

Attention to sexual stimuli and its relationship to sexual identity in the context of empirical studies with sexual minorities: a scoping review

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Abstract

Introduction: In experimental sex research, attention to sexual stimuli is considered a well-established indicator of sexual interest, with patterns that differ across sexual orientations. While earlier studies primarily focused on heterosexual populations, recent research has increasingly explored attention in sexual minority individuals (SMIs). Building on the incentive motivation and information processing models of sexual response, it can be hypothesized that differences in the appraisal of sexual stimuli contribute to variations in individuals' sexual responses, raising the possibility that attention to sexual stimuli may be related to individuals' sexual identities.

Objectives: This scoping review aimed to map the existing literature on attention to sexual stimuli among SMIs and to clarify the relationship between attention to sexual stimuli and sexual identity.

Methods: A systematic literature search was conducted using PubMed, EBSCOhost, Web of Science, and ProQuest databases, adhering to the PRISMA guidelines for scoping reviews.

Results: The search resulted in 1107 records, 56 of which were included in the review. Overall, the results highlight patterns of automatic and controlled attention to sexual stimuli in SMIs. These findings are interpreted as reflecting attention-identity relationships in each sexual minority group. The review also suggests several areas for future research.

Conclusion: This review underscores opportunities to improve healthcare for SMIs by clarifying attentional patterns across non-heterosexual orientations and factors related to their sexual self-identification. The findings also offer valuable insights for clinicians in dealing with sexual identity conflicts and advancing sexual minorities' mental health and well-being.

Keywords: attention; sexual orientation; sexual identity; sexual stimuli; gay; lesbian; bisexual; asexual; sexual minority; trans-attraction.

The scientific literature highlights two stages of attentional focus—automatic and controlled.^{1–3} Automatic attention or pre-attention (also known as exogenous or stimulus-driven) is a type of information processing that operates without one's conscious awareness, whereas controlled or endogenous attention refers to the conscious and deliberate allocation of an individual's attention to a particular stimulus.^{1,2,4} Both types of attention are crucial for detecting threats and reproductive opportunities, playing a critical role in human survival.^{5,6} Emotion research suggests that salient stimuli (eg, food, sex, threat) trigger appetitive and aversive motivational systems that guide attention.⁷ While the appetitive system is connected to hedonic behavior and intention to approach a specific stimulus, the aversive system is responsible for threat detection and facilitates stimulus avoidance.^{8–12} Extensive literature theorizes that attentional engagement with sexual stimuli is frequently shaped by appetitive motivation, amplifying individuals' experiences of arousal and desire.^{1,7,12,13} As such, attention to sexual stimuli (eg, nudes or pictures displaying sexual intercourse) is often used as a proxy of sexual interest in the context of experimental studies of sexuality.^{1,13–15} However, it should be noted that this relationship is not straightforward. As such, some studies

demonstrated that one's attention to sexual stimuli could be connected to fear, anxiety, and disgust.^{16–18} Indeed, sexual stimuli appraisal varies depending on the motivational context in which the stimulus was encountered.¹⁹ As such, according to the incentive motivational model, competent stimulus energizes the sexual system and signals affective or motivational rewards based on the incentivized qualities of the stimuli and experiences that were pleasurable to an individual in the past.^{19–21} Interacting with the physiological and psychological state of the organism, this process facilitates attentional engagement and appraisal of the stimulus as sexually relevant. Notably, neither the internal state of the organism nor the sexual stimulus alone is considered sufficient to activate sexual motivation.²⁰ Furthermore, the affective and motivational rewards operate independently, explaining why a stimulus can be simultaneously wanted and not liked and vice versa.^{19,20} Some findings suggest that sexual activity could pose a stronger incentive value for heterosexual men due to their higher expectation of the reward, whereas heterosexual women's sexual response might be more driven by intimacy and relationship context.^{14,19,21} This may explain the gender differences in the motivational valence of the sexual cues, which have a more pronounced association

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with sexual orientation in cisgender men than in cisgender women.^{1,13-15} Indeed, attention to sexual stimuli varies as a function of both gender/sex¹ and sexual orientation.¹⁴

Numerous studies examined attention to sexual stimuli among the heterosexual population, showing that heterosexual men and women display a moderate bias toward sexual cues,³ with men's attention being high and women's attention being low on gender-specificity (bias toward one's preferred gender(s)).¹⁴ Research on attention to sexual stimuli among sexual minority individuals (SMIs)² has also expanded, utilizing a diverse range of methods.^{14,22-26} However, despite the emerging body of research, no synthesis on the attentional processing of sexual stimuli among SMIs has yet been conducted. This resulted in existing contradictions within the literature, especially regarding attentional patterns in sexual minority women, with mixed findings on the relationships between their attention and sexual orientations/identities.^{14,22,27,28} Moreover, the inconsistency in researchers' definitions of sexual orientation (eg, through sexual attractions, identities, behaviors, or a combination of these factors) and their measurements of attention (eg, through viewing times [VTs], eye-tracking or self-report) has led to difficulty in understanding if the findings could result from the assessed type of attention or are explained by sexual orientation alone. The lack of literature synthesis has also hindered the identification of some research gaps and has implications for clinical practitioners as it is not possible to understand if the sexual health treatment and practices designed for heterosexuals (eg, sensate focus, mindfulness-based sex therapy) can be applicable to SMIs.²⁹⁻³¹

According to the information processing model (IPM), attention to sexual stimuli or lack thereof can amplify or disrupt sexual arousal.¹ Specifically, differential appraisal of sexual stimuli leads to differences in sexual response.³² However, despite the existing evidence, there is no clarity if variation in attentional patterns across sexual orientations suggests that attention to sexual stimuli is connected to sexual self-identification (an active process of adopting a certain sexual identity label).³³ Based on the assumption that all sexual cues are automatically detected in the early stages of attentional processing, it is possible that the identification of specific gender cues becomes associated with reward-seeking behavior.^{1,14} This may explain the attentional disengagement from the stimuli that do not coincide with an individual's sexual identity (part of self-concept grounded in one's conceptualization of their sexual arousal and desire, as well as in political positioning, rooted in a shared sense of community)³⁴ at the later stages of information processing. Alternatively, a gender-nonspecific pattern of pre-attention could also be driven by the interaction of non-sexual motivation (eg, intrasexual competition, threat avoidance, aesthetic appreciation) with sexual stimulus prepotency.¹⁴ Assuming this is accurate, only controlled

attention should match an individual's sexual identity. However, due to consistent reinforcement of gender cues in SMIs's,^{14,21} their attention could be selectively directed toward sexual identity-congruent stimuli and withdrawn from those stimuli that do not coincide with their sexual identities.³² A variety of factors (eg, internalized homophobia, homo- or heteronormativity, individual incentivization history, etc.) could further interfere with sexual stimuli processing, making one's controlled attention more distracted by sexually non-preferred stimuli.^{14,34-36} As such, an outcome where only pre-attention will correspond with one's sexual identity is also probable.³⁷ Alternatively, an individual's recognition of their sexual interest or disinterest could be linked to how the brain interprets their attention to specific types of sexual stimuli. In other words, attention to sexual stimuli could be connected to sexual reward-seeking shaped by personal sexual preferences and incentivization history^{14,38} and, therefore, may help explain the relationships between sexual arousal and sexual self-identification. If this holds true, then we expect both automatic and controlled attention to be closely related to individuals' sexual identities.

Notably, since self-identification as heterosexual often serves as the default for individuals' sexual identity development, other non-heterosexual identities may not follow the same pathways, as reflected in stage-based sexual identity models.^{39,40} Therefore, the abovementioned assumptions may be more applicable to SMIs. As such, synthesizing the literature on attention to sexual stimuli in SMIs could be the first step in testing these hypotheses. Furthermore, by examining attentional bias alongside its underlying affective and motivational mechanisms, researchers could expand the theories on sexual identity beyond traditional models centered on developmental stages and identity milestones,^{39,40} exploring how individuals' attention to a variety of sexual stimuli may be connected to SMIs' identity labels on subliminal and conscious levels.

The current study

The aim of this scoping review is to systematically map the existing literature on attention to sexual stimuli (broadly defined as any stimuli that can evoke sexual interest) among SMIs, providing a comprehensive overview of current knowledge and informing future research directions in the field. Another purpose of the review is to clarify the sexual identity phenomenon in its relationship to the attentional processing of sexual stimuli. To achieve these goals, the review will seek to answer an overarching research question: *"What is the current state of research on attention to sexual stimuli among SMIs?"* along with more specific sub-questions: (1) *What are the patterns of attention to sexual stimuli among SMIs?* (2) *What are the key gaps in the literature on this topic?* (3) *What methodologies have been employed in studying attention to sexual stimuli in this population?* (4) *Is there a link between sexual identity and attention to sexual stimuli in SMIs?*

To answer these questions, the review requires a certain degree of flexibility in terms of included populations and sources of evidence, which are not restricted to peer-reviewed articles and encompass additional data from the gray literature, allowing a broader coverage of the topic. Furthermore, there is a need to systematically map the main characteristics related to attention to sexual stimuli among

¹ In the reviewed studies, researchers use the terms "men" and "women" without explicitly distinguishing between gender and sex. In our work, the term "gender/sex" is used to acknowledge that in referenced literature, these constructs are often not separated conceptually or methodologically.³⁴ As such, in our synthesis, we refer to "men" and "women" based on participants' chosen gender identities, acknowledging at the same time that some studies may have included transgender/non-binary individuals without explicitly noting it. We will specify the cases where authors clearly stated that they included or excluded transgender participants from their studies.

² Umbrella term that includes a variety of non-heterosexual sexual identities such as gay, lesbian, bisexual, asexual, pansexual, queer, etc.

non-heterosexual individuals while highlighting key concepts and research methodologies utilized in the studies. As such, the format of the scoping review seems the most suitable for our research purposes, allowing for the effective identification of main research gaps in attentional studies with diverse sexual orientations and assessing the need to conduct a systematic review for each of these orientations.^{41,42} Moreover, given the exploratory nature of our fourth research question, the scoping framework enables a broader assessment of the literature across different sub-fields of sexology, considering multiple perspectives.

Method

We followed PRISMA guidelines⁴² and JBI recommendations for scoping reviews.⁴³ The study was pre-registered with the Open Science Framework (OSF) (https://osf.io/eby6s/?view_only=ce55d1fa9e374f0eb60606b9b95). Our approach involved synthesizing qualitative reports of the main findings, offering a general interpretation of the results, and reporting numerical data where applicable.

Search strategy

The preliminary search was performed in the Web of Science database in December 2023 using the keywords “attention*,” “sex*,” “gay,” “lesbian,” “bisexual,” “pansexual,” and “asexual” to determine whether sufficient evidence exists for the scoping review. After that, the search strings were revised and new keywords (eg, “gynandromorphophilic”) were added. See [Appendix A](#) for our complete search strategy. The main search was conducted between 29 and 30 January 2024 in Web of Science, PubMed, and several EBSCOhost databases (Academic Search Ultimate, PsyArticles, Psychology and Behavioral Science Collection, PsycINFO) separately. Furthermore, gray literature was searched via the ProQuest Dissertations. The search was limited to works in the English language. Finally, the references of the included articles were scanned, and additional searches were performed using the Research Rabbit application⁴⁴ and Google Scholar. The last search was conducted on December 10, 2024.

Eligibility criteria

The records were then independently assessed for eligibility by two authors, and all arising disagreements were resolved. Studies were included in the review if they: (1) specifically focused on or incorporated measurement of attention towards sexual stimuli; (2) included gay, lesbian, bisexual, asexual, or gender diverse individuals as experimental or comparison group; (3) only recruited participants over 18 years old; (4) targeted non-clinical population. We excluded studies that (1) were irrelevant to the research questions; (2) recruited exclusively heterosexual sample or did not report participants’ sexual orientation; (3) were focused on sexual offenders and pedophilic sexual interests; (4) solely focused on assessing methodological properties without providing any useful information for the main research question (ie, no meaningful information on attention to sexual stimuli among SMIs could be extracted).

Data extraction

The full-texts of the selected papers were read and analyzed by two reviewers. Subsequently, one reviewer has extracted

the following data about each study: author(s), year of publication, country of origin, aims of the study, population (participants’ sexual orientation, sex/gender, and sample size), type of attention examined (automatic or controlled), methodology, authors’ conceptualization of sexual orientation, and key findings that relate to the scoping review questions. We have also extracted some data on the types of sexual stimuli used in each study (static or dynamic; explicit or non-explicit; faces or whole-body stimuli).³ Considering that there is already an exhaustive review of the use of sexual stimuli in clinical sexology,⁴⁵ we haven’t focused on them in more detail. For readability, the aims of the selected studies were not included in the main text of this review but are available in the extended version of the table on the OSF website (https://osf.io/eby6s/?view_only=ce55d1fa9e374f0eb60606b9b95).

Results

The PRISMA diagram illustrates the records selection process (see [Figure 1](#)). The initial search identified 1695 records imported into the Zotero reference manager. After the duplicates and retracted papers (unrelated to our research field) were removed, the remaining 1107 records were screened for eligibility. After the prior examination, we removed eight additional duplicates and 22 records that were not in English. Titles and abstracts of the remaining articles were further examined, yielding the exclusion of an additional 1040 records. Specifically, 1027 records were irrelevant to our research question, nine records mentioned only heterosexuals or did not mention participants’ sexual orientation at all, three records focused on methodological evaluation or validation, providing no meaningful data for the review, and one record was not retrieved. The screening resulted in 37 records, with subsequent searches bringing the total to 56 papers (see [Appendix B](#)). Among them, 48 studies were conducted in the U.S., Canada, Europe, and Australia, and only eight were held in non-Western countries (ie, Samoa, India, China, and Colombia).

Methodology used to study attention to sexual stimuli among SMIs

Thirty-one studies focused on automatic and 35 studies on controlled attention to sexual stimuli among SMIs. [Figures 2 and 3](#) illustrate methods that have been used for these purposes. As evident from the diagram, pupillometry was the most frequent method for the assessment of automatic attention,⁴⁶⁻⁵⁷ whereas the VT technique or its variations (vicarious VT, virtual VT) was the most popular way of capturing controlled attention.^{24,52,58-75} Notably, VT methods were often coupled with the ratings of model/face sexual attractiveness or sexual appeal. Eye-tracking metrics (eg, time to first fixation, total fixation duration) were implemented to measure both types of attention, with some of them utilizing free-viewing tasks^{76,77} and others employing a forced viewing paradigm.^{27,78-84}

[Table 1](#) presents the mean, median, and range of sample sizes in the reviewed studies categorized by different sexual orientations and genders, and [Table 2](#) refers to the various terminology used to describe attention.

³ This was not stated in the scoping review protocol.

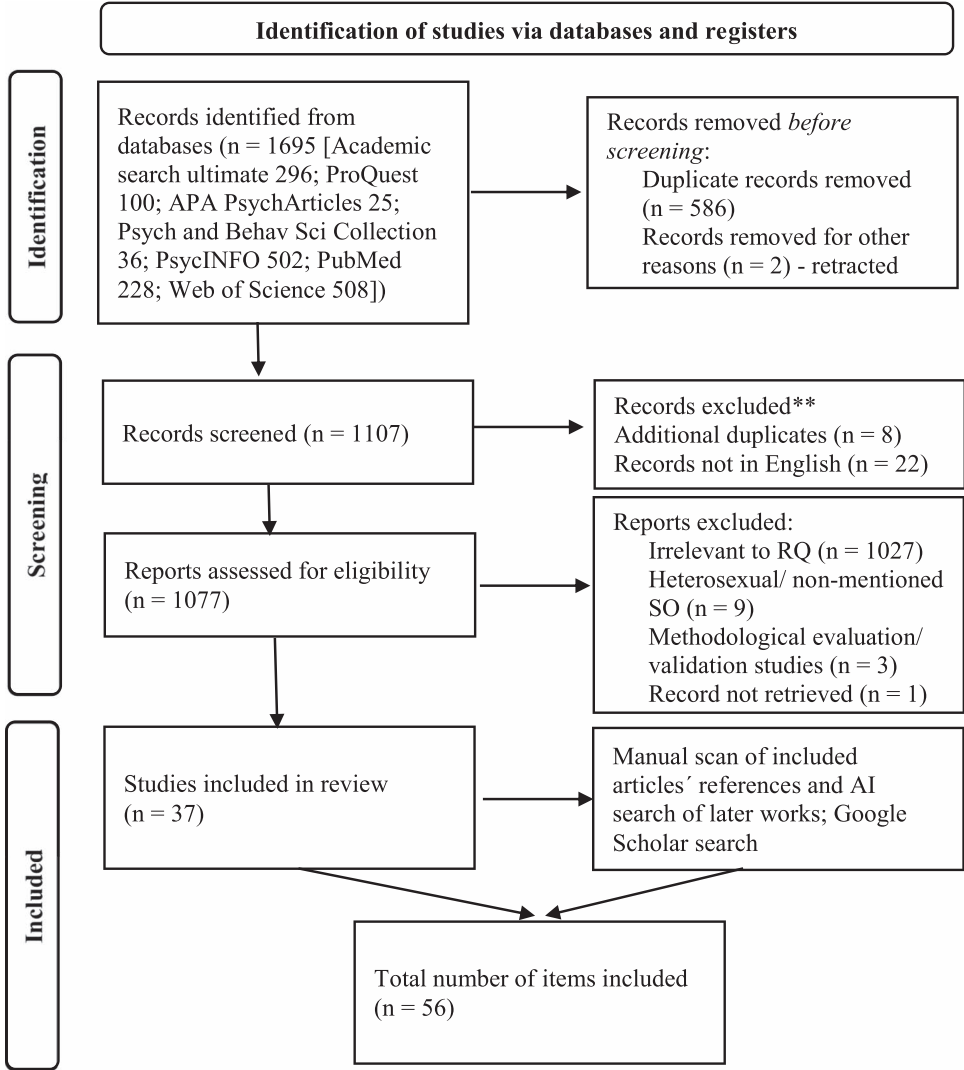


Figure 1. PRISMA flowchart of the records selection process for the systematic scoping review.

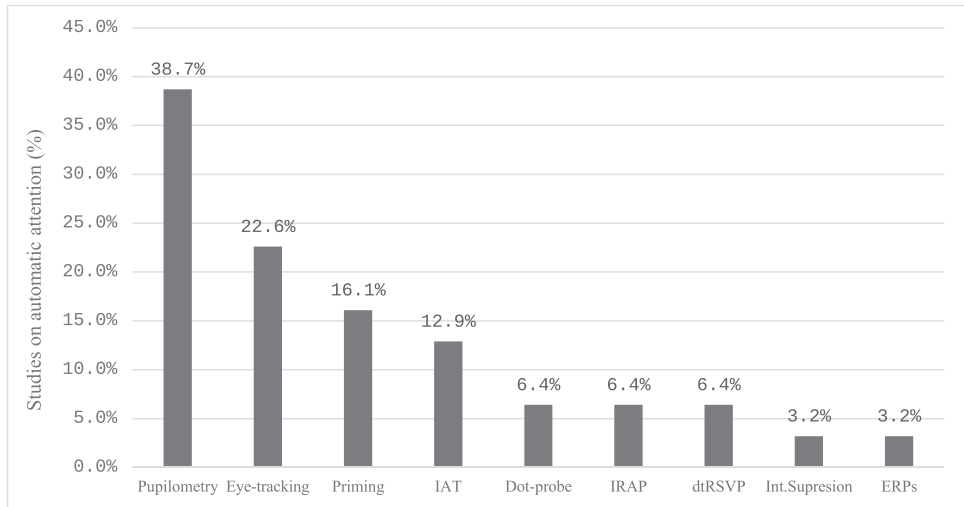


Figure 2. Methods used to assess automatic attention among sexual minorities. Note. Pupilometry—Measurement of pupil size and reactivity; eye-tracking—A method of measuring eye movements; priming—A method measuring how exposure to one stimulus (prime) affects the response to a subsequent stimulus; IAT—Implicit association test; dot-probe—A method that involves simultaneous presentation of two stimuli, followed by a dot replacing one of them; IRAP—Implicit relational assessment procedure; dtRSVP—Dual rapid serial visual presentation task; interocular suppression task—Method in which one eye's perception is suppressed by competing visual input to the other eye; ERPs—Event-related potentials.

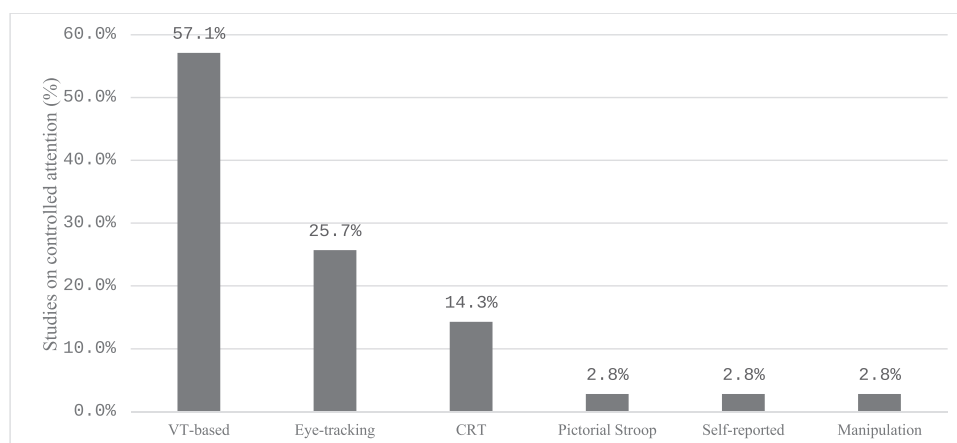


Figure 3. Methods used to assess controlled attention among sexual minorities. Note. VT—Viewing times; CRT—Choice reaction time; Pictorial Stroop task—a method that shows how competing visual stimuli can affect reaction times and accuracy; self-reported attention—a method where participants report their attention to particular stimuli using the Likert scale; manipulation and assessment of attention—a method designed by Samson and Janssen.²⁵

Table 1. Sample size overview of the studies on attention to sexual stimuli by sexual orientation.

Sexual orientation group	Number of participants per sexual orientation		
	Mean	Median	Range
Gay men	28.07	20	5-107
Lesbian women	27.79	19.5	7-106
Androphilic gender-diverse individuals	31.75	25.5	21-55
Bisexual men	27.5	18.5	11-76
Bisexual women	43.08	44	17-108
Asexual men	11	11	9-13
Asexual women	22.75	21	12-37
Asexual non-binary individuals	6	5	5-8
Men attracted to gender-diverse individuals	49	44	35-79

Note. In a few studies, different gender/sexual orientation groups were merged in one sample (eg, bisexual and lesbian women; ace women and ace non-binary individuals). For our sample size calculations, we differentiated between these groups whenever possible.

Table 2. Terminology related to attention.

Terminology	Number of papers	Proportion of included papers (%)
Proxies of attention (eg, sexual interest, sexual arousal, pupil dilation)	25	44.6%
Automatic/initial and controlled attention	10	17.8%
Attention or gaze	4	7.1%
Late or early attention	5	8.9%
(Continuous) visual attention	5	8.9%
Attentional blink, pop-out effect, pre-attention, Sexual content-induced delay and its analogs	4	7.1%
Spatial attention	1	1.8%
Self-directed attention/manipulated attention/self-selected attention	1	1.8%
Self-reported attention	1	1.8%

Note. Attentional blink is a cognitive phenomenon in which the ability to detect the second target stimulus is impaired when it is presented shortly after the first target in a rapid serial visual presentation task (RSVP). The pop-out effect refers to an automatic attentional response where a stimulus with distinct visual features is rapidly detected and prioritized, standing out from surrounding stimuli.

Types of sexual stimuli used in studies with SMIs

Eleven studies used erotic videos, while 46 have incorporated a set of still images. Sexual explicitness of the stimuli also varied. As such, 37 papers used sexually explicit stimuli, which included nude or semi-nude individuals or depictions of sexual acts. Some of these stimuli also incorporated computer-generated images (CGI) of adults and children. Non-explicit sets of stimuli utilized in 33 papers featured pictures of faces and dressed individuals (eg, swimsuit models, people in real-world scenes, etc.), and six studies included sexual words. Notably, aside from the depictions of humans, one study used

sexually explicit and non-explicit images of robots.⁷⁷ Additionally, only 11 papers used stimuli from the standardized picture sets (eg, International Affective Picture System, Not-Real People set, etc.).

Conceptualization of sexual orientation in studies with SMIs

To examine how sexual orientation was conceptualized across studies involving SMIs, we analyzed sexual orientation indicator(s) used to categorize participants into experimental groups (see Table 3). We decided to focus on this criterion, given that

Table 3. Measured proxies of sexual orientation across the literature.

Sexual orientation proxy	Number of papers	Proportion of included papers (%)
Sexual identity ^{24–26,46,48–52,54–56,59,60,63–65,68,70,72,76–78,80–96}	40	71.4%
Sexual attraction ^{27,28,48–51,54,55,57,60,61,71,73,75,81,82,84,85,89–93,95,96}	25	44.6%
Sexual behavior ^{47,58,66,67,69,73–75,85,91–94,96}	14	25%
Sexual fantasies ^{48–51,93,96}	6	10.7%
Sexual interest/infatuations ^{48,53,63}	3	5.3%
Sexual preferences ^{47,96}	2	3.6%
Lifestyle ^{93,96}	2	3.6%
Sexual responsiveness ⁶⁰	1	1.8%
Sexual feelings ⁷⁵	1	1.8%
Sexual motivation ⁷¹	1	1.8%

Note. Sexual fantasies, sexual preferences, lifestyle, sexual responsiveness, sexual feelings, and sexual motivation were never used as a single operationalization of sexual orientation. Some of these constructs were a part of the KSOG or Kinsey scale, and the rest were measured together with other sexual orientation components. Sexual attraction, behavior, and sexual interest were only infrequently used as single conceptualizations of SMI's sexual orientations, whereas sexual identity was frequently the only operationalization of sexual orientation. Notably, one of the included studies was not clear in its operationalization of sexual orientation, and thus, we were unable to determine if it was based on sexual attraction or sexual behavior.⁷⁹ Another study measured both sexual orientation and sexual identity through single-item self-report questions, reported that they do not always align, and organized the groups based on self-reported sexual orientation.⁶²

the study outcomes and their interpretation are shaped by the authors' definitions of sexual orientations. However, it should be noted that many studies have also included additional measurements related to sexual orientation, which further informed their findings. For example, in four studies, conclusions related to sexual orientation were made after the experimental intervention based on the participants' VTs,^{67,69,71,74} while a few other studies also utilized measures of sexual age-orientation (ie, pedophilia).^{53,85}

It is important to note that the literature approaches the sexual identity phenomenon through three main methods: (1) relying mainly on participants' self-reports (27.5% or 11/40 papers), (2) combining participants' self-identifications with experimenter-assigned identity labels (32.5% or 13/40 papers), or (3) exclusively relying on experimenter-assigned identity labels (40% or 16/40 papers). In this case, 15% (6/40 articles) were based on the interpretation of a one-item scale such as a 7-point Kinsey Scale, where scores 0–1 refer to heterosexuals, 2–4 – to bisexuals, and 5–6 – to gay/lesbian individuals; 25% (10/40 articles) revolved around the interpretation of a multidimensional scale such as Klein Sexual Orientation Grid (KSOG) that, among other sexual orientation components, included a measurement of sexual identity. In our analysis, all these approaches are considered to address the concept of sexual identity despite potential subtle differences between participants' self-identifications and researchers' conceptualizations.⁴

Overall, most of the included papers adopted a categorical view on sexual orientation and assigned their participants one of several discrete labels (gay, lesbian, bisexual, asexual, heterosexual). Only eight studies viewed sexual orientation continuously, accounting for the internal variability within these labels (eg, bisexual-leaning gay; predominantly lesbian and occasionally heterosexual, etc.).^{27,48–52,54,55} It is also worth mentioning that 51 articles had a heterosexual experimental or comparison group(s).

⁴ Two of the included studies identified that self-reported sexual identity did not correspond with sexual orientation in some of the participants^{62,95}. Research implications deriving from such divergence will be explored in the Discussion section of this review.

Attention to sexual stimuli among gay⁵ and lesbian individuals

Automatic attention

Numerous studies highlight that gay men allocate more automatic attention toward male⁶ sexual stimuli.^{46,48–50,52–54,56,57,79,80,83,86,93} Moreover, these stimuli prime gay men's pre-attention faster and distract them more than other sexual stimuli.^{68,85,87–89} Two studies also indicated that male sexual stimuli have a pop-out effect on gay-assigned men, leading to their better detection, although mixed findings exist regarding the role of such stimuli in the generation of the attentional blink.^{91,92} Furthermore, gay-identified men are faster to fixate on cisgender men than on feminine transgender individuals and show no difference in their pre-attention to transgender people with and without breasts.⁸³ In addition to the gender-specific effect of sexual stimuli, some authors also investigated the age-specific effect (attentional bias to individuals of certain age groups). The findings demonstrate that androphilic (attracted to men) men pay greater attention to stimuli featuring adult men and postpubescent adolescents (Tanner⁷ IV–V) and exhibit no automatic attentional bias toward younger children.^{53,79} A single study examined attention to sexual stimuli among identical twins with discordant sexual orientations⁵⁶ and found that pupils of gay male twins dilated more to images of men than pupils of their heterosexual co-twins. Simultaneously, some researchers suggested that gay-assigned men may be susceptible to female sexual attractiveness⁶⁸ or at least have no substantial aversion

⁵ In the current paper, sexual identity labels (ie, gay, lesbian, bisexual, and asexual) are used to refer to both (1) labels selected by participants and (2) labels assigned by experimenters. In the results section, we will use terms like “gay-identified” and “gay-assigned” to describe participants' sexual identity when it is possible to make a distinction between participant-chosen and experimenter-assigned labels. Given that, in 28.6% (16 out of 56) of the included studies, there was no measurement of sexual identity, or it did not affect the formation of experimental groups, we will use general sexual orientation terms (eg, androphilic) when discussing the findings of such studies. We acknowledge that all abovementioned groups may be similar but not fully overlapping.

⁶ By “male sexual stimuli,” we mean types of stimuli that display individuals with phenotypical characteristics typically classified as male.

⁷ Tanner stages are a system used to classify the physical development of children, adolescents, and adults during puberty. Stage I refers to pre-pubic children, II and III—children in early puberty, IV—adolescents, and V—adults.

to women.⁹³ As such, one study found androphilic men's significant pupil dilation to male and female⁸ sexual stimuli,⁵³ while two others reported no differences in their pre-attention to male and female pictures from one among gynephilic (attracted to women) men.^{47,85} However, it should be noted that in Santtila et al.'s findings, these effects were likely superseded by habituation. A recent study also explored pupil dilation among men with different degrees of androphilia and found no group differences between gay, mostly gay, and bisexual-leaning gay men.⁵² Another study assessed gay-assigned men's pre-attention to masculine and feminine faces of Asian men and women, depictions of which were digitally altered to enhance facial sexual dimorphism. Results suggest that the first fixation duration among gay-assigned men was significantly shorter for masculinized faces than for feminized faces and that they showed pupil constriction to masculinized faces.⁷⁸ In other words, these men were significantly less aroused by masculinized faces compared to feminized ones.

Research on lesbian women's pre-attention indicates that they respond faster,^{27,88,90} detect better⁸⁶ and display more automatic attention toward female sexual stimuli.^{28,48,50,51,55,56,79,80} Their automatic attention was also found to be more biased towards women than among their heterosexual identical twins.⁵⁶ There is also evidence that lesbian women have a stronger pre-attentional bias toward their preferred stimuli⁴⁸ and weaker bias toward their non-preferred stimuli than heterosexual and bisexual women.^{48,55} Conversely, one study found that gynephilic women's pre-attentional bias was more pronounced toward male than female sexual stimuli and that, surprisingly, this tendency was stronger than among androphilic women.⁵⁷ Furthermore, Rieger and colleagues tested the hypothesis that lesbian-assigned women's pre-attentional patterns are influenced by their behavioral masculinity-femininity (ie, behaviors, traits, and roles traditionally associated with being a man or a woman).⁵¹ They found no evidence that most masculine lesbian-assigned women show more pupil dilation to women than to men. Finally, another study reported that in addition to gender-specificity, gynephilic women also exhibit age-specificity in their automatic attention directed toward adults.⁷⁹

Controlled attention

Gay men's controlled attention was frequently found to be biased toward male sexual stimuli.^{24,26,58,59,61–63,65,66,68,72–74,76,79,80,94–96} They also attended significantly less to female sexual stimuli than mostly gay (Kinsey 5) and bisexual-leaning gay men⁵² and fixated less frequently and for a shorter duration on feminine transgender individuals than on cisgender men.⁸³ Furthermore, the gender-specificity of gay men's self-reported attention mediated the relationships between the gender-specificity of their physiological and subjective arousal.⁹⁵ Interestingly, one study suggested that gay-identified men spent more time viewing attractive female stimuli, but no relationship was found between the attractiveness of male stimuli and their VTs.²⁴ In contrast, another study reported that these men looked longer at the less attractive faces of women than at the less attractive faces of men.⁷⁶ It

was also found that androphilic men allocate more controlled attention to sexual stimuli depicting adults rather than children.^{61,62,79} Specifically, androphilic men focused more on the chest and pelvis and less on the face of their preferred gender, with the children's pelvis being the least observed area, and paid more attention to female sexual stimuli than to those featuring children.⁷⁹ Other researchers found that androphilic men distribute their controlled attention more equally between their preferred and non-preferred genders compared to heterosexual men⁷³ or even exhibit gender-nonspecific response patterns.²⁵ Additionally, gay-assigned men spent equal time viewing the breasts of women and gynoid robots and allocated more attention to the robotic pelvis than to that of the human female.⁷⁷ They also paid more visual attention to machine-like robots than human-like robots and less attention to the pelvis of human-like robots than did heterosexual-assigned men. There is also evidence that gay-assigned men watched feminized faces longer than masculinized ones.⁷⁸

Most findings suggest that lesbian women pay more controlled attention to female sexual stimuli,^{24,26,27,59,62,65,72,79,80,94} while a few report their equal attention to the images of men and women, the pattern especially pronounced with the increase of the stimuli's explicitness.^{62,76,95} There are also studies that describe lesbian-identified women's attention patterns as moderate in specificity—more specific than in other women but less so than in gay-identified and heterosexual-identified men.^{24,26} In contrast, one study reported no differences between lesbian-identified women's and gay-identified men's response magnitude to the sexual stimuli of their preference.⁶⁵ In addition, there is some data that these women's attention to any sexual stimuli, especially ones featuring women, increases with model attractiveness²⁴ and that they look longer at the less attractive faces of men than at the less attractive faces of women.⁷⁶ Furthermore, lesbian-assigned women showed a bias toward masculinized faces.⁷⁸ Gynephilic women also allocated more controlled attention toward sexual stimuli depicting adults and the least attention to the genitals of children.^{62,79}

All studies that assessed VT in androphilic gender-diverse individuals found that they paid more controlled attention to male sexual stimuli.^{67,69,71,73} Moreover, their attentional patterns were relatively indistinguishable from ones of cisgender androphilic men and less gender-specific compared to cisgender gynephilic (attracted to women) men.⁷³

Attention to sexual stimuli among bisexual individuals

Automatic attention

Some studies on bisexual men's pre-attention report their equal attention to female and male sexual stimuli,^{48–50,53,54,89} and others highlight their substantial pupil dilation to men^{49,52,57} or women.⁵³ Moreover, there is also evidence that bisexual-assigned men allocate more automatic attention to their less arousing gender (ie, gender that elicits less pupil dilation)^{48,50,54} and less pre-attention to their more arousing gender (ie, gender that elicits more pupil dilation)^{48,50} than both heterosexual and gay-assigned men. Nevertheless, according to Morandini et al. (2020), although their responses were not biased toward male or female stimuli, they were not uniquely distinct from gay and heterosexual men's

⁸ By "female sexual stimuli," we mean types of stimuli that display individuals with phenotypical characteristics typically classified as female.

viewing patterns⁹. There is also data suggesting that bisexual-assigned men's pre-attention is connected to their level of sexual curiosity.⁴⁹ As such, men with high sexual curiosity demonstrate gender-nonspecific arousal patterns and pre-attentional bias to their less arousing gender, while men with low sexual curiosity exhibit more pre-attention to male sexual stimuli. Additionally, two out of three of Attard-Johnson et al.'s (2017) studies found no significant pupil dilation to children among ambiphilic (attracted to men and women) men, while a third one, somewhat unexpectedly, reported no dilation to adults. Finally, research also suggests that bisexual men's pupil dilation is not affected by their mental health.⁵⁴ Interestingly, in this study, the mental health issues were the most prevalent among 1) bisexual-leaning straight men with less pupil dilation to their less arousing gender and 2) bisexual-leaning gay men with more pupil dilation to their less arousing gender.

Bisexual women displayed mixed patterns of automatic attention, with some studies identifying their pre-attentional bias toward women^{27,28,90} or toward men⁵⁷ and others suggesting an intermediate pattern of attention, meaning that bisexual women's pre-attention is less biased toward female stimuli than in lesbian women, but more than in heterosexual women.^{48,50,51,55,90} One study has also concluded that bisexual-identified women's automatic attention does not reflect a truly ambiphilic (biased toward two genders) pattern, as they did not show a stronger preference for their less arousing gender and did not demonstrate equal pre-attention to men and women.⁸⁰ This study also discovered gynephilic pre-attentional patterns among lesbian-leaning bisexual women (Klein 5).

Controlled attention

Several researchers found that bisexual men allocate their controlled attention to female and male sexual stimuli relatively equally.^{60,62,64,65,80} There is also evidence that they viewed female sexual stimuli significantly longer than gay men^{52,60,74} and fixated for a longer time on their less preferred gender than men of other sexual orientations.^{74,80} Bisexual men's controlled attention was also found to be biased toward sexually mature individuals.⁶² Additionally, one study has examined attentional patterns in transgender and cisgender men with diverse sexual behaviors in a Samoan sample.⁷⁴ Although all cisgender men who had sex with fa'afafine (feminine third-gender individuals with penises) showed more even attentional distribution between female and male sexual cues, only men who engaged in sex with men, women, and fa'afafine had truly ambiphilic viewing patterns.

Some studies reported gender-nonspecific patterns of controlled attention among bisexual women,^{27,60,62,64,65} with other authors indicating that bisexual women's specificity was lower than in lesbian women but higher than in heterosexual women.^{60,80} There is also evidence of the controlled attention bias toward female sexual stimuli among ambiphilic women with primary gynephilia and concurrent androphilia (Kinsey 4).²⁷ Findings on the between-gender differences in the specificity of bisexual individuals' attention are mixed, with one study suggesting that bisexual women are more gender-specific than bisexual men⁶⁰ and another reporting

no significant gender differences.⁶⁵ In addition, ambiphilic women's controlled attention was found to be biased toward adult stimuli.⁶²

Attention to sexual stimuli among asexual individuals

Automatic attention

One study has examined automatic attention patterns among asexual (experiencing from no to little sexual attraction) cisgender and transgender men. Asexual men's pre-attention was found to be evenly distributed between sexual and non-sexual stimuli; however, their first fixation duration was longer for sexual than for other types of stimuli.⁸⁴

Findings regarding the automatic attention of asexual women and non-binary individuals are mixed, with one study highlighting the absence of strong pre-attentional bias to sexual stimuli in these groups⁸¹ and another pointing towards the existence of such bias.⁸⁴ Overall, the pre-attentive responses of asexual women and non-binary individuals were found to be as biased toward sexual cues as those of heterosexual participants but less so than those of women with SIAD (Sexual interest/arousal disorder).^{81,84}

Controlled attention

One study identified no controlled attention bias to sexual stimuli in asexual individuals,⁸² and another reported that such bias exists, although it is 5 times smaller than among heterosexuals.⁸⁴ Furthermore, asexual women and non-binary individuals were found to fixate relatively evenly on sexual and non-sexual stimuli and paid less attention to the areas of sexual contact than women with SIAD.^{82,84} There is also evidence of lower gender-specificity of asexual individuals' controlled attention compared to heterosexual, gay, and lesbian people.⁶⁵ The same study has also identified a smaller difference between asexual men and women in the magnitude of gender-specificity compared to one among heterosexual and gay/lesbian individuals.

Attention to sexual stimuli among cisgender men attracted to gender-diverse individuals

Controlled attention

Research suggests that cisgender men attracted to gender-diverse individuals distribute their controlled attention quite evenly between female and male sexual stimuli, demonstrating a relatively gender-nonspecific pattern of attraction.^{67,69,71,74} However, they do not exhibit equal attentional preferences for cisgender men and women.⁶⁷ Specifically, some authors found that the controlled attention of cisgender men attracted to gender-diverse individuals consists of a range of female and male-biased responses.^{71,74} Moreover, compared to fa'afafine, cisgender men attracted to gender-diverse individuals pay more attention to women and more attention to cisgender men than do gynephilic men.^{67,69,74} Additionally, their controlled attention was found to be equally biased towards feminine transgender individuals and cisgender women, and they looked at both of them longer than cisgender men.⁸³

Discussion

This review aimed to synthesize existing literature on attention to sexual stimuli and explore its relationship to sexual

⁹ According to Morandini et al. (2020), this could mean that differences in bisexual men's pre-attention could result from averaging together viewing patterns of gay and heterosexual men.

identity in non-heterosexual populations. The results revealed that automatic and controlled attention were assessed by an approximately equal number of studies, employing a wide range of methods and experimental paradigms. Most authors used static images, with relatively even representation of the explicit and non-explicit sexual stimuli across the studies.

How is attention to sexual stimuli in SMIs related to their sexual identities?

Overall, evidence indicates that gay men and lesbian women demonstrated automatic and controlled attentional biases to male and female sexual stimuli, respectively. As such, their attentional patterns seem to coincide with their sexual identities. Although the controlled attention patterns of androphilic third-gender individuals were biased toward men, no direct conclusions about the relationships between their sexual identity and attention to sexual stimuli can be drawn as terms related to sexual orientation hold smaller significance in non-Western countries.⁷³ However, based on the existing findings, it can be approximated that controlled attention among these individuals is closely coincident with their gender/sexual identity.³⁴

Literature regarding the pre-attentional patterns of bisexual men and women is mixed. Thus, we cannot firmly conclude that their pre-attention and sexual identities are related. However, our findings do not contradict this idea either, as bisexuality encompasses a spectrum of sexual responses, which could be biased toward women, men, or other genders.^{33,97} Conversely, bisexual men's controlled attention was found to be gender-nonspecific and more inclined toward their less arousing gender than in gay and heterosexual men, highlighting a coincidence with their sexual identity. The controlled attention of bisexual women was also coincident with their sexual identity, although this conclusion was based only on one criterion of ambiphilia—gender-nonspecificity of attentional patterns. Indeed, one study found that bisexual women did not show greater controlled attention toward their less arousing gender, thus failing to meet the second criterion of an ambiphilic response.⁸⁰ These results could be explained by lower levels of sexual identity integration and valence among bisexual individuals,⁹⁸ making it possible that their attentional patterns could be less related to their sexual identity.

Research on the automatic and controlled attention of asexual individuals is scarce, making definitive conclusions about the relationships between their sexual identity and attention to sexual stimuli untimely. However, there appears to be a tendency for asexual individuals to show a smaller degree of gender-specificity of controlled attention and less bias toward sexual cues than among allosexuals, which may be linked to the development of their sexual identity.^{65,82,84} Nevertheless, further research is needed to verify this speculation.

Evidence shows that men attracted to gender-diverse individuals display gender-nonspecific controlled attention, which is fairly evenly distributed between different genders. However, a few reasons prevent us from drawing any conclusions regarding the relationships between sexual identity and attention to sexual stimuli in these men. First, in four out of five included studies, groups were formed based on self-reported sexual behavior, while no information on participants' sexual identities was given.^{67,69,74,75} Moreover, most of the studies were conducted in cultures where sexual orientation has

little influence on individuals' self-identification.⁹⁹ Finally, it is unclear whether attraction to gender-diverse individuals should be classified as a unique sexual orientation,^{99,100} considering that some authors suggest that these men's sexual orientation is best described as a variant of heterosexuality.¹⁰¹ Furthermore, in Western countries, men attracted to gender-diverse individuals frequently adopt heterosexual, bisexual, and, more rarely, gay identities, although it could be argued that they do it to decrease social stigmatization of their sexual preferences.¹⁰²

Overall, the results of our review suggest that, at least in gay and lesbian individuals, attention to sexual stimuli could play a role in shaping sexual identity. Additionally, evidence from other SMIs points to a more intricate, possibly bidirectional, relationship between attention to sexual stimuli and sexual self-identification, warranting further exploration. However, we must underscore that scholars should not assume full attention-identity alignment. Indeed, by automatically expecting sexual orientation indicators to align with individuals' attentional patterns (alignment normativity), one can overlook ingroup variability, individual differences, and complexities of SMIs' real-life experiences.^{21,34} Such an approach also does not account for the possibility that an individual's attention to sexual stimuli and their sexual identity, attraction, and behavior can be different, though still interrelated. For instance, similar to androphilic women, other sexual orientation groups may share relatively homogeneous patterns of attention that do not align with their sexual attractions or identity labels.^{14,34} As such, alignment normativity contributes to the overgeneralization of the findings, making the real-world data fit in the narrow theoretical boxes rather than building their interpretations based on the acquired evidence, acknowledging existing diversity. Notably, some authors characterize the discordance between attention and identity/orientation as non-normative or inconsistent,^{22,34} ignoring the empirical reality outlined by other scholars.^{103,104} Finally, alignment normativity doesn't account for the possibility that individuals' sexuality may be better explained by other factors rather than their attention to sexual stimuli. If this is the case, then attention-identity discordance is not only natural but is also to be expected.

Sexual orientation conceptualization and measurement in studies with SMIs

Sexual orientation is a construct describing the direction of an individual's sexual attraction.^{34,105} However, in experimental sex research, sexual orientation is often conflated with several other simultaneously related but distinct constructs.^{33,106–108} Evidence shows that as a single measure, sexual attraction remains the most reliable indicator of sexual orientation.¹⁰⁸ Sexual identity was also found to be quite accurate in distinguishing sexual orientations closer to the ends of the continuum, but often failed to assess the sexual orientation of non-exclusively attracted individuals accurately, whereas sexual behavior showed even more significant divergence from an individual's sexual orientation.¹⁰⁸ Therefore, variations in authors' conceptualizations of sexual orientation across the literature have a sizable effect on the experimental findings and their interpretation, affecting who could be referred to as a sexual minority and majority in each study, as well as who would be categorized as gay, lesbian, bisexual, asexual or other labels.³³ Indeed, our findings suggest that in attentional

studies with SMIs, experimental groups are often formed based on participants' sexual identities and/or attractions.

It is also noteworthy that sexual orientation lacks a standardized measurement tool, leading to varying operationalizations across the literature.^{107,109} This review identified the most commonly used sexual orientation assessments among SMIs, including the Kinsey-type scales, KSOG, and single multiple-choice questions addressing sexual orientation.

As such, the original Kinsey Scale assessed sexual behavior and attraction to men and women continuously but faced criticism for conflating different sexual orientation components.^{33,108,109} Therefore, in its modern form, researchers typically clarify whether a Kinsey-type scale is being used to measure sexual identity, attraction, or behavior.¹⁰⁵ Furthermore, this scale was also criticized for its bipolar structure, which frames heterosexuality and homosexuality as opposites and is unable to differentiate between a lack of attraction to any gender and attraction to multiple genders, potentially misclassifying asexual individuals as bisexual.¹⁰⁹ Among other limitations of the Kinsey scale is its inability to capture sexual fluidity and account for the experiences of individuals adopting multiple sexual identities. Therefore, the sexual orientation labels assigned by researchers based on their interpretations of participants' Kinsey scores do not always mirror individuals' self-selected sexual identities.

KSOG shares most of the drawbacks of the Kinsey scale, but unlike the latter, it measures several sexual orientation constructs separately across three dimensions (past, future, and ideal).¹⁰⁹ However, some of its components (eg, lifestyle, emotional, and social preference) were found to be highly variable across sexual orientations, so their utility for experimental research remains questionable.⁸⁰ Nevertheless, despite their limitations, KSOG and Kinsey-type scales continue to be primary tools for assessing sexual orientation in experimental research, with many researchers highlighting their relevance.^{105,110}

Notably, the challenges in conceptualizing sexual orientation extend beyond assessment tools, often concerning the target population. Indeed, researchers may struggle to operationalize the sexual orientations of gender-diverse individuals, who report a wide spectrum of sexual identities, attractions, and behaviors.^{33,74} Furthermore, widely recognized sexual identity labels often rely on binary gender relationships, emphasizing same- and opposite-sex attraction and, therefore, fail to adequately represent gender identities outside the binary.³³ For this reason, many gender-diverse individuals adopt alternative, less scientifically established labels (eg, queer) to describe their sexual identity.¹¹¹ However, these labels often lack clarity, making them less practical for operationalization in experimental studies. Instead, researchers might consider focusing on participants' sexual attraction, labeling it solely according to the partner's gender, ie, androphilic (attracted to men), gynephilic (attracted to women), and ambiphilic (attracted to men and women).¹⁰⁵ Such an approach can be useful for research inclusive of gender-diverse individuals from both Western and non-Western countries.

Research gaps

The findings of this review outline several general and sexual orientation-specific research gaps.

General gaps.

There is a need for more studies that employ continuous conceptualization of sexual orientation, as the reviewed literature overlooks the diversity within plurisexual identities (eg, pansexual, queer, etc.) and sexual fluidity.^{108,112,113} Indeed, despite the frequent inclusion of continuous scales in experimental studies, most researchers still assign participants' scores to heterosexual, gay/lesbian, and bisexual categories.¹⁰⁸ Similarly, attentional studies with asexual individuals have mostly focused on one ace-spectrum identity (asexual)^{81,82} or grouped all ace-identified participants together.^{65,84} Consequently, it remains unclear if individual differences in SMIs' sexual identities correspond to the cognitive differences in their attention to sexual stimuli. However, it could be argued that minor variations in SMIs' attractions and self-identifications may have limited relevance for their attention to sexual cues. As such, Savin-Williams and colleagues (2017) found no differences in pre-attention among gay, mostly gay, and bisexual-leaning gay men, with controlled attention differing only between gay and bisexual-leaning gay men, supporting the use of sexual orientation categories in attentional studies with sexual minority men. Conversely, another study identified notable differences in the controlled attention of bisexual women based on their varying sexual attraction scores, emphasizing the importance of viewing sexual orientation as a continuum.²⁷ Indeed, future research on in-between sexualities should examine whether categorizing SMIs into distinct groups based on their Kinsey scores offers insights into their attentional patterns to sexual stimuli.

To further advance our understanding of attention to sexual stimuli among SMIs, there is also a need to diversify the research methods used in this area. While attentional studies with gay and lesbian individuals employ diverse methods and paradigms,¹⁴ research with bisexual individuals relies almost exclusively on pupillometry and VTs.^{49-51,59,60,80} Similarly, in asexual individuals, attention is studied primarily with eye-tracking,^{81,82,84} whereas VT is the only method to measure attention in men attracted to gender-diverse individuals.⁹⁹ Such differences in experimental methodologies hinder direct comparisons of findings across sexual orientations, limiting the generalizability of results. Moreover, this poses a risk that some observed effects may be artifacts of the specific measurements. Therefore, future research should broaden the range of methods employed to enable replication across different approaches, ensuring the validity of the findings.

Another research gap concerns the types of sexual stimuli used to assess attention. Most studies have only included static sexual stimuli, restricting the ecological validity of the findings. Indeed, research demonstrates that video-based stimuli are more effective than static images in eliciting sexual arousal.^{45,114} Furthermore, most authors incorporated unstandardized picture sets into their experiments, making them susceptible to stimulus selection biases. For instance, some reviewed studies indicated that stimulus attractiveness could influence SMIs' attentional patterns,^{24,70,96} suggesting that selection of images with significantly varied attraction scores could impact the results. Also, all included studies with SMIs are focused on visual types of stimuli, while no research has examined their attention to non-visual sexual cues.

Additionally, studies with gender-diverse individuals, both as participants and as targets of SMIs' attention, are also lacking. As such, research has yet to examine pre-attention and controlled attention among gynephilic gender-diverse

individuals. Similarly, a few studies have assessed gay men's attention to feminine transgender individuals with penises, but no studies have explored their attention to masculine transgender individuals with vulvas, limiting our understanding of the SMIs' attention to sexual stimuli outside the gender binary.⁴⁵

Finally, there is a growing interest in examining between-gender specificity of automatic and controlled attention in SMIs.^{65,105} However, the existing findings are mixed, highlighting the need for further investigation to determine whether gender differences in attention to sexual stimuli operate independently of sexual orientation. Current research on bisexual individuals suggests otherwise,^{60,65} indicating a potential interaction between gender and sexual orientation.

Research gaps specific to sexual orientation

Considering the extensive research on attentional patterns in gay and lesbian individuals,^{14,22} future systematic reviews could shed light on their degree of attentional bias toward preferred and non-preferred sexual cues. Moreover, as the mechanisms underlying weaker bias to non-preferred gender(s) among gay men and lesbian women remain unclear, further research is needed to understand whether this attentional pattern reflects lower attraction to non-preferred sexual stimuli or higher aversion to them. Additionally, care should be taken on how the authors conceptualize non-Western third-gender identities to avoid their stigmatization. Indeed, some studies pointed out that such individuals represent a form of male androphilia,⁷³ emphasizing sex assigned at birth as a primary factor related to their sexual orientation.

As for research on attention to sexual stimuli in bisexual individuals, it would greatly benefit from the consistent application of established criteria for bisexual-type responses. Notably, studies on bisexual men typically report their gender-specificity score and attention to less arousing gender, whereas only the former is usually reported for bisexual women.^{48,50,54} Moreover, while research shows relatively equal attention to male and female stimuli among bisexual women, this pattern is often overlooked in light of the further decreased gender-specificity of heterosexual women.^{48,50,51,55,80} In addition, more research focused on bisexual individuals' pre-attention to their less arousing gender could provide stronger evidence for the coincidence of their sexual identity and automatic attention.

Research on attention to sexual stimuli in asexual individuals is still in its early stage, highlighting the need for clear steps to advance current knowledge in this area. First, future research should be more inclusive of asexual men to enhance our understanding of their attentional patterns. In addition, mixed findings on asexual individuals' controlled attention to sexual cues^{82,84} emphasize the need for further investigation. Moreover, unlike research with allosexuals, studies with ace-spectrum participants have focused on their attention to sexual versus non-sexual cues. Indeed, only one study examined the gender-specificity of their controlled attention,⁶⁵ with no research measuring this aspect in relation to asexual individuals' pre-attention. As such, the next step in research on asexuality could bring a more nuanced understanding of what constitutes their unique patterns of attention to sexual stimuli.⁸⁰ In addition to asexual individuals' smaller attentional bias to sexual stimuli, we expect them to demonstrate (1) more equal attention to male and female sexual stimuli than among monosexuals and (2) less attention to their more

arousing gender than in heterosexual, gay, and lesbian individuals.

Another emerging scope of research concerns attentional patterns in men attracted to gender-diverse individuals. To further elucidate our knowledge of these populations, future studies should examine their pre-attention to sexual stimuli. Furthermore, there is a need for more research that conceptualizes these men's sexual orientation through sexual identity or attraction, as opposed to existing research focusing on their sexual behavior.⁹⁹ Finally, to determine whether the attentional patterns of men attracted to gender-diverse individuals coincide more closely with those of bisexual individuals^{67,69,71,74} or represent a combination of male-, female-, and third-gender-biased responses,^{71,74} studies should examine their attention to their least and most arousing genders.

Limitations

Methodological

First, this review is limited to articles in the English language,

Furthermore, some of the included studies had low sample sizes (<18 participants per group) and, therefore, could be underpowered to register small and medium-sized patterns of attention in SMIs, as well as significant differences between sexual minority groups. Future systematic reviews should employ quality assessment techniques to account for the reliability of the findings and potential research biases.

Additionally, results of several included studies could be explained by the use of unique methods and measurement techniques,^{25,46,47,95} type of stimuli selected (eg, static stimuli in pupillometry task⁵⁷), variations in experimental instructions,^{24,63,70} habituation effects,⁸⁵ and authors' unclear operationalizations of sexual orientation.^{53,79} In several studies, the presentation of the outcomes was incomplete (ie, no results for lesbian women were provided) and, as such, should be treated with caution.^{76,78} There is also evidence that the stimulus explicitness affects SMIs' controlled and automatic attention more than its concordance with sexual orientation.⁹⁶ Consequently, studies using exclusively non-explicit sexual stimuli may have failed to detect significant differences between sexual orientations.⁷⁶

Finally, the VT technique was widely used in research with SMIs. However, it was shown that VT effects are more task-dependent than stimulus-driven, meaning that this method does not directly measure attention but instead reflects participants' decision-making processes.^{63,70,115} Indeed, gay men exhibited longer VTs to female images when instructed to rate their attractiveness from the heterosexual perspective.⁶³

Conceptual

Upon screening, we encountered several articles examining attention to sexual stimuli among transgender individuals, with no indication of participants' sexual orientation.^{116,117} Such oversights may stem from the authors' lack of awareness or an implicit assumption of transgender individuals' heterosexuality, which risks underestimating the complexity of measured phenomena and perpetuating stereotypes. Therefore, to increase scientific rigor and prevent stigmatization of transgender individuals, future research should gather information about their sexual orientations.

In addition, not all of the included studies operationalized sexual orientation through sexual identity (only). As such, we acknowledge that we sometimes made assumptions about participants' sexual identity based on their sexual attractions

or averaged sexual orientation scores that included several indicators. Therefore, to reduce the effect of alignment normativity^{21,34} on the findings of our review, we would like to highlight the existence of numerous studies demonstrating that sexual identity and attraction do not always align in the overall population (especially among women and bisexual individuals).^{34,103,104,118,119} Indeed, two of the reviewed studies reported sexual identity-attraction discordance in a subset of their samples.^{62,95} Most of Ebsworth & Lalumière's (2012) participants with discordant sexual identity and attraction used sexual identity labels that were synonymous with "gay," "lesbian," and "bisexual," a few other participants selected labels not included in the provided sexual orientation options (eg, "asexual"), or expressed uncertainty about their sexual orientation and two individuals reported branched sexual orientation and identities.⁶² Similar patterns were reported by Huberman et al. (2015), with additional evidence that pluriosesexual women exhibited sexual identity-attraction discordance more frequently. On the other hand, there is also a need to mention the existence of research suggesting a high correlation between sexual identity and attraction,¹⁰⁸ with some of the reviewed papers corroborating this statement.^{48-51,54,55,80,89-92} However, the reported correlations are never perfect and sometimes stem from the exclusion of participants whose sexual identity and attraction do not coincide with the aim to increase group homogeneity.^{57,87,89,90} This demonstrates how alignment normativity affects findings on attention to sexual stimuli in SMIs, limiting our review's ability to account for the experiences of individuals with branched sexual identity and attraction.^{21,34} Therefore, we encourage future research to directly examine attentional patterns of individuals with discordant sexual identity and attraction.

Conclusion

Taken together, we believe that the current scoping review can offer insights for scientific research and practice. Specifically, it can clarify attentional patterns across non-heterosexual orientations and improve our understanding of the factors related to sexual self-identification. It can also enhance health care services for SMIs by providing them with comprehensive psychoeducation and tailored clinical support, helping improve the treatment of sexual dysfunctions through the use of attentional focus techniques, and assisting clinicians in dealing with identity conflicts among SMIs.²⁹ This review may also contribute to social stigma reduction by promoting a better understanding of sexual orientation and sexual identity among the general public, reducing societal stereotypes about SMIs, and improving their psychological and sexual well-being.¹²⁰

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Supplementary material

Supplementary material is available at *Sexual Medicine Reviews* online.

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Conflicts of interest

None.

References

- Janssen E, Everaerd W, Spiering M, Janssen J. Automatic processes and the appraisal of sexual stimuli: toward an information processing model of sexual arousal. *J Sex Res*. 2000;37(1):8–23. <https://doi.org/10.1080/00224490009552016>
- Spiering M, Everaerd W, Janssen E. Priming the sexual system: implicit versus explicit activation. *J Sex Res*. 2003;40(2):134–145. <https://doi.org/10.1080/00224490309552175>
- Strahler J, Baranowski AM, Walter B, Huebner N, Stark R. Attentional bias toward and distractibility by sexual cues: a meta-analytic integration. *Neurosci Biobehav Rev*. 2019;105:276–287. <https://doi.org/10.1016/j.neubiorev.2019.07.015>
- Spiering M, Everaerd W, Laan E. Conscious processing of sexual information: mechanisms of appraisal. *Arch Sex Behav*. 2004;33(4):369–380. <https://doi.org/10.1023/B:ASEB.00000028890.08687.94>
- Fabio RA, Capri T. Automatic and controlled attentional capture by threatening stimuli. *Heliyon*. 2019;5(5):e01752. <https://doi.org/10.1016/j.heliyon.2019.e01752>
- Carretié L. Exogenous (automatic) attention to emotional stimuli: a review. *Cogn Affect Behav Neurosci*. 2014;14(4):1228–1258. <https://doi.org/10.3758/s13415-014-0270-2>
- Bradley MM, Codispoti M, Cuthbert BN, Lang PJ. Emotion and motivation I: defensive and appetitive reactions in picture processing. *Emotion*. 2001;1(3):276–298. <https://doi.org/10.1037/1528-3542.1.3.276>
- Öhman A, Mineka S. Fears, phobias, and preparedness: toward an evolved module of fear and fear learning. *Psychol Rev*. 2001;108(3):483–522. <https://doi.org/10.1037/0033-295X.108.3.483>
- LoBue V, DeLoache JS. Detecting the snake in the grass: attention to fear-relevant stimuli by adults and young children. *Psychol Sci*. 2008;19(3):284–289. <https://doi.org/10.1111/j.1467-9280.2008.02081.x>
- Hansen CH, Hansen RD. Finding the face in the crowd: an anger superiority effect. *J Pers Soc Psychol*. 1988;54(6):917–924. <https://doi.org/10.1037/0022-3514.54.6.917>
- Kim H, Anderson BA. Primary rewards and aversive outcomes have comparable effects on attentional bias. *Behav Neurosci*. 2023;137(2):89–94. <https://doi.org/10.1037/bne0000543>
- Spiering M, Everaerd W. The sexual unconscious. In: Janssen E ed. *The Psychophysiology of Sex. The Kinsey Institute Series*. Indiana University Press; 2007: 166–184.
- Prause N, Janssen E, Hetrick WP. Attention and emotional responses to sexual stimuli and their relationship to sexual desire. *Arch Sex Behav*. 2008;37(6):934–949. <https://doi.org/10.1007/s10508-007-9236-6>
- Chivers ML. The specificity of women's sexual response and its relationship with sexual orientations: a review and ten hypotheses. *Arch Sex Behav*. 2017;46(5):1161–1179. <https://doi.org/10.1007/s10508-016-0897-x>
- Rupp HA, Wallen K. Sex differences in response to visual sexual stimuli: a review. *Arch Sex Behav*. 2008;37(2):206–218. <https://doi.org/10.1007/s10508-007-9217-9>
- Carvalho J, Pereira R, Barreto D, Nobre PJ. The effects of positive versus negative mood states on attentional processes during exposure to erotica. *Arch Sex Behav*. 2017;46(8):2495–2504. <https://doi.org/10.1007/s10508-016-0875-3>
- Kane L, Dawson SJ, Shaughnessy K, Reissing ED, Ouimet AJ, Ashbaugh AR. A review of experimental research on anxiety and sexual arousal: implications for the treatment of sexual dysfunction using cognitive behavioral therapy. *J Exp Psychopathol*. 2019;10(2). <https://doi.org/10.1177/2043808719847371>

18. Wen G, Niu C, Zhang Y, Santtila P. Bidirectional relationship between sexual arousal and (sex-related) disgust. *PLoS One*. 2023;18(5):e0285596–e0285532. <https://doi.org/10.1371/journal.pone.0285596>
19. Dewitte M. Gender differences in liking and wanting sex: examining the role of motivational context and implicit versus explicit processing. *Arch Sex Behav*. 2015;44(6):1663–1674. <https://doi.org/10.1007/s10508-014-0419-7>
20. Both S, Everaerd W, Laan E. Desire emerges from excitement: A psychophysiological perspective on sexual motivation. In: *The Psychophysiology of Sex. The Kinsey Institute Series*. Indiana University Press; 2007: 327–339.
21. Chivers ML, Blumenstock SM. Beyond gendered/sexed sexual response: Debunking essentialism, revisiting experience, and centering women's sexual pleasure. In: Lorenz T, Hope D, Holland K, eds. *Gender Resilience, Integration and Transformation*. Springer Nature Cham; 2024:61–100. doi:https://doi.org/10.1007/978-3-031-61969-4_5
22. Attard-Johnson J, Vasilev MR, Ciardha C Ó, Bindemann M, Babchishin KM. Measurement of sexual interests with pupillary responses: a meta-analysis. *Arch Sex Behav*. 2021;50(8):3385–3411. <https://doi.org/10.1007/s10508-021-02137-y>
23. Wenzlaff F, Briken P, Dekker A. Video-based eye tracking in sex research: a systematic literature review. *J Sex Res*. 2016;53(8):1008–1019. <https://doi.org/10.1080/00224499.2015.1107524>
24. Lippa RA. Effects of sex and sexual orientation on self-reported attraction and viewing times to images of men and women: testing for category specificity. *Arch Sex Behav*. 2012;41(1):149–160. <https://doi.org/10.1007/s10508-011-9898-y>
25. Samson L, Janssen E. Sexual and affective responses to same- and opposite-sex stimuli in heterosexual and homosexual men: assessment and manipulation of visual attention. *Arch Sex Behav*. 2014;43(5):917–930. <https://doi.org/10.1007/s10508-013-0221-y>
26. Wright LW, Adams HE. Assessment of sexual preference using a choice reaction time task. *J Psychopathol Behav Assess*. 1994;16(3):221–231. <https://doi.org/10.1007/BF02229209>
27. Dawson SJ, Fretz KM, Chivers ML. Visual attention patterns of women with androphilic and gynephilic sexual attractions. *Arch Sex Behav*. 2017;46(1):141–153. <https://doi.org/10.1007/s10508-016-0825-0>
28. Snowden RJ, Gray NS, Rollings J, Uzzell KS. Automatic attention to sexual images of men and women in androphilic, ambiphilic, and gynephilic women. *J Bisexuality*. 2023;23(2):170–185. <https://doi.org/10.1080/15299716.2023.2183923>
29. Berry MD, Lezos AN. Inclusive sex therapy practices: a qualitative study of the techniques sex therapists use when working with diverse sexual populations. *Sex Relatsh Ther*. 2017;32(1):2–21. <https://doi.org/10.1080/14681994.2016.1193133>
30. Evans M, Barker M. How do you see me? Coming out in counselling. *Br J Guid Couns*. 2010;38(4):375–391. <https://doi.org/10.1080/03069885.2010.503698>
31. Haboubi NHJ, Lincoln N. Views of health professionals on discussing sexual issues with patients. *Disabil Rehabil*. 2003;25(6):291–296. <https://doi.org/10.1080/0963828021000031188>
32. Dickenson JA, Diamond L, King JB, Jenson K, Anderson JS. Understanding heterosexual women's erotic flexibility: the role of attention in sexual evaluations and neural responses to sexual stimuli. *Soc Cogn Affect Neurosci*. 2020;15(4):447–465. <https://doi.org/10.1093/scan/nsaa058>
33. Galupo MP, Davis KS, Gryniewicz AL, Mitchell RC. Conceptualization of sexual orientation identity among sexual minorities: patterns across sexual and gender identity. *J Bisexuality*. 2014;14(3-4):433–456. <https://doi.org/10.1080/15299716.2014.933466>
34. van Anders SM. Beyond sexual orientation: integrating gender/sex and diverse sexualities via sexual configurations theory. *Arch Sex Behav*. 2015;44(5):1177–1213. <https://doi.org/10.1007/s10508-015-0490-8>
35. Anderson BA, Laurent PA, Yantis S. Value-driven attentional capture. *Proc Natl Acad Sci*. 2011;108(25):10367–10371. <https://doi.org/10.1073/pnas.1104047108>
36. Tassone D, Dawson SJ, Chivers ML. The impact of homonegativity on gynephilic men's visual attention toward non-preferred sexual targets. *Personal Individ Differ*. 2019;149:261–272. <https://doi.org/10.1016/j.paid.2019.05.062>
37. Chivers ML, Seto MC, Lalumière ML, Laan E, Grimbos T. Agreement of self-reported and genital measures of sexual arousal in men and women: a meta-analysis. *Arch Sex Behav*. 2010;39(1):5–56. <https://doi.org/10.1007/s10508-009-9556-9>
38. Crocetti E, Prati F, Rubini M. The interplay of personal and social identity. *Eur Psychol*. 2018;23(4):300–310. <https://doi.org/10.1027/1016-9040/a000336>
39. Cass VC. Homosexual identity formation: a theoretical model. *J Homosex*. 1979;4(3):219–235. https://doi.org/10.1300/J082v04n03_01
40. Hall WJ, Dawes HC, Plocek N. Sexual orientation identity development milestones among lesbian, gay, bisexual, and queer people: a systematic review and meta-analysis. *Front Psychol*. 2021;12:12. <https://doi.org/10.3389/fpsyg.2021.753954>
41. Peters MDJ, Godfrey CM, Khalil H, McInerney P, Parker D, Soares CB. Guidance for conducting systematic scoping reviews. *JBI Evid Implement*. 2015;13(3):141–146. <https://doi.org/10.1097/XEB.000000000000050>
42. Tricco AC, Lillie E, Zarin W, O'Brien KK, et al. PRISMA extension for scoping reviews (PRISMA-SCR): checklist and explanation. *Ann Intern Med*. 2018;169(7):467–473. <https://doi.org/10.7326/M18-0850>
43. Aromataris E, Lockwood C, Porritt K, Pilla B, Jordan Z. JBI manual for evidence synthesis. Published online. 2024. <https://doi.org/10.46658/JBIMES-24-01>
44. Chandra K, Slater B, Ma M. Research rabbit [citation-based literature mapping tool]. Published online. 2023. <https://www.researchrabbit.ai/>
45. Katz MA, Penniston TL, Barry C, Micanovic N, Seto MC, Chivers ML. Use of sexual stimuli in research and clinical settings: expert opinion and recommendations. *Sex Med*. 2023;11(2). <https://doi.org/10.1093/sexmed/qfad012>
46. Hess EH, Seltzer AL, Shlien JM. Pupil response of hetero- and homosexual males to pictures of men and women: a pilot study. *J Abnorm Psychol*. 1965;70(3):165–168. <https://doi.org/10.1037/h0021978>
47. Scott TR, Wells WH, Wood DZ, Morgan DI. Pupillary response and sexual interest reexamined. *J Clin Psychol*. 1967;23(4):433–438. [https://doi.org/10.1002/1097-4679\(196710\)23:4<433::AID-JCLP2270230408>3.0.CO;2-2](https://doi.org/10.1002/1097-4679(196710)23:4<433::AID-JCLP2270230408>3.0.CO;2-2)
48. Rieger G, Savin-Williams RC. The eyes have it: sex and sexual orientation differences in pupil dilation patterns. *PLoS One*. 2012;7(8):1–10. <https://doi.org/10.1371/journal.pone.0040256>
49. Rieger G, Rosenthal AM, Cash BM, Linsenmeier JAW, Bailey JM, Savin-Williams RC. Male bisexual arousal: a matter of curiosity? *Biol Psychol*. 2013;94(3):479–489. <https://doi.org/10.1016/j.biopsycho.2013.09.007>
50. Rieger G, Cash BM, Merrill SM, Jones-Rounds J, Dharmavaram SM, Savin-Williams RC. Sexual arousal: the correspondence of eyes and genitals. *Biol Psychol*. 2015;104:56–64. <https://doi.org/10.1016/j.biopsycho.2014.11.009>
51. Rieger G, Savin-Williams RC, Chivers ML, Bailey JM. Sexual arousal and masculinity-femininity of women. *J Pers Soc Psychol*. 2016;111(2):265–283. <https://doi.org/10.1037/pspp0000077>
52. Savin-Williams RC, Cash BM, McCormack M, Rieger G. Gay, mostly gay, or bisexual leaning gay? An exploratory study distinguishing gay sexual orientations among young men. *Arch Sex Behav*. 2017;46(1):265–272. <https://doi.org/10.1007/s10508-016-0848-6>
53. Attard-Johnson J, Bindemann M, Ciardha Ó, C. Heterosexual, homosexual, and bisexual men's pupillary responses to persons

- at different stages of sexual development. *J Sex Res.* 2017;54(9):1085–1096. <https://doi.org/10.1080/00224499.2016.1241857>
54. Slettevold E. *Sexual Arousal and Mental Health in Bisexual Men. Masters.* University of Essex; 2018. Accessed February 12, 2024. <https://repository.essex.ac.uk/23208/>
 55. Holmes L, Watts-Overall TM, Slettevold E, Gruia DC, Raines J, Rieger G. Sexual orientation, sexual arousal, and finger length ratios in women. *Arch Sex Behav.* 2021;50(8):3419–3432. <https://doi.org/10.1007/s10508-021-02095-5>
 56. Watts TM, Holmes L, Raines J, Orbell S, Rieger G. Sexual arousal patterns of identical twins with discordant sexual orientations. *Sci Rep.* 2018;8(1):14970. <https://doi.org/10.1038/s41598-018-33188-2>
 57. Snowden RJ, McKinnon A, Fitoussi J, Gray NS. Pupillary responses to static images of men and women: a possible measure of sexual interest? *J Sex Res.* 2019;56(1):74–84. <https://doi.org/10.1080/00224499.2017.1394959>
 58. Zamansky HS. A technique for assessing homosexual tendencies. *J Pers.* 1956;24(4):436–448. <https://doi.org/10.1111/j.1467-6494.1956.tb01280.x>
 59. Rullo JE, Strassberg DS, Israel E. Category-specificity in sexual interest in gay men and lesbians. *Arch Sex Behav.* 2010;39(4):874–879. <https://doi.org/10.1007/s10508-009-9497-3>
 60. Rullo JE, Strassberg DS, Miner MH. Gender-specificity in sexual interest in bisexual men and women. *Arch Sex Behav.* 2015;44(5):1449–1457. <https://doi.org/10.1007/s10508-014-0415-y>
 61. Bourke AB, Gormley MJ. Comparing a pictorial stroop task to viewing time measures of sexual interest. *Sex Abus.* 2012;24(5):479–500. <https://doi.org/10.1177/1079063212438922>
 62. Ebsworth M, Lalumière ML. Viewing time as a measure of bisexual sexual interest. *Arch Sex Behav.* 2012;41(1):161–172. <https://doi.org/10.1007/s10508-012-9923-9>
 63. Imhoff R, Schmidt AF, Weiß S, Young AW, Banse R. Vicarious viewing time: prolonged response latencies for sexually attractive targets as a function of task- or stimulus-specific processing. *Arch Sex Behav.* 2012;41(6):1389–1401. <https://doi.org/10.1007/s10508-011-9879-1>
 64. Lippa RA. Men and women with bisexual identities show bisexual patterns of sexual attraction to male and female “swimsuit models.”. *Arch Sex Behav.* 2013;42(2):187–196. <https://doi.org/10.1007/s10508-012-9981-z>
 65. Lippa RA. Category specificity of self-reported sexual attraction and viewing times to male and female models in a large U.S. sample: sex, sexual orientation, and demographic effects. *Arch Sex Behav.* 2017;46(1):167–178. <https://doi.org/10.1007/s10508-016-0844-x>
 66. Fromberger P, Meyer S, Kempf C, Jordan K, Müller JL. Virtual viewing time: the relationship between presence and sexual interest in androphilic and gynephilic men. *PLoS One.* 2015;10(5):e0127156. <https://doi.org/10.1371/journal.pone.0127156>
 67. Petterson LJ, Dixon BJ, Little AC, Vasey PL. Viewing time measures of sexual orientation in Samoan cisgender men who engage in sexual interactions with fa’afafine. *PLoS One.* 2015;10(2):1–17. <https://doi.org/10.1371/journal.pone.0116529>
 68. Rönspies J, Schmidt AF, Melnikova A, Krumova R, Zolfagari A, Banse R. Indirect measurement of sexual orientation: comparison of the implicit relational assessment procedure, viewing time, and choice reaction time tasks. *Arch Sex Behav.* 2015;44(5):1483–1492. <https://doi.org/10.1007/s10508-014-0473-1>
 69. Petterson LJ, Dixon BJ, Little AC, Vasey PL. Reconsidering male bisexuality: sexual activity role and sexual attraction in Samoan men who engage in sexual interactions with fa’afafine. *Psychol Sex Orientat Gend Divers.* 2016;3(1):11–26. <https://doi.org/10.1037/sgd0000160>
 70. Pohl A, Wolters A, Ponseti J. Investigating the task dependency of viewing time effects. *J Sex Res.* 2016;53(8):1027–1035. <https://doi.org/10.1080/00224499.2015.1089429>
 71. Stief M. The sexual orientation and gender presentation of hijra, Kothi, and Panthi in Mumbai. *India Arch Sex Behav.* 2017;46(1):73–85. <https://doi.org/10.1007/s10508-016-0886-0>
 72. Lalumière ML, Babchishin KM, Ebsworth M. The use of film clips in a viewing time task of sexual interests. *Arch Sex Behav.* 2018;47(3):627–635. <https://doi.org/10.1007/s10508-017-1108-0>
 73. Petterson LJ, Dixon BJ, Little AC, Vasey PL. Viewing time and self-report measures of sexual attraction in Samoan cisgender and transgender androphilic males. *Arch Sex Behav.* 2018;47(8):2427–2434. <https://doi.org/10.1007/s10508-018-1267-7>
 74. Petterson LJ, Dixon BJ, Little AC, Vasey PL. Heterogeneity in the sexual orientations of men who have sex with fa’afafine in Samoa. *Arch Sex Behav.* 2020;49(2):517–529. <https://doi.org/10.1007/s10508-020-01646-6>
 75. Petterson LJ, Vasey PL. Samoan men’s sexual attraction and viewing time response to male-to-feminine transgender and cisgender adults. *Arch Sex Behav.* 2021;50(3):873–884. <https://doi.org/10.1007/s10508-020-01905-6>
 76. Mitrovic A, Tinio PPL, Leder H. Consequences of beauty: effects of rater sex and sexual orientation on the visual exploration and evaluation of attractiveness in real world scenes. *Front Hum Neurosci.* 2016;10:10. <https://doi.org/10.3389/fnhum.2016.00122>
 77. Szczuka JM, Krämer NC. There’s more to humanity than meets the eye: differences in gaze behavior toward women and gynoid robots. *Front Psychol.* 2019;10:10. <https://doi.org/10.3389/fpsyg.2019.00693>
 78. Hou J, Sui L, Jiang X, Han C, Chen Q. Facial attractiveness of Chinese college students with different sexual orientation and sex roles. *Front Hum Neurosci.* 2019;13:13. Accessed February 6, 2024. <https://doi.org/https://www.frontiersin.org/articles/10.3389/fnhum.2019.00132>
 79. Vázquez-Amézquita M, Leongómez JD, Seto MC, Bonilla M, Rodríguez-Padilla A, Salvador A. Visual attention patterns differ in gynephilic and androphilic men and women depending on age and gender of targets. *J Sex Res.* 2019;56(1):85–101. <https://doi.org/10.1080/00224499.2017.1372353>
 80. Morandini JS, Spence B, Dar-Nimrod I, Lykins AD. Do bisexuals have a bisexual viewing pattern? *Arch Sex Behav.* 2020;49(2):489–502. <https://doi.org/10.1007/s10508-019-01514-y>
 81. Bradshaw J, Brown N, Kingstone A, Brotto L. Asexuality vs. sexual interest/arousal disorder: examining group differences in initial attention to sexual stimuli. *PLoS One.* 2021;16(12):e0261434–e0261418. <https://doi.org/10.1371/journal.pone.0261434>
 82. Brown NB, Peragine D, VanderLaan DP, Kingstone A, Brotto LA. Cognitive processing of sexual cues in asexual individuals and heterosexual women with desire/arousal difficulties. *PLoS One.* 2021;16(5):e0251074–e0251022. <https://doi.org/10.1371/journal.pone.0251074>
 83. Petterson LJ, Vasey PL. Canadian undergraduate men’s visual attention to cisgender women, cisgender men, and feminine trans individuals. *Sci Rep.* 2021;11(1):388. <https://doi.org/10.1038/s41598-020-79870-2>
 84. Milani S, Zhang JY, Zdaniuk B, Bogaert A, Rieger G, Brotto LA. Examining visual attention patterns among asexual and heterosexual individuals. *J Sex Res.* 2023;60(2):271–281. <https://doi.org/10.1080/00224499.2022.2078768>
 85. Santtila P, Mokros A, Viljanen K, et al. Assessment of sexual interest using a choice reaction time task and priming: a feasibility study. *Leg Criminol Psychol.* 2009;14(1):65–82. <https://doi.org/10.1348/135532507X267040>
 86. Jiang Y, Costello P, Fang F, Huang M, He S. A gender- and sexual orientation-dependent spatial attentional effect of invisible images. *Proc Natl Acad Sci.* 2006;103(45):17048–17052. <https://doi.org/10.1073/pnas.0605678103>
 87. Snowden RJ, Wichter J, Gray NS. Implicit and explicit measurements of sexual preference in gay and heterosexual men: a comparison of priming techniques and the implicit association task.

- Arch Sex Behav.* 2008;37(4):558–565. <https://doi.org/10.1007/s10508-006-9138-z>
88. Snowden RJ, Gray NS. Implicit sexual associations in heterosexual and homosexual women and men. *Arch Sex Behav.* 2013;42(3):475–485. <https://doi.org/10.1007/s10508-012-9920-z>
 89. Snowden RJ, Fitton E, McKinnon A, Gray NS. Sexual attraction to both genders in ambiphilic men: evidence from implicit cognitions. *Arch Sex Behav.* 2020;49(2):503–515. <https://doi.org/10.1007/s10508-019-01552-6>
 90. Snowden RJ, Gray NS, Uzzell KS. Implicit sexual cognitions in women with ambiphilic sexual attractions: a comparison to androphilic and gynephilic women. *Arch Sex Behav.* 2024;53(1):141–152. <https://doi.org/10.1007/s10508-023-02727-y>
 91. Zappalà A, Antfolk J, Bäckström A, Dombert B, Mokros A, Santtilä P. Using a dual-target rapid serial visual presentation task (RSVP) as an attention-based measurement procedure of sexual preference: is it possible to fake? *Psychiatry Psychol Law.* 2013;20(1):73–90. <https://doi.org/10.1080/13218719.2011.619642>
 92. Zappalà A, Antfolk J, Bäckström A, Dombert B, Mokros A, Santtilä P. Differentiating sexual preference in men: using dual task rapid serial visual presentation task. *Scand J Psychol.* 2013;54(4):320–327. <https://doi.org/10.1111/sjop.12050>
 93. Timmins L, Barnes-Holmes D, Cullen C. Measuring implicit sexual response biases to nude male and female pictures in androphilic and gynephilic men. *Arch Sex Behav.* 2016;45(4):829–841. <https://doi.org/10.1007/s10508-016-0725-3>
 94. Wright LW, Adams HE. The effects of stimuli that vary in erotic content on cognitive processes. *J Sex Res.* 1999;36(2):145–151. <https://doi.org/10.1080/00224499909551979>
 95. Huberman JS, Maracle AC, Chivers ML. Gender-specificity of women's and men's self-reported attention to sexual stimuli. *J Sex Res.* 2015;52(9):983–995. <https://doi.org/10.1080/00224499.2014.951424>
 96. Ziogas A, Habermeyer B, Kawohl W, Habermeyer E, Mokros A. Automaticity of early sexual attention: an event-related potential study. *Sex Abus.* 2022;34(5):507–536. <https://doi.org/10.1177/10790632211024241>
 97. Rosenthal AM, Sylva D, Safron A, Bailey JM. The male bisexuality debate revisited: some bisexual men have bisexual arousal patterns. *Arch Sex Behav.* 2012;41(1):135–147. <https://doi.org/10.1007/s10508-011-9881-7>
 98. la Roi C, Meyer IH, Frost DM. Differences in sexual identity dimensions between bisexual and other sexual minority individuals: implications for minority stress and mental health. *Am J Orthop.* 2019;89(1):40–51. <https://doi.org/10.1037/ort0000369>
 99. Petterson LJ, Vasey PL. Men's sexual interest in feminine trans individuals across cultures. *J Sex Res.* 2022;59(8):1015–1033. <https://doi.org/10.1080/00224499.2021.2013429>
 100. Ashley W, Robertson R. Trans-attraction: not kink or fetish, but a legitimate sexual orientation. *Open J Soc Sci.* 2020;08(10):212–227. <https://doi.org/10.4236/jss.2020.810014>
 101. Rosenthal AM, Hsu KJ, Bailey JM. Who are gynandromorphophilic men? An internet survey of men with sexual interest in transgender women. *Arch Sex Behav.* 2017;46(1):255–264. <https://doi.org/10.1007/s10508-016-0872-6>
 102. Hsu KJ, Rosenthal AM, Miller DI, Bailey JM. Who are gynandromorphophilic men? Characterizing men with sexual interest in transgender women. *Psychol Med.* 2016;46(4):819–827. <https://doi.org/10.1017/S0033291715002317>
 103. Diamond LM. Sexual identity, attractions, and behavior among young sexual-minority women over a 2-year period. *Dev Psychol.* 2000;36(2):241–250. <https://doi.org/10.1037/0012-1649.36.2.241>
 104. Diamond LM. Was it a phase? Young women's relinquishment of lesbian/bisexual identities over a 5-year period. *J Pers Soc Psychol.* 2003;84(2):352–364. <https://doi.org/10.1037/0022-3514.84.2.352>
 105. Chivers ML, Bouchard KN, Timmers AD. Straight but not narrow; within-gender variation in the gender-specificity of women's sexual response. *PLoS One.* 2015;10(12). <https://doi.org/10.1371/journal.pone.0142575>
 106. Salomaa AC, Matsick JL. Carving sexuality at its joints: defining sexual orientation in research and clinical practice. *Psychol Assess.* 2019;31(2):167–180. <https://doi.org/10.1037/pa0000656>
 107. Wolff M, Wells B, Ventura-DiPersia C, Renson A, Grov C. Measuring sexual orientation: a review and critique of U.S. data collection efforts and implications for health policy. *J Sex Res.* 2017;54(4-5):507–531. <https://doi.org/10.1080/00224499.2016.1255872>
 108. Savin-Williams RC. An exploratory study of the categorical versus spectrum nature of sexual orientation. *J Sex Res.* 2014;51(4):446–453. <https://doi.org/10.1080/00224499.2013.871691>
 109. Galupo MP, Mitchell RC, Gryniewicz AL, Davis KS. Sexual minority reflections on the Kinsey scale and the Klein sexual orientation grid: conceptualization and measurement. *J Bisexuality.* 2014;14(3-4):404–432. <https://doi.org/10.1080/15299716.2014.929553>
 110. Jabbour JT, Hsu KJ, Bailey JM. Sexual arousal patterns of mostly heterosexual men. *Arch Sex Behav.* 2020;49(7):2421–2429. <https://doi.org/10.1007/s10508-020-01720-z>
 111. Morandini JS, Menzies RE, Moreton SG, Dar-Nimrod I. Do beliefs about sexual orientation predict sexual identity labeling among sexual minorities? *Arch Sex Behav.* 2023;52(3):1239–1254. <https://doi.org/10.1007/s10508-022-02465-7>
 112. Savin-Williams RC. Sexual orientation: categories or continuum? Commentary on Bailey et al. (2016). *Psychol Sci Public Interest.* 2016;17(2):37–44. <https://doi.org/10.1177/1529100616637618>
 113. Savin-Williams RC, Vrangalova Z. Mostly heterosexual as a distinct sexual orientation group: a systematic review of the empirical evidence. *Dev Rev.* 2013;33(1):58–88. <https://doi.org/10.1016/j.dr.2013.01.001>
 114. Dawson SJ, Chivers ML. The effect of static versus dynamic stimuli on visual processing of sexual cues in androphilic women and gynephilic men. *R Soc Open Sci.* 2018;5(6):1–17. <https://doi.org/10.1098/rsos.172286>
 115. Imhoff R, Schmidt AF, Nordsiek U, Luzar C, Young AW, Banse R. Viewing time effects revisited: prolonged response latencies for sexually attractive targets under restricted task conditions. *Arch Sex Behav.* 2010;39(6):1275–1288. <https://doi.org/10.1007/s10508-009-9595-2>
 116. Tsujimura A, Kiuchi H, Soda T, et al. The pattern of sexual interest of female-to-male transsexual persons with gender identity disorder does not resemble that of biological men: an eye-tracking study. *Sex Med.* 2017;5(3):e169–e174. <https://doi.org/10.1016/j.esxm.2017.04.003>
 117. Tsujimura A, Miyagawa Y, Fukuhara S, et al. Differences in sexual interest between biological men and female-to-male transsexual persons with gender identity disorder. *J Urol Published online.* 2016;195(4S). <https://doi.org/10.1016/j.juro.2016.02.338>
 118. Diamond LM. What does sexual orientation orient? A biobehavioral model distinguishing romantic love and sexual desire. *Psychol Rev.* 2003;110(1):173–192. <https://doi.org/10.1037/0033-295X.110.1.173>
 119. Dickson N, van Roode T, Cameron C, Paul C. Stability and change in same-sex attraction, experience, and identity by sex and age in a New Zealand birth cohort. *Arch Sex Behav.* 2013;42(5):753–763. <https://doi.org/10.1007/s10508-012-0063-z>
 120. Lewis R, Bosó Pérez R, Maxwell K, et al. Conceptualizing sexual wellbeing: a qualitative investigation to inform development of a measure (Natsal-SW). *J Sex Res.* Published online. 2024;1-19;62(5):693–711. <https://doi.org/10.1080/00224499.2024.2326933>