implied presence condition, only 32% of participants gazed at a calendar featuring images of nude women, whereas 92% of individuals in the no presence condition viewed the provocative stimulus. Milani, Brotto, & Kingstone (2019) measured men and women’s visual attention to images of nude and clothed models, and assigned participants to either the “aware” condition, when they were told their eyes were being tracked, or the “unaware” condition, when they were not provided with this information. The authors observed a gendered effect of implied social presence, such that women in the aware condition made fewer fixations than men suggesting that the women avoided looking at the monitor altogether in the aware condition. Thus, it is possible that in the current study groups were differentially impacted by implied social presence, which may have led certain groups to modulate their viewing behavior to a greater degree than others. Future studies should seek to understand the impact of implied social presence on the viewing behavior of asexual individuals and women with sexual difficulties.

I did not recruit individuals who primarily identified as Gray-A, and excluded participants who identified as demisexual. As a result, these findings cannot be generalized to and are not representative of all people within ace communities. Researchers should examine whether groups encompassed by the ace umbrella (i.e., asexual, Gray-A, demisexual) differ in their cognitive processing of sexual cues to better comprehend if and how people located at various positions on the ace spectrum are dissimilar.
Lastly, frequency of sexual activity and the quality of past sexual experiences was not assessed in the current study, as the aim of the project was to investigate group differences in cognitive processing of sexual cues. However, these variables may influence visual attention to and appraisals of erotic stimuli. Researchers should explore whether the quantity of sexual activity or the positive/negative outcomes of one’s sexual experiences predicts cognitive processing of sexual words and imagery, especially in clinical samples.

Conclusions

The present findings provide new data showing that heterosexual women with lifelong and acquired SIAD display a controlled visual attention bias for sexual cues, whereas asexual persons do not. Moreover, this study sheds light on asexual individuals’ and women with SIAD’s appraisals of sexual stimuli, and revealed that while all three groups displayed negative – neutral implicit associations with sexual words, women with acquired SIAD reported more positive attitudes towards sex relative to other groups. These results raise important clinical implications. First, the finding that asexual individuals’ gaze behavior differs markedly from women with SIAD adds to growing evidence that asexuality may be better conceptualized as a unique sexual orientation rather than an extreme form of a sexual desire disorder. Second, my results indicate that re-incentivizing sexual cues for women with SIAD may be an important treatment goal. Finally, these findings revealed that disentangling asexuality and lifelong SIAD may prove challenging for clinicians, given their similar implicit and explicit appraisals of erotic cues. Thus, practitioners should carefully consider whether clients presenting with longstanding sexual disinterest are on the ace spectrum or meet diagnostic criteria for lifelong SIAD, as the former group would likely not benefit from treatment. Future studies should aim to better understand
how the experiences of women with lifelong SIAD differ from their counterparts with the acquired subtype in an attempt to develop treatments that better meet their needs.
Table 1

**Sociodemographic Information for Participants**

<table>
<thead>
<tr>
<th></th>
<th>Asexual</th>
<th>Lifelong SIAD</th>
<th>Acquired SIAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age M (SD)</td>
<td>26.67 (5.31)</td>
<td>24.78 (4.52)</td>
<td>29.06 (4.64)</td>
</tr>
<tr>
<td>Gender identity (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woman</td>
<td>87.2</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Non-binary</td>
<td>12.8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trans-experience (%)</td>
<td>13.2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Relationship status (%)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>75.6</td>
<td>11.1</td>
<td>12.5</td>
</tr>
<tr>
<td>Dating</td>
<td>14.6</td>
<td>66.7</td>
<td>31.3</td>
</tr>
<tr>
<td>Married/common-law</td>
<td>9.8</td>
<td>22.2</td>
<td>56.3</td>
</tr>
<tr>
<td>Relationship length in yrs. M (SD)</td>
<td>4.73 (5.20)</td>
<td>3.38 (2.33)</td>
<td>5.29 (3.00)</td>
</tr>
<tr>
<td>AIS M (SD)*</td>
<td>48.35 (6.98)</td>
<td>30.11 (8.01)</td>
<td>25.81 (8.40)</td>
</tr>
<tr>
<td>Sexual assault history (%)</td>
<td>52.5</td>
<td>44.4</td>
<td>40.0</td>
</tr>
<tr>
<td>Ethnicity (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Asian</td>
<td>19.0</td>
<td>22.2</td>
<td>31.3</td>
</tr>
<tr>
<td>South Asian</td>
<td>4.8</td>
<td>11.1</td>
<td>6.3</td>
</tr>
<tr>
<td>Southeast Asian</td>
<td>2.4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>First Nation</td>
<td>0</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2.4</td>
<td>11.1</td>
<td>6.3</td>
</tr>
<tr>
<td>Middle Eastern</td>
<td>0</td>
<td>11.1</td>
<td>0</td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>59.5</td>
<td>44.4</td>
<td>43.8</td>
</tr>
<tr>
<td>Other</td>
<td>11.9</td>
<td>0</td>
<td>6.3</td>
</tr>
<tr>
<td>Level of education (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>4.8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Attended some college</td>
<td>33.3</td>
<td>33.3</td>
<td>12.5</td>
</tr>
<tr>
<td>College degree</td>
<td>50.0</td>
<td>44.4</td>
<td>56.3</td>
</tr>
<tr>
<td>Post-graduate degree</td>
<td>11.9</td>
<td>22.2</td>
<td>31.3</td>
</tr>
<tr>
<td>Income category (annual)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$20,000</td>
<td>21.2</td>
<td>37.5</td>
<td>13.3</td>
</tr>
<tr>
<td>$20,000 – $39,999</td>
<td>18.2</td>
<td>12.5</td>
<td>0</td>
</tr>
<tr>
<td>$40,000 – $59,999</td>
<td>24.2</td>
<td>12.5</td>
<td>6.7</td>
</tr>
<tr>
<td>$60,000 – $79,999</td>
<td>15.2</td>
<td>12.5</td>
<td>0</td>
</tr>
<tr>
<td>$80,000 – $99,999</td>
<td>6.1</td>
<td>0</td>
<td>33.3</td>
</tr>
<tr>
<td>$100,000 – $119,999</td>
<td>6.1</td>
<td>12.5</td>
<td>13.3</td>
</tr>
<tr>
<td>$120,000 – $139,999</td>
<td>3.0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>$140,000 – $159,999</td>
<td>6.1</td>
<td>12.5</td>
<td>20.0</td>
</tr>
<tr>
<td>&gt;$160,000</td>
<td>0</td>
<td>0</td>
<td>13.3</td>
</tr>
</tbody>
</table>
Note. Abbreviation: AIS = Asexuality Identification Scale. Table presents comparisons between asexual individuals ($n = 42$), women with lifelong SIAD ($n = 9$), and women with acquired SIAD ($n = 16$). One-way ANOVAs evaluated group differences in age, relationship length, and AIS scores. Chi-square tests of homogeneity examined group differences in gender-identity, trans experience, relationship status (single vs. dating/partnered), sexual assault history, ethnicity (White/Caucasian vs. all other categories), level of education (no college degree vs. college degree), and annual income (above vs. below median income – $40,000 – $59,999).

*Groups differed on variable of interest, $p < .05.$
Table 2

Number of Fixations to Regions of Interest

<table>
<thead>
<tr>
<th>Regions of Interest</th>
<th>Asexual</th>
<th>Lifelong SIAD</th>
<th>Acquired SIAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erotic Image $M \ (SD)$</td>
<td>10.10 (3.77)</td>
<td>13.70 (2.29)</td>
<td>13.04 (2.17)</td>
</tr>
<tr>
<td>Neutral Image $M \ (SD)$</td>
<td>12.09 (3.32)</td>
<td>9.11 (2.37)</td>
<td>7.96 (1.39)</td>
</tr>
<tr>
<td>Area of Sexual Contact $M \ (SD)$</td>
<td>1.77 (0.90)</td>
<td>3.32 (1.16)</td>
<td>3.09 (0.96)</td>
</tr>
<tr>
<td>Background $M \ (SD)$</td>
<td>1.26 (0.49)</td>
<td>1.24 (0.54)</td>
<td>0.97 (0.28)</td>
</tr>
</tbody>
</table>

Note. Mean total number of fixations to regions of interest for asexual participants ($n = 39$), women with lifelong SIAD ($n = 9$), and women with acquired SIAD ($n = 16$).
Table 3

*Dwell Times in s to Regions of Interest*

<table>
<thead>
<tr>
<th>Regions of Interest</th>
<th>Asexual</th>
<th>Lifelong SIAD</th>
<th>Acquired SIAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erotic Image $M (SD)$</td>
<td>4.01 (1.57)</td>
<td>5.89 (1.29)</td>
<td>5.88 (0.56)</td>
</tr>
<tr>
<td>Neutral Image $M (SD)$</td>
<td>4.98 (1.48)</td>
<td>3.34 (1.11)</td>
<td>3.48 (0.69)</td>
</tr>
<tr>
<td>Area of Sexual Contact $M (SD)$</td>
<td>0.86 (0.52)</td>
<td>1.78 (0.83)</td>
<td>1.73 (0.49)</td>
</tr>
<tr>
<td>Background $M (SD)$</td>
<td>0.34 (0.17)</td>
<td>0.36 (0.33)</td>
<td>0.27 (0.13)</td>
</tr>
</tbody>
</table>

*Note.* Mean dwell times (s) to regions of interest for asexual participants ($n = 39$), women with lifelong SIAD ($n = 9$), and women with acquired SIAD ($n = 16$).
Figure 1

Cognitive-Motivational Model of Sexual Response

Note. Adapted from DeWitte (2016) and Janssen and colleagues (2000).
Figure 2

Sample Experimental Trial in the Eye-Tracking Task

Note. Depiction of the time sequence and visual presentation of a single trial.
Figure 3

*Diagram of the Single-Category Implicit Association Task*

*Note.* Diagram of the SC-IAT explaining which keys (“e” and “i”) are associated with each superordinate category (i.e., good, bad, and sex) in the different experimental blocks.
Figure 4

Sample Experimental Stimulus Display for the Eye-Tracking Task

Note. Experimental stimuli in the forced-attention paradigm with relevant regions of interest (i.e., erotic image, non-erotic image, area of sexual contact, and background).
Figure 5

Proportion of Fixations and Dwell Time to the Erotic Image vs. Non-Erotic Image

Note. Asexual individuals ($n = 39$) made fewer fixations and had shorter dwell times (s) to erotic images relative to women with lifelong SIAD ($n = 9$) and women with acquired SIAD ($n = 16$). Error bars represent standard error of the mean.

*p<.05.
Figure 6

Proportion of Fixations and Dwell Time to the Area of Sexual Contact vs. Screen

*Note. Asexual individuals (n = 39) made fewer fixations and had shorter dwell times (s) to the area of sexual contact relative to women with lifelong SIAD (n = 9) and women with acquired SIAD (n = 16). Error bars represent standard error of the mean.

*p<.05.
Figure 7

Proportion of Fixations and Dwell Time to the Background vs. Screen

![Graph showing proportion of fixations and dwell time to the background vs. screen for lifelong SIAD, asexual, and acquired SIAD groups. Error bars represent standard error of the mean.]

Note. Asexual individuals (n = 39), women with lifelong SIAD (n = 9) and women with acquired SIAD (n = 16) exhibited similar numbers of fixations and dwell times (s) to the background. Error bars represent standard error of the mean.
Figure 8

*D-scores from the Single Category-Implicit Association Task*

*Note.* Mean SC-IAT D-scores for asexual individuals (*n* = 41), women with lifelong SIAD (*n* = 8), and women with acquired SIAD (*n* = 15). There were minimal differences between groups. Error bars represent standard error of the mean.
Figure 9

Sex Semantic Differential Scale Scores

Note. Asexual individuals ($n = 42$) and women with lifelong SIAD ($n = 9$) had lower average SSDS scores compared to women with acquired SIAD ($n = 16$). Error bars represent standard error of the mean.

*p<.05.
References


