

Compulsive Sexual Behavior and HIV/STI Risk: a Review of Current Literature

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Abstract

Purpose of Review The current literature consistently links compulsive sexual behavior (CSB) to sexual risk behaviors among diverse populations. Controversy over the conceptualization of CSB has led to challenges in formulating standardized treatment options and health promotion/prevention strategies. However, the increase in empirical research on this topic has led to a greater understanding of CSB and evidence for subtypes including the consumption of sexually explicit media (SEM) via the Internet.

Recent Findings While the etiology of CSB is under debate, the absence of standard criteria and measures supports the heterogeneity of the condition and emphasizes the importance of other factors (e.g., developmental stage, personality characteristics, cultural background, and gender concepts) in making a comprehensive clinical assessment. Moreover, there is growing empirical support that CSB contributes to a syndemics model of HIV risk, which suggests the importance of additive and complex effects of co-occurring factors in sexual risk taking. While much scientific progress has been made on CSB in the past few years, it remains a pliable topic.

Summary Further exploration on varying levels of CSB severity and the determination of clinically and contextually appropriate cutoff points using existing measures of CSB could provide a greater understanding of this condition, leading to more effective treatment and prevention options.

Keywords Compulsive sexual behavior · Hypersexuality · HIV · Sexually transmitted infections

Introduction

The relationship between compulsive sexual behavior (CSB), also known as sexual addiction, hypersexual disorder, sexual compulsivity, or sexual impulsivity, and high-risk sexual behavior has been previously established in the scientific literature [1]. Specifically, CSB has been identified as an important risk factor for a variety of negative health consequences related to sexual risk taking such as HIV or other sexually transmitted infection (STI) acquisition and unintended pregnancies [2, 3]. CSB is also linked to negative psychological outcomes and additional risk behaviors including substance use and addiction disorders including pathological gambling and compulsive buying [3].

Consensus has yet to be reached regarding the conceptualization, definition, and measurement of CSB and consequently, the precise mechanisms by which CSB creates increased risk for negative physical and emotional health outcomes. The field of sexual health is still being shaped by ongoing theoretical and empirical investigations on the topic. This review presents recent literature (past 3 years) investigating the relationship between CSB and high-risk sexual behavior, and outlines promising research that examines correlates of CSB.

Definitions of CSB

Non-paraphilic CSB is characterized by intense preoccupations with sexual fantasies, urges, and behaviors that cause significant distress and/or psychosocial impairment in the individual [4•]. As opposed to paraphilias, which consist of

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behaviors that are considered socially unacceptable, non-paraphilic CSB is comprised of normative sexual behaviors [5, 6]. CSB can manifest in a variety of ways, including behavioral symptoms such as sex with multiple partners, excessive masturbation, compulsive consumption of sexually explicit media (SEM), and preoccupation with an unobtainable sex partner [7]. Further, cognitive and emotional symptoms may include a lack of control over excessive sexual behavior, feelings of guilt, low self-worth, feelings of shame, boredom, and obsessive thoughts of sex [8].

The emergence of the Internet as a venue for engaging in sexual behavior has prompted further investigation on this topic as it relates to sexual development and behavior. Just as offline sexual pursuits can involve problematic sexual expression, excessive engagement in sexual activities on the Internet (e.g., online SEM consumption, interactive exchange of SEM in chat rooms, cybersex) can precipitate to the point of Internet sex addiction, where sexual behaviors cause distress or impairment in the individual [9]. The accessibility, affordability, and anonymity offered by the Internet [10] contribute to its popularity as a forum for pursuing sexual interests and draw attention to the role of compulsive Internet use as a factor in CSB.

The diversity of behavioral and emotional patterns of CSB symptomatology may be a reflection of etiology, which has become a controversial topic in research and clinical practice [7, 11–16]. Ongoing debate over the definition and etiological mechanisms underlying CSB has led to heterogeneity within the field. Common pathways proposed by the scientific community have included impulsive, compulsive, addictive, and neurobiological models. Most recently, Kafka proposed a set of diagnostic criteria for “hypersexual disorder” to be included in the DSM-5 [3, 15]. Due to insufficient scientific evidence of the validity and reliability of the “hypersexual disorder” diagnosis, including its conceptualization, pathophysiology, and neuropsychological assessment [7, 12], these criteria were subsequently excluded from the DSM-5 as a clinical disorder, driving the rapid expansion of research in the past few years. The potentially negative consequences of adding a diagnosis, including the potential to pathologize normative sexual behaviors or false diagnoses, exceeded the benefits [13]. As treatment approaches for CSB tend to be guided by the etiological basis of the behavior [17], the lack of standard treatment has generated a sense of urgency among researchers and clinicians to move closer to consensus on its clinical definition and underlying mechanisms to begin to formulate most appropriate treatment options and to inform high impact health promotion and prevention strategies to reduce HIV/STI transmission.

Sexual Risk Behaviors

CSB has been consistently linked to high-risk sexual behaviors [1, 5, 18, 19] including multiple partners, condomless sex,

and sexual intercourse under the influence of drugs or alcohol [8]. Historically, scientific exploration on this topic has focused largely on clinical or treatment-seeking individuals and high-risk populations, such as gay, bisexual, and other men who have sex with men (GBMSM) or HIV-positive individuals, with less focus on CSB in non-clinical or female samples [20]. The adverse consequences and risks of CSB extend beyond the acquisition and transmission of HIV/STIs to include unwanted pregnancies, infertility, loss of relationship, social isolation, loss of self-esteem, job loss, legal issues, and financial difficulties [8, 21, 22], causing significant personal distress and impairment in daily functioning [21].

Method

A comprehensive literature search was conducted using PubMed, Medline, Google Scholar, and PsycINFO databases. To gather the most recent findings on the topic, the review was limited to articles published within the past 3 years (January 1, 2013 to December 31, 2015). The search strategy combined the following key terms and their derivatives for CSB: sexual compulsivity, sexual impulsivity, sex addiction, problematic sexual behavior, hypersexual behavior, and hypersexuality; with key terms for high-risk behavior: high-risk sexual behavior and risky sexual behavior. The reference sections of all review articles were appraised to identify additional articles. Potential articles were identified, first based on a preliminary review of titles and abstracts, and then by thorough examination. The search returned 50 articles including several reviews and editorials that discuss the phenomenology of CSB; however, these studies will not be presented in detail here and will only be referenced in the context of the primary topic. Overall, 31 empirical articles were examined and are presented in Tables 1 and 2.

Prevalence of CSB

The lack of large epidemiological data using standardized diagnostic criteria has led to approximations of the true prevalence of CSB in the USA and abroad (for study locations, see Table 1). A recent review of the literature found the prevalence of CSB and related disorders to range from 3 to 16.8 % [8], but a majority of studies report a prevalence estimate of 3 to 6 % in the general population [5, 8, 14]. Only one study found in this review employed a probability sample of 1837 university students and found that 2 % met criteria for current CSB, with men reporting higher rates of CSB compared to women (3.0 vs 1.2 %, respectively) (see Table 1) [23•]. Another study comprised primarily of university students ($N=1749$) reported a CSB rate of 6 %, comparable to the current consensus prevalence in the general population [24•]. CSB prevalence

Table 1 Summary of articles related to CSB

#	Author(s)	Location	Population; sample size; sampling method	Study design	Measures of CSB/sexual risk	Prevalence or mean scale scores
1	Carpenter et al. [45]	USA	Men meeting criteria for hypersexual disorder; <i>n</i> = 132; nonprobability	Cross-sectional	HD-DCT ^a , HBI ^b	–
2	Carvalho et al. [41]	Croatia	Men and women aged 18–60 years; <i>n</i> = 4597; nonprobability	Cross-sectional, internet-based survey	HBCS ^c	6 % of men and 3 % of women
3	Derbyshire and Grant [5, 46]	USA	Aged 18–29 and meeting criteria for CSB based on MIDI; controls, <i>n</i> = 13 and CSB, <i>n</i> = 13	Matched case-control	MIDI ^d	–
4	Dhuuffar et al. [26]	UK	University students aged 18–51 (15 % gay/bisexual); <i>n</i> = 165 (men, <i>n</i> = 67 and women, <i>n</i> = 98); nonprobability	Cross-sectional pen-and-paper survey	HBCS ^c , HDQ ^e	19.4 %
5	Dhuuffar and Griffiths [30]	UK	Women, non-clinical; <i>n</i> = 102; nonprobability	Cross-sectional, internet-based survey	HBCS ^c , HDQ ^e , HBI ^b	8.5 %
6	Klein et al. [31•]	Germany	Women, non-clinical; <i>n</i> = 988; nonprobability	Cross-sectional, internet-based survey	HBI ^b , SSSS ^f	3.1 %
7	Muisse et al. [57]	Mainly USA	Heterosexual, non-student, married adults; <i>n</i> = 1301 (men, <i>n</i> = 1061 and women, <i>n</i> = 240); nonprobability	Cross-sectional, internet-based survey	SCS ^g , SESII-W/M ^h (Arousal, Relationship Importance, and Inhibitory Cognitions subscales)	SCS mean = 1.87 (SD = 0.60) in men; SCS mean = 1.46 (SD = 1.46) in women
8	Odling et al. [23•]	USA	Young adults (college students); <i>n</i> = 1837; probability sample	Cross-sectional, internet-based survey	MIDI ^d	3 % of men and 1.2 % of women
9	Parsons et al. [53•, 55]	USA	GBMSM, highly sexually active (9+ partners in 90 days); <i>n</i> = 370; nonprobability	Longitudinal (baseline data reported only), internet-based survey and in-person Component	SCS ^g , HDSI ⁱ , SIS/SES ^j	30.0 % SC only, 21.1 % SC and HD, 48.9 % neither SC nor HD
10	Parsons et al. [53•, 55]	USA	GBMSM, highly sexually active (9+ partners in 90 days); <i>n</i> = 368; nonprobability	Longitudinal, (baseline data reported only) internet-based survey and in-person component	SCS ^g , HDSI ⁱ	30.0 % SC only, 21.1 % SC and HD, 48.9 % neither SC nor HD
11	Parsons et al. [28]	USA	GBMSM, highly sexually active (9+ partners in 90 days); <i>n</i> = 202; nonprobability	Longitudinal (baseline data reported only), internet-based survey and in-person component	HDSI ⁱ	20.3 %
12	Reid et al. [50, 51]	USA	Men meeting diagnostic criteria for HD; <i>n</i> = 172; nonprobability	Cross-sectional	HD-DCT ^a , HBI ^b , SCS ^g , HBCS ^c	HBI mean score = 75.5 (SD = 12.5)
13	Giordano and Cecil [25]	USA	Undergraduate students aged 18+; <i>n</i> = 235 (men, <i>n</i> = 136 and women, <i>n</i> = 99); nonprobability	Cross-sectional, paper survey	HBI ^b	16.2 % of men and 4 % of women
14	Rettenberger et al. [24•]	Germany	University students and faculty; <i>n</i> = 1749 (men, <i>n</i> = 750, women, <i>n</i> = 988, and neither male nor female, <i>n</i> = 11); nonprobability	Cross-sectional, internet-based survey	HBI ^b , SIS/SES-SF ⁱ (short form)	6 %
15	Seanavino et al. [42]	Brazil (Sao Paulo)	Treatment-seeking men meeting sexual drive and sexual addiction; <i>n</i> = 86; nonprobability	Cross-sectional, pen-and-paper self-assessment, clinician-administered diagnostic interview	SCS ^g	SCS mean = 32.01 (SD = 0.54)
16	Smith et al. [32]	USA	Male military veterans; <i>n</i> = 258 (baseline); nonprobability	Longitudinal (baseline reported only) structured telephone interviews	MIDI ^d	16.7 %
17	Spenhoff et al. [58]	Germany, Austria, and Switzerland	Male self-identified sex addicts; <i>n</i> = 349; nonprobability	Cross-sectional, internet-based survey	SAST-R ^k (German)	82.8 %

Table 1 (continued)

#	Author(s)	Location	Population; sample size; sampling method	Study design	Measures of CSB/sexual risk	Prevalence or mean scale scores
18	Starks et al. [39]	USA	GBMSM couples; $n = 344$ (172 couples); nonprobability	Cross-sectional, street-intercept survey	SCS ^g	SCS mean = 18.16 (SD 6.44)
19	Stavro et al. [33]	Canada	Patients seeking treatment for a substance use disorder, 18+; $n = 211$; nonprobability	Secondary data review of medical records	SAST-R ^k	25 %
20	Storholm et al. [29 ^a]	USA	Young GBMSM, 18–19 years of age, sexually active with another man in past 6 months, resident of NYC, seronegative or unknown HIV status at baseline; $n = 509$; nonprobability	Cross-sectional, audio computer-assisted self-interview	CSBI ^l	35.4 %
21	Walton et al. [27]	Australia, Spain, UK, USA	Men and women aged 18+; $n = 540$ (men, $n = 267$ and women, $n = 243$); nonprobability	Cross-sectional, internet-based survey	HBI ^b , SIS/SES ^j	18.4 %
22	Weinstein et al. [43]	Mainly Israel	Men and women aged 18+; $n = 100$; nonprobability	Cross-sectional, survey	SCS ^g	SCS mean = 4.25 (SD = 2.65)
23	Yeagley et al. [4 [*]]	USA	Single young GBMSM aged 18–24 and sexually active with a male partner met on a dating website in past 6 months; $n = 366$; nonprobability	Cross-sectional, internet-based survey	HBI ^b	22 %

^a *HD-DCI* Hypersexual Disorder Diagnostic Clinical Interview—structured interview designed to assess DSM-5 proposed criteria for Hypersexual Disorder

^b *HBI* Hypersexual Behavior Inventory—19-item self-report measure assessing degree to which participants feel hypersexual behavior is out of control; degree to which sexual behavior is used as coping mechanism; degree to which negative consequences are experienced due to their sexual activities

^c *HBCS* Hypersexual Behavior Consequences Scale—22-item measure assessing the presence and frequency of various consequences encountered by hypersexual patients

^d *MIDI* Minnesota Impulsive Disorders Interview—self-report measure of CSB

^e *HDO* Hypersexual Disorder Questionnaire—10-item self-report measure assessing hypersexual disorder

^f *SSSS* Sexual Sensation Seeking Scale—11-item measure of sexual risk behavior

^g *SCS* Sexual Compulsivity Scale—10-item measure of sexual compulsivity

^h *SESI-W/M* Sexual Excitation/Sexual Inhibition Inventory for Women and Men—self-report measure assessing inhibitory and excitatory factors related to sexual arousal in men and women

ⁱ *HDSI* Hypersexual Disorder Screening Inventory—7-item measure assessing level of problematic sexuality, specifically recurrent and intense sexual fantasies, urges and behaviors and level of distress and impairment as a result of these

^j *SIS/SES* Sexual Inhibition Scale/Sexual Excitation Scales—self-report scale assessing sexual excitation, sexual inhibition I, and sexual inhibition II

^k *SAST-R* Sexual Addiction Screening Test- Revised—45-item measure assessing four core addictive dimensions of sexual behavior (preoccupation, loss of control, relationship disturbance, affect disturbance)

^l *CSBI* Compulsive Sexual Behavior Inventory—22-item self-report measure assessing the various components of compulsive sexual behaviors

Table 2 Summary of articles related to Internet SEM

#	Author(s)	Location	Population; sample size; sampling method	Study design	Measures of CSB/sexual risk	Prevalence or mean scale scores
1	Downing et al. [61]	New York City, Philadelphia, Baltimore, Washington, DC	Internet SEM viewing GBMSM, aged 18+, sex with a man in past 12 months, viewed man on material on Internet in past 3 months; $n = 265$; nonprobability Men aged 18+; $n = 226$	Cross-sectional, internet-based survey	CIUS ^a , SSSS ^b	—
2	Egan and Parmar [48]	UK	Men aged 18+; $n = 226$	Cross-sectional, internet-based survey	IAT ^c , SAST-R ^d , CPUJ ^e	SAST-R mean = 3.36 (SD = 3.20); IAT mean = 30.85 (SD = 14.49); CPUJ compulsivity mean = 29.53 (SD = 10.45); CPUJ social mean = 4.62 (SD = 3.89)
3	Grubbs et al. [52, 62]	USA	Study 1: scale reduction and preliminary analyses—undergraduate students who viewed pornography in past month; $N = 269$ (men, $n = 227$ and women, $n = 42$) Study 2: confirmatory factor analysis—men and women who viewed pornography in past month; $n = 214$ (136 men, 74 women, 3 transgender, 1 unreported); nonprobability Study 3: confirmatory factor analysis in a clinical sample—university students, viewed pornography within 30 days before intake; $N = 152$ (men, $n = 103$ and women, $n = 49$) Study 1: heterosexual men; $n = 171$; nonprobability	Cross-sectional, internet-based survey	CPUJ ^e	—
4	Laier et al. [64]	Germany	Study 1: heterosexual men, healthy cybersex users (HCU) matched for age and education and problematic cybersex users (PCU); HCU, $n = 25$ and PCU, $n = 25$ Instrument validation: GBMSM, 18+; $n = 240$; nonprobability Main sample: GBMSM, 18+, at least one male sexual partner in last 5 years, reside in USA; $n = 1165$; nonprobability	Cross-sectional, surveys and experimental paradigm (presentation of explicit Internet pornographic cues) Matched case-control, surveys and experimental paradigm (presentation of explicit Internet pornographic cues)	s-IATsex ^h s-IATsex ^h	s-IATsex mean = 19.27 (SD = 6.22) PCU group s-IATsex mean = 34.72 (SD = 4.04) HCU group s-IATsex mean = 18.00 (SD = 4.07)
5	Noor et al. [60]	USA	Instrument validation: GBMSM, 18+; $n = 240$; nonprobability Main sample: GBMSM, 18+, at least one male sexual partner in last 5 years, reside in USA; $n = 1165$; nonprobability	Cross-sectional, internet-based survey Cross-sectional, internet-based survey	CPCS ⁱ CPCS ⁱ , CSBI ^j , PCES ^k	—

Table 2 (continued)

#	Author(s)	Location	Population; sample size; sampling method	Study design	Measures of CSB/sexual risk	Prevalence or mean scale scores
6	Rosser et al. [66 ^a]	USA	GBMSM, 18+, at least one male sexual partner in last 5 years, reside in USA; <i>n</i> = 1165; nonprobability	Cross-sectional, internet-based survey	CPCS ⁱ , CSBI ^j (“control” subscale)	No-CPC, <i>n</i> = 917 (79 %); problematic, <i>n</i> = 165 (14 %); compulsive, <i>n</i> = 83 (7 %)
7	Schiebener et al. [67]	Germany	Heterosexual males; <i>n</i> = 104; nonprobability	Cross-sectional, surveys and executive multitasking paradigm (pictures of persons and pictures of pornographic media)	s-IATsex ^h	s-IATsex mean = 19.86 (SD = 6.45)
8	Voon et al. [65]	UK	Heterosexual men aged 18+, healthy, age-matched controls and CSB cases; controls, <i>n</i> = 19 and CSB, <i>n</i> = 19	Matched case-control	Face-to-face clinician-administered interview	—

^a *CIUS* Compulsive Internet Use Scale—14-item self-report measure assessing severity of compulsive internet use

^b *SSSS* Sexual Sensation Seeking Scale—11-item measure of sexual risk behavior

^c *IAT* Internet Addiction Test—20-item measure of addictive Internet use

^d *SAST-R* Sexual Addiction Screening Test-Revised—45-item measure assessing four core addictive dimensions of sexual behavior (preoccupation, loss of control, relationship disturbance, affect disturbance)

^e *CPUI* Cyber-Pornography Use Inventory—40-item measure assessing Internet pornography use

^f *CPUI-9* Cyber-Pornography Use Inventory-9—9-item shortened version of the CPUI measure aimed to measure perceived addiction to Internet pornography

^g *K-SCS* Kalichman Sexual Compulsivity Scale—10-item measure of sexual compulsivity

^h *s-IATsex* Symptoms of Cybersex Addiction—short-version of the IAT

ⁱ *CPCS* Compulsive Pornography Consumption Scale—5-item measure to assess level of compulsive pornography use

^j *CSBI* Compulsive Sexual Behavior Inventory—22-item self-report measure assessing the various components of compulsive sexual behaviors

^k *PCES* Pornography Consumption Effect Scale—seven-item scale to measure positive and negative effects of SEM use

estimates of 11.1 % [25] and 19.5 % [26] were found in smaller samples of students, substantially higher than general population estimates. However, several factors including the use of snowball sampling or recruitment from a major city may have resulted in an overestimation of the rate of CSB. In an international sample of male and female participants ($N = 540$), 18.4 % self-reported clinically relevant hypersexual behavior [27]. However, the recruitment strategy targeted sex addiction groups and the same cutoff of the Hypersexual Behavior Inventory (HBI) was used for both male and female participants due to the lack of clinically relevant data on women.

In a sample of GBMSM living in New York City ($N = 202$), 20.3 % reported CSB [28]. The same study also found higher rates of CSB in men of color compared to White men (26.1 vs 15.8 %), HIV-positive men compared to HIV-negative men (30.9 vs 13.2 %), and those with a high school degree or less compared to those with some college (30.9 vs 13.2 %). A nonprobability sample of young GBMSM recruited from New York City ($N = 509$) reported 35.4 % of their sample as meeting the cutoff for CSB [29•]. In a separate study looking at young GBMSM ($M = 21.46$ years old), 22 % scored above the clinical cutoff point [4•].

Several studies conducted since 2013 are among the first to explore prevalence of CSB in diverse populations (e.g., non-male, military). An online study conducted in London recruited a non-clinical sample of female participants through popular social media websites and personal contacts and estimated the rate of CSB to be 8.5 % [30]. This rate of CSB is higher than an online survey conducted in Germany, which estimated the prevalence of CSB in a non-clinical sample of women to be 3.1 % [31•]. Another study estimated the prevalence of CSB in a sample of male veterans to be 16.7 % at baseline, however, due to convenience sampling this may not be generalizable to other US military samples [32]. Stavro et al. estimated the prevalence of CSB in patients seeking treatment for substance use disorders using health records and found a prevalence of 25 % [33].

Prevalence data indicate higher rates of CSB in specific populations, such as GBMSM, men of color, and individuals with HIV, consistent with previous findings [5, 14]. Importantly, higher rates of CSB have been found in young GBMSM and male veterans, drawing attention to these groups as potentially high-risk. Further, the sensitive nature of CSB and subjectivity of many survey measures may contribute to over- or under-estimation of the true prevalence. Overall, the lack of large epidemiological data on this topic, variability in sampling methods, and inconsistency of measures and cutoff criteria used have led to only approximations of the true prevalence of CSB in the general population and in various subgroups [34, 35]. Lack of standardized criteria for assessing CSB has been a consistent challenge, and while calls have been made for objective research on prevalence [4•, 7, 33,

36], these data have yet to be collected from a nationally representative survey.

CSB and Sexual Risk

Researchers have found an association between CSB and sexual risk behaviors across multiple studies [5, 29•, 36–39]. In a recent review of the literature, Derbyshire and Grant reported links between CSB and several negative health outcomes including HIV/STI acquisition, unwanted pregnancies, and physical injuries [5]. Another review exploring this relationship found these links to be consistent across different populations, including GBMSM and low-income African-American women [37]. Similarly, researchers have reported positive correlations between CSB and sexual risk behavior in a sample of mostly heterosexual women ($N = 988$), with the coping subscale of the Hypersexual Behavior Inventory (HBI), a 19-item self-report measure evaluating the degree of hypersexual behavior [40], yielding the greatest correlation [31•]. Furthermore, lack of control over sexual urges and fantasies was associated with more negative outcomes (i.e., loss of job, loss of relationship) in a large sample of men and women ($N = 4597$), consistent with previous research [41].

In their investigation of young GBMSM, Yeagley et al. found that individuals scoring above the cutoff point for CSB on the HBI were more likely to report a higher number of sexual partners in the past 2 months and have more condomless anal sex partners (both receptive and insertive) compared to those with scores below the cutoff point for CSB [4•]. Similarly, a separate study with young GBMSM found a significant association between level of CSB reported and number of condomless anal sex partners in the past 30 days [29•]. In a study exploring this relationship in gay male couples, CSB was associated with greater risk for HIV transmission from casual sex partners outside of the relationship [39].

Predictors and Correlates of CSB

Consistent with past work, current research in this area has demonstrated that men are more likely to receive treatment for CSB [26, 27, 38]. However, although sexual orientation has previously been identified as a predictor of CSB, conflicting evidence over this association has emerged in recent studies. Dhuffar reported that sexual orientation was a predictor of CSB in a British university sample [26], though this association has not been replicated in other studies [27, 42]. Importantly, one study found no difference in CSB between GBMSM and heterosexual men, but noted higher rates of CSB in lesbian women compared to heterosexual women [43]. Studies examining the influence of religion and

spirituality on CSB provide complex, conflicting insight into this relationship [25, 30]. One study reported that low levels of spirituality and high levels of negative religious coping (i.e., spiritual discontent, interpersonal religious discontent) significantly predicted CSB in a sample of college students [25]. Nevertheless, a separate study revealed that religious affiliation/beliefs had no impact on levels of CSB and consequences of sexual behaviors as predictors of shame in a British sample of women [30].

CSB is often associated with a range of psychiatric and behavioral comorbidities, including mood disorders, anxiety, personality disorder, behavioral addictions, substance use disorders [32], attention deficit hyperactivity disorder, and post-traumatic stress disorder [5, 27, 33, 38]. Recent empirical investigations of CSB comorbidity with Axis I disorders offer further support of this relationship. Specifically, several studies reported a positive correlation between CSB, anxiety, and depression [23•, 27, 29•]. In a sample of men seeking treatment for CSB, 72 % presented with at least one Axis I psychiatric diagnosis [42], lending support to the notion that mood and anxiety disorders are common in persons with CSB. The link between emotional dysregulation and CSB has been consistently demonstrated; specifically, CSB as a mechanism for coping with stressful life events has been shown across populations [26, 31•, 42, 44]. While less research has explored the link with Axis II disorders, one study found that men seeking treatment for CSB were at a slightly higher risk for comorbid personality disorders (i.e., narcissistic personality disorder and obsessive-compulsive personality disorder) [45]. In a pilot study using neurological data to compare cognitive functioning (i.e., decision-making, risk-taking actions) of those with CSB against healthy controls, investigators found no difference between the two groups, though the sample size was small ($N = 26$) [46].

Exploration of the relationship between CSB and personality traits has also increased substantially in recent years. Neuroticism has been positively correlated with CSB [24•, 27, 47] while agreeableness and conscientiousness have been negatively correlated [24•, 27, 48]. The link between extraversion and CSB has yielded inconsistent results across studies [24•, 27, 48]. Findings further reflect the potential usefulness of examining interactions between key personality features and sexual behaviors (i.e., correlations between depressed mood, anxiety, impulsiveness, and neuroticism) [49].

While factors such as emotional dysregulation and feelings of shame are consistently linked to CSB, self-compassion and mindfulness have been negatively associated with CSB and its correlates [50–52]. Since individuals with CSB tend to report lower self-esteem compared to those without CSB [23•], incorporating mindfulness in HIV prevention work to promote emotional resilience and buffer some of the negative effects of CSB warrants further consideration.

CSB, Syndemics, and HIV Risk

A syndemics framework of HIV risk focuses on the additive and complex effects of co-occurring health and psychosocial risk factors on acquisition and transmission behaviors. Parsons et al. hypothesized that CSB contributes to the syndemics model of HIV risk and conducted an empirical investigation of this relationship with a population of highly sexually active GBMSM [53•, 54]. In their three-group model of CSB severity (those with both sexual compulsivity and hypersexual disorder, those with only sexual compulsivity, and those with neither condition), those experiencing both sexual compulsivity and hypersexual disorder reported more high-risk sexual behavior, including more condomless anal sex and condomless anal sex with serodiscordant partners, compared to men experiencing only sexual compulsivity [55]. In a follow-up paper examining the same sample, Parsons et al. reported that the number of syndemic factors experienced increased by CSB severity group, lending further support for CSB as a contributing factor to a syndemics model of HIV risk [53•]. These findings suggest that sexual compulsion alone does not account for differences in sexual risk behavior among highly sexually active populations. In a sample of young GBMSM residing in New York City, Storholm et al. found that high scores on both depression and CSB contributed to a greater frequency of past 30-day condomless anal sex than either score alone [29•]. This finding lends additional support to a syndemics model of HIV risk, and suggests that depression may moderate the relationship between CSB and high-risk sexual behavior in GBMSM. Given the diversity of syndemic factors that are experienced in different populations, further research is needed to determine the generalizability of this finding to other groups (i.e., other genders, racial, and ethnic minorities).

Dual-Control Model of Sexual Excitation and Inhibition

The Dual-Control Model of sexual response by means of inhibitory and excitatory responses has been explored across several studies as an underlying framework for understanding high-risk sexual behavior and CSB. Specifically, research has focused on the hypothesis that individuals who experience high sexual excitation and low sexual inhibition are more prone to CSB [3, 56]. Most studies used a variation of Bancroft et al. validated Sexual Inhibition/Sexual Excitation (SIS/SES) questionnaire, which consists of a single subscale measuring an individual's propensity for sexual arousal/excitation (SES), and two subscales measuring sexual inhibition factors known as Sexual Inhibition Due to Threat of Performance Failure (SIS1), and Sexual Inhibition Due to Performance Consequences (SIS2) [44, 56].

Several studies have examined the tendency toward sexual excitation and sexual inhibition as an underlying mechanism for understanding CSB. Current research exploring CSB through this model have consistently found a positive correlation between sexual excitation and CSB across different measures of CSB and populations [24•, 27, 57]. Online samples of men and women recruited in the USA and Europe have demonstrated a strong positive correlation between sexual excitation and CSB [24•, 27]. Muise et al. explored this relationship in a US sample of heterosexual adults and also found that higher levels of arousability (a subscale of sexual excitation) predicted sexual compulsivity in both men and women [57]. Interestingly, Parsons et al. found that GBMSM who reported both sexual compulsivity and hypersexual disorder experienced the most problematic levels of both sexual excitation and sexual inhibition due to performance failure, compared to those with neither condition or those with sexual compulsivity alone [55].

Additionally, Muise et al. found among men and women that relationship importance (i.e., the level to which sexual arousal depends on sex occurring within a specific relationship) was negatively correlated with CSB [57]. Further examination of gender differences revealed that gender significantly moderated the association between Inhibitory Cognitions (a subscale of sexual inhibition that measures concerns during sex) and CSB. Specifically, higher scores on the Inhibitory Cognitions subscale among heterosexual men were significantly associated with CSB [57]. This is consistent with findings from a previous study of GBMSM that found sexual inhibition due to performance failure significantly predicted CSB, perhaps due to the need to seek out more intense sexual experiences to compensate for sexual concerns [24•, 27]. Studies looking at inhibition due to performance consequences consistently reported finding a negative correlation with CSB, but this was less predictive of CSB than sexual excitation [24•, 27].

These findings suggest a strong predictive relationship between sexual excitation, arousal, and CSB, and possible variability in sexual inhibition by gender. Sexual inhibition may play a more significant role in its relationship to CSB in men than women. Further, CSB severity appears to be strongly linked to sexual excitation and may be an important risk factor for high-risk sexual behavior.

CSB and Internet-Based Sexually Explicit Media (SEM)

Use of Internet-based SEM, or pornography, has been identified as one of the most commonly reported types of CSB [5, 42, 58] and is an increasingly important subdomain within this field (see Table 2). Riemersma and Sytsma suggest that a new generation of sexual addiction developed in tandem with the rapid growth of the Internet, defined by chronicity, content,

and culture [59]. The relevance of problematic and compulsive use of Internet SEM accompanied by technological shifts in society has led to the development and validation of instruments to operationalize and measure such behavior [60–63]. Not surprisingly, recent studies report that measures of SEM consumption are strongly associated with CSB and its correlates [60, 64, 65]. Laier et al. also found that sexual excitation, a strong correlate of CSB, predicted cybersex addiction [64]. Furthermore, Grubbs et al. found that perceived addiction to online SEM was positively correlated with general CSB [62].

Use of Internet SEM has also been linked to a variety of sexual health concerns, including internalized homonegativity, earlier sexual debut, lower condom use self-efficacy, lower sexual satisfaction [66•], and more recently, sexual frustration and sexual sensation seeking [61]. Nevertheless, study findings from Rosser et al. suggest that variations in certain health consequences are highly dependent on the reported level of SEM consumption [66•]. When using lower cutoff scores indicative of problematic SEM use (14 %, $N = 165$), they found that GBMSM with problematic SEM use had increased odds of heavy alcohol consumption and later sexual debut compared to those with no problematic SEM use (79 %, $N = 917$). These findings were reversed when higher cutoff scores representing clinical SEM use were used; specifically, GBMSM with problematic SEM use (7 %, $N = 83$) had lower odds of both heavy alcohol use and later sexual debut compared to men reporting no problematic SEM consumption. Regarding the impact of SEM on sexual behavior, Downing et al. found that compulsive Internet SEM use was positively correlated with perceived influence of engaging in risky sex in a sample of 265 MSM [61]. Importantly, they also found that individuals with greater consumption of Internet SEM reported more recent male sexual partners. Nelson et al. similarly found that the more men perceived Internet SEM as influencing their condomless sex scripts, the more likely they were to report engaging in high-risk behaviors [68].

The growing body of empirical research on compulsive use of Internet SEM provides strong evidence for its inclusion as a subdomain of general CSB. However, it also appears that general CSB and compulsive SEM use has its own distinct elements related to sexual risk. There is some evidence that individuals with high levels of SEM consumption engage in fewer high-risk sexual behaviors. Importantly, the vast majority of research has focused on men, particularly GBMSM, warranting further investigation in other populations (e.g., non-male; those with varying education levels and religious affiliations).

Implications for Future Research

This review explored current research on the relationship between CSB and sexual risk behavior. Debate over the definition and conceptualization of CSB persists and is indicative of

two overarching and competing issues. The first is the struggle to rigorously study and treat CSB due to a lack of standardized diagnostic criteria, and the second is a concern over stigmatization as a result of pathologizing CSB as a psychiatric disorder. Despite these challenges, research efforts among the scientific community have provided important insight into CSB, showing progress in the field.

Findings from this review point to the usefulness of assessing for different subtypes of CSB and its potential for enhancing treatment options. Studies continue to demonstrate high rates of comorbidity with depression, anxiety, and substance use disorders. New scientific exploration on the significance of personality on CSB offers preliminary evidence that core traits, such as high neuroticism and low conscientiousness, may predispose certain individuals to CSB. Further, research also points to increasing relevance of compulsive Internet SEM consumption and its association with CSB. Therefore, assessing correlates of CSB (i.e., comorbid psychiatric conditions, core personality traits) as well as subtypes (i.e., compulsive SEM consumption, frequent casual or anonymous sex) might greatly enhance treatment and reduce negative health consequences associated with CSB.

Moreover, there is ample evidence that CSB is especially context-specific and can vary based on developmental stage, cultural background, and gender concepts, stressing the importance of acknowledging the circumstances in which CSB presents. The diversity of factors that determine “normal sexual behavior” is broad and often subjective, making it inappropriate to generalize a standard set of criteria across groups. What might be characterized as normal sexual behavior in one subgroup may not be considered normal elsewhere. Furthermore, this review provides evidence for the usefulness of considering CSB severity in sexual risk taking. Future investigation should explore the application of CSB measures in different contexts and populations to determine clinically appropriate and meaningful cutoff points (i.e., severity). Statistical strategies, including cluster analysis and survival analysis, have been proposed for developing a CSB severity index [69].

Promising frameworks for understanding CSB and its relationship with sexual risk behavior have emerged in recent years. There is strong empirical support for the Dual-Control Model as an underlying framework for conceptualizing CSB that should be further explored. Future investigations should assess excitatory and inhibitory patterns within different sexual contexts in which CSB presents, for instance, examining determinants of sexual arousal or inhibition by subgroups.

Moreover, there is preliminary evidence that CSB contributes to a syndemics model of HIV risk, which may be an important consideration for future sexual health research. Developing an index of CSB severity (as noted above) and gaining a better understanding for how levels of perceived CSB interact with other risk factors, such as comorbid Axis

I disorders and socioeconomic risk factors, could guide treatment and prevention strategies. The three-level model of sexual compulsivity/hypersexuality put forth by Parsons et al. [53] is a promising framework for how CSB severity may be operationalized. Interventions that target the broader spectrum of syndemic factors, rather than CSB alone, offer a potentially high impact treatment approach by reducing the negative effects of multiple conditions. In the context of HIV/STI prevention, interventions that address multiple syndemic factors might be more effective in reducing HIV/STI acquisition than interventions addressing CSB alone.

Conclusion

Despite continuing differences in the conceptualization of CSB among the scientific and clinical communities, the recent evidence stresses the importance of examining several factors, including personality and comorbid psychiatric conditions, when assessing for CSB. Furthermore, the heterogeneity of CSB on an individual level and presenting within a specific context should be taken into consideration to create optimal treatment options and health prevention strategies that address sexual risk behaviors while reducing the negative health and social consequences that often stem from these behaviors.

Compliance with Ethical Standards

Conflict of Interest Irene S. Yoon, Steven T. Houang, Dr. Sabina Hirshfield, and Dr. Martin J. Downing, Jr declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors. The study conducted by Downing, Antebi, and Schrimshaw (2014) received approval from the Columbia University Institutional Review Board for human subjects participation.

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- masturbation frequency, number of sexual partners, and frequency of pornography use. Women who scored above an HBI cutoff of ≥ 53 (range: 19 to 95) were more likely to identify as single, bisexual, and to report higher rates of sexual encounters under the influence of drugs and alcohol.**
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