

Viewing Sexual Stimuli Associated with Greater Sexual Responsiveness, Not Erectile Dysfunction

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ABSTRACT

Introduction. Time spent viewing visual sexual stimuli (VSS) has the potential to habituate the sexual response and generalize to the partner context.

Aim. The aim of this study was to examine whether the time spent viewing VSS is related to sexual responsiveness felt in the laboratory or with a sexual partner.

Methods. Nontreatment-seeking men (N = 280) reported their weekly average VSS viewing in hours. VSS hours were examined in relation to the sexual arousal experienced while viewing a standardized sexual film in the laboratory and erectile problems experienced with a sexual partner.

Main Outcome Measures. Self-reported sexual arousal in response to sexual films and erectile problems on the International Index of Erectile Function were the main outcome measures.

Results. More hours viewing VSS was related to stronger experienced sexual responses to VSS in the laboratory, was unrelated to erectile functioning with a partner, and was related to stronger desire for sex with a partner.

Conclusions. VSS use within the range of hours tested is unlikely to negatively impact sexual functioning, given that responses actually were stronger in those who viewed more VSS. **Prause N and Pfaus J. Viewing sexual stimuli associated with greater sexual responsiveness, not erectile dysfunction. Sex Med **;***-**.**

Key Words. Erectile Dysfunction; Sex Stimuli; Erotica; Sexual Arousal

Introduction

The introduction of VHS tapes allowed many people to access erotic films in the privacy of their own homes, which appears to have increased the viewing of sexual films [1]. Many speculate that the Internet has increased viewing of visual sexual stimuli (VSS) [2], although data have not yet supported this viewing change [3]. People do increase the breadth of their interests in visual erotica over time [4]. Although some activists (e.g., Dines [5]) and clinicians (e.g., Bronner and

Ben-Zion [6]) have voiced concerns that watching VSS causes erectile dysfunction (ED), others report using VSS to overcome erectile problems [7,8]. Surprisingly, data have not yet tested the relationship between the amount of VSS viewing and erectile functioning.

Studies of very high frequency viewing have thus far not found a relationship between VSS consumption and erectile problems. In one study of 24 sexually “compulsive” individuals, just 4 reported erectile problems [9]. A small study of 19 “hypersexual” men reported that 11 had “dimin-

ished libido or erectile function specifically in physical relationships with women” (p. 4), leaving the specific erectile problems, and their magnitude, unclear [10]. The reported problems in this study of 19 men could have been elevated because erectile problems may have been used to meet the impairment criteria in recruitment. In a different study of 78 men who were described by therapists as having sexual addiction problems, 18 also were diagnosed with some type of sexual dysfunction [11].

In contrast, published case reports deny the presence of erectile problems in those reporting addiction problems to VSS [12]. Another study reported no relationship between sexual inhibition and impaired erectile function in a sample of self-identified sex addicts [13]. Moreover, another study of 161 men with a primary complaint of hypersexuality found no elevation in erectile problems [14]. Mudry and colleagues [15] noted a lack of empirical studies on hypersexuality, suggesting the required data to link hypersexuality and erectile problems may simply not exist yet.

Some “hypersexuals” report difficulty finding a new sex partner, so it may not be reasonable to expect this group as a whole to report erectile problems if they do not have a partner [16]. However, an overwhelming majority of those who self-report hypersexuality endorse problems with VSS use [17]. Accordingly, hypersexual patients may represent a special subset of VSS consumers. For example, many of those who label themselves as sex addicts also report a stronger religious background [18]. For these reasons, it would be useful to examine whether erectile functioning is dependent on the level of VSS consumed by those who are not receiving treatment for hypersexual problems.

VSS viewing may affect erectile functioning through at least two mechanisms. More VSS viewing may result in tolerance or desensitization. For example, those who started viewing VSS at earlier ages report more breadth (termed “deviant” in the study) in their current VSS viewing [4]. Thus, erectile problems may occur when real-life sexual stimulation does not match the broad content accessed through VSS. There is evidence that gross anatomical differences exist in the average brain of those who view more VSS [19], but it is unclear whether the differences precede or follow VSS consumption. Secondly, erections may become conditioned to aspects of VSS that do not transition easily to real-life

partner situations. Sexual arousal may be conditioned to novel stimuli (for review, see Brom et al. [20]), including particular sexual images [21], specific sexual films [22], or even nonsexual images [23,24]. It is conceivable that experiencing the majority of sexual arousal within the context of VSS may result in a diminished erectile response during partnered sexual interactions. Similarly, young men who view VSS expect that partnered sex will occur with themes similar to what they view in VSS [25]. Accordingly, when high stimulation expectations are not met, partnered sexual stimulation is ineffective.

Confounding variables also may link VSS consumption to erectile problems, thereby creating an association between the two that is not actually causal. Perhaps the most likely of these confounding variables is anxiety. Anxiety has been clearly and repeatedly linked to erectile problems (e.g., Beck and Barlow [26]). VSS lacks many of the features of partnered sex that could induce anxiety during sex, such as concerns about the partner’s sexually transmitted disease status, relationship expectations, and concerns about one’s own attractiveness or penis size. In sum, there are direct and indirect reasons why VSS may be associated with erectile problems.

The generation of an erection in response to sexual stimulation requires a relatively complex integration of information. When responding to VSS with an erection, men must attend to the VSS, recognize it as possessing sexual content, be motivated by the particular content presented, and experience general autonomic activation in addition to the very specific activation of penile motor cortex [27]. Men with erectile problems show similar areas of activity in their brain when viewing VSS to men without erectile problems, and apomorphine further enhances response in the lateral superior frontal cortex associated with erections [28,29]. In studies that do suggest some brain response differences between these men, these appear to reflect primarily frontal areas of control coming online [28,30]. This appears more consistent with problems due to a third variable, such as anxiety, rather than a downregulation of areas associated with sexual rewards.

Some neuro-structural differences have been suggested in men with erectile problems. Differences in white matter tracts in the splenium of the corpus callosum in patients with erectile problems have been noted, which the authors interpreted as likely problems in the communication of sensory information and conduction of visual signals [31].

Others have investigated gray matter. Of seven subcortical structures investigated, the nucleus accumbens specifically was smaller in men reporting erectile problems [32]. This finding is particularly interesting in light of a very recent publication associating the hours of VSS viewing per week with a smaller ventral striatum [19]. The latter acknowledged an association between the amount of VSS consumed with depression and alcohol consumption, which were not controlled and might provide an alternative interpretation of the results. Whereas fMRI studies are more suggestive of active inhibition contributing to erectile problems, neuro-structural studies point a bit more toward reward sensitivity problems. These are hardly completely separable processes, and either could be sufficient to link VSS use and erectile problems.

Aims

In sum, VSS use could be related to erectile functioning, but this has never been investigated in non-patient samples. When described in hypersexual patients, there appears to be no remarkable elevations of erectile problems relative to the general population. The current study investigated erectile difficulties in a non-patient sample using a secondary data analysis approach. Specifically, these studies included 280 men who reported the average number of hours they consumed VSS per week. First, their experienced sexual arousal to standardized VSS was examined in relation to the number of hours they consumed VSS in the average week. Second, self-reported erectile problems with a partner were compared with VSS consumption in a subset of these men in relationships. These tests provide information on erectile functioning in the context of both solo and partnered sexual stimulation. In the case of solo activity, it is predicted that men who view more VSS will report lower sexual arousal to the VSS, because they are expected to be desensitized (or less rewarded by) these relatively weak VSS. It is further predicted that men who consume more VSS will report more erectile difficulties with sexual partners.

Methods

Participants

Two hundred eighty men participated over four different studies conducted by the first author. These data have been published or are under

Table 1 Demographic information

Variable	n*	Mean	SD
Age	262	23.3	6.1
Intercourse partners (last year)	280	4.5	10.0
International Index of Erectile Function			
Total [†]	127	52.2	19.8
Erection subscale [‡]	127	21.4	9.8
Sexual Desire Inventory			
Dyadic [§]	257	47.3	12.9
Solitary	259	9.8	5.9
		n	%
Relationship status	259		
Monogamous		123	47.5
Non-monogamous		30	11.6
No relationship		106	40.9
Ethnicity	212		
White		113	53.3
Hispanic		49	23.1
Black		34	16.0

*Studies varied in the information requested and participants were not forced to respond to all questions [†]Range 5 to 75 [‡]Range 1 to 30 [§]Range 8 to 70 ^{||}Range 3 to 26
SD = standard deviation.

review [33–36], and all men provided informed consent for the study in which they participated. These tended to be younger (see Table 1), white (60.6%) men. While exclusion criteria varied for each study, no study screened participants on the basis of the number of hours they viewed VSS, relationship status, or erectile problems. All reported attraction to women, so that the VSS would be relevant for their orientation [37]. All were aware that they would be asked to view VSS as a part of the study.

Self-Report

Sexual Arousal

Men reported their level of sexual arousal after each sexual film (see below). Specifically, men were asked to indicate their level of “sexual arousal” ranging from 1 “not at all” to 9 “extremely.” This item has been shown to converge strongly with men’s erectile responses across many studies [38]. This relationship between erection and reported sexual arousal may be strong in men because they tend to monitor their physiological cues as indicators of their experienced sexual arousal [39] more than women [40]. Questions after sexual films were used instead of continuous lever ratings, which can decrease the sexual arousal experienced in the moment [41].

International Index of Erectile Function

The International Index of Erectile Function (IIEF) [42] is a 19-item questionnaire that requires

men to provide Likert-scaled ratings of their experience with erectile function, intercourse satisfaction, orgasmic function, overall satisfaction, and sexual desire. The scales converge with clinical interviews, have high test–retest reliability, and do not covary with measures of social desirability [42]. While not a useful tool for differentiating vascular causes of erectile problems [43], it has been used in thousands of studies to quantify clinical improvement (e.g., Martin-Morales et al. [44]) and general erectile functioning [45]. A recent critique suggested that the IIEF only appeared useful when the domain of interest was sexual arousal and the sample was sexually experienced [46]. The current study is precisely interested in sexual arousal. Specifically, the total scale score and the erection subscale were examined for their relationship with the amount of VSS viewed weekly.

Sexual Desire Inventory

Some participants completed the Sexual Desire Inventory (SDI; see Table 1). The SDI is a 14-item, Likert-style questionnaire that measures levels of trait sexual desire. One-month test–retest reliability was $r = 0.76$ [47]. SDI scores also have been related to activity in areas of the brain associated with rewards in general [48]. The SDI is typically calculated as two subscales [47,49]. The three-item Solitary Sexual Desire scale measures an individual's desire for autoerotic sexual activity. The eight-item Dyadic Desire scale measures an individual's desire for sex with a partner and is commonly used as an index of trait sexual desire level [50–52]. Both subscales are related to impulsive sexual behaviors and intentions to engage in risky sexual behaviors, including anal intercourse, but only the dyadic scale was related to actual sex acts, including with uncommitted partners [53]. The results of both scales are reported for completeness, although the dyadic scale is of greater interest from the perspective of likely impact on partnered interactions.

Stimuli

The VSS presented in the studies were all films. They varied in length from 20 seconds to 3 minutes. All films portrayed one man and one woman engaging in consensual vaginal intercourse. They excluded low base rate sexual behaviors (e.g., bondage, anal sex). Films were drawn from a standardized film set [54] or were demonstrated to evoke similar levels of sexual arousal to those films. As some studies included several longer sexual films, the first sexual film was used. In the case of the sexual regulation study [36], only

the 20-second sexual films in the watch-only condition were averaged across. The sexual arousal reported did not differ by film length, so data were collapsed across studies for this analysis.

Protocol

VSS Viewing

Participants were solicited by flyers in the community and from psychology courses in Pocatello, Idaho and Albuquerque, New Mexico. All participants were required to be age 18 or over and were informed that they would be viewing sexual films as a part of the study. Men contacted the laboratory by phone or e-mail to volunteer. On arrival to the laboratory, they provided informed consent. The institutional review boards at Idaho State University or the University of New Mexico approved all protocols.

Participants entered a private room with a computer. They were reassured that they could not be viewed during the study. After receiving instructions about the particular study in which they were participating, the experimenter informed the men that they would not reenter the testing room without first requesting their permission to reenter, then the experimenter left the room, closing the door. Subsequent communication occurred with the experimenter via intercom.

Participants viewed neutral films. Neutral films were the same length as the sexual film in each study. Neutral films did not include any violence, sexual content, or other highly evocative interactions. Neutral films are primarily used in sex studies to provide a period for genital responses to return to pre-stimulation levels. Unlike brain responses, which are relatively rapid and transient, detumescence in the genitals requires a more extended period of quiescence to return to baseline. This ensured that any sexual arousal at the start of the study, or in response to a recent sexual stimulus, had sufficient time to dissipate before the start of the (next) sexual film.

Main Outcome Measures

Hours of VSS viewing per week were expected to be strongly positively skewed (cp. Kühn and Gallinat [19]) and were in these data as well. Transformations were not sufficient to support a Gaussian distribution, so data were binned. These bins represented watching 0 ($n = 25$), up to 2 ($n = 56$), or more than 2 ($n = 55$) hours of VSS in the average week.

The amount of VSS viewed during the week was used to predict the level of sexual arousal reported in response to the VSS in the laboratory using a Kruskal–Wallis test. (Correlations are included for interested readers.) Analyses on the IIEF were conducted in several ways. First, analyses were conducted on the full sample with IIEF scores ($n = 133$). Then analyses were conducted including only the participants who reported being currently in a sexual relationship ($n = 59$). This is a notable challenge of research in this area, as men are likely to increase their VSS use when a partner is not available. Many have mentioned the need to characterize the impact of relationship status on VSS use [55]. To partially address this challenge, hours of VSS consumed in the average week were also used to predict the level of sexual desire reported for sex with a partner. While a less direct test, the desire for partnered sex is not dependent on the availability of a sexual partner like current erectile function.

Results

Hours of VSS and Self-Reported Sexual Response to VSS

Men ($n = 136$) reported an average sexual arousal rating of 5.1 (standard deviation = 2.0) to the sexual films. The hours of VSS viewed in the typical week significantly predicted the sexual arousal reported to the sexual film (Kruskal–Wallis $\chi^2(2) = 9.1$, $P = 0.01$, $\Phi = 0.26$; $r = 0.28$, $P < 0.0001$). The group viewing the most VSS also reported the highest sexual arousal in response to the sexual film (see Figure 1).

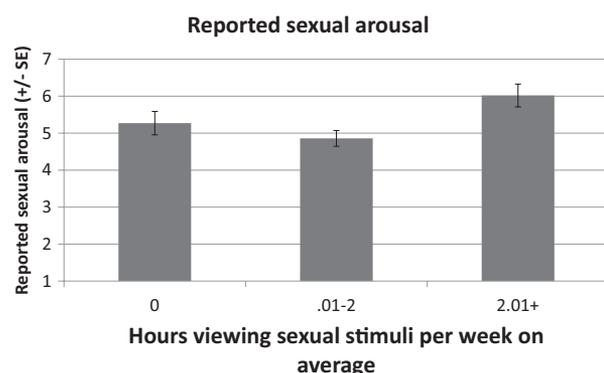


Figure 1 Stronger sexual arousal reported to standardized sexual films with more hours of viewing sexual films at home. SE = standard error.

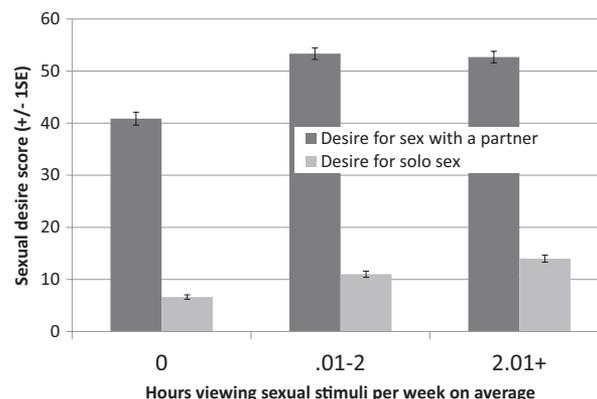


Figure 2 More hours viewing sexual stimuli associated with stronger sexual desire both for a partner and for masturbation. SE = standard error.

Hours of VSS and Sexual Response with a Partner

Men ($n = 127$) reported relatively good erectile functioning (see Table 1). Neither the total scale score nor the erectile subscale score on the IIEF was related to the hours of VSS viewed in the average week. There was no association whether the total sample or the subset of individuals who were currently in relationships was included in analyses. Erectile functioning with a partner appeared unrelated to the hours of VSS being consumed in the average week.

Hours of VSS and Desire for Sex

Men reported their desire for sex with a partner and desire for solitary sex. Both were significantly related to the hours of VSS viewed in the average week. Specifically, higher desire for sex with a partner ($n = 257$, Kruskal–Wallis $\chi^2(2) = 59.4$, $P < 0.0001$, $\Phi = 0.48$; $r(255) = 0.29$, $P < 0.0001$) or for solo sexual activity ($n = 259$, Kruskal–Wallis $\chi^2(2) = 77.2$, $P < 0.0001$, $\Phi = 0.55$; $r(257) = 0.38$, $P < 0.0001$) was associated with more VSS use (see Figure 2).

Conclusions

Data from a large sample of men ($N = 280$) across similar studies were aggregated to test the hypothesis that consuming more VSS was related to erectile problems. These men answered questions about their sexual behaviors and feelings, including their consumption of VSS, and viewed sexual films in the laboratory. Those who reported viewing more VSS in their own life reported higher sexual arousal to films in the laboratory. Self-reported erectile functioning with a partner

was not related to the hours of VSS viewed weekly. Finally, those who viewed VSS more also reported higher desire for both partnered sexual behaviors and solo sexual behaviors. This pattern suggests that those who view more VSS likely have a higher sexual drive and experience a stronger sexual response to standardized VSS than those who view less VSS. Sexual arousal responsivity may not be impaired by viewing more VSS at home, as it actually was related to stronger desire and sexual arousal in two of the three relationships tested.

Greater time spent viewing VSS has been related to many negative mental health outcomes [56], so the mechanism for VSS to promote positive outcomes is unclear. One explanation may be that those who view more VSS report more positive sexual attitudes in general [56]. Also, consumers tend to view VSS that they find sexually arousing [57], contributing to ego-syntonic, positive affect. In the laboratory, VSS tend to promote both positive and negative feelings, although feelings are generally strongly skewed toward more positive feelings [58], including in hypersexuals [35]. In other words, it may be the case that VSS viewing promotes both positive and negative feelings and outcomes. Many studies simply do not ask about positive effects, which may contribute to poor identification of the possible benefits of VSS use. These data further suggest that the relationship of VSS with higher sexual drive might explain why viewing VSS appears to relate positively with self-reported sexual arousal. The ultimate impact of these mixed states might be determined by individual predispositions.

The positive relationships between VSS viewing and many indices of sexual responsiveness suggest that VSS viewing might even *improve* erectile functioning. VSS might provide a greater variety of sexual stimulation. In a *Drosophila* model, males raised with access to multiple partners were more successful in securing later partners than males that had been raised monogamously [59]. While the comparison is hardly direct, VSS may broaden male's ability to respond to different sexual stimuli types. This could facilitate their sexual responses to females who may vary tremendously in their sexual behavior preferences, such as those who may experience more clitoral or vaginal sensations as contributing to their orgasm experience.

Rumors linking VSS use and ED may arise from clinical lore. A systematic literature review identified lack of data as a pervasive problem of publications in the domain of excessive sexual behaviors [15]. To determine whether this might still be the

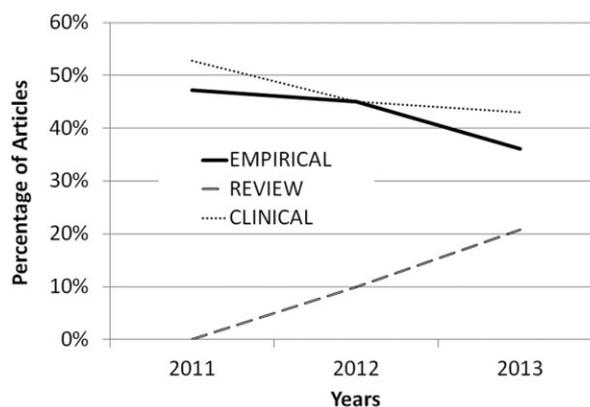


Figure 3 Types of publications in hypersexuality over time.

case, we repeated this systematic literature search¹ of peer-reviewed articles. Two raters trained by the first author independently classified each article by its approach to the topic. The categories were “clinical,” “review,” and “empirical.” “Clinical” was used to describe articles that were written by clinicians presenting their opinions or individual cases that did not include any quantitative data. “Review” was used to describe articles that discussed existing published data, whether systematic or nonsystematic, while not presenting any new quantitative data from new study participants. “Empirical” was used to describe articles that presented new quantitative data. Additional subcategories were included for descriptive purposes only (see Figure 3). Cohen’s kappa [60] calculated using R library irr [61] was high ($k = 0.90$, $z = 14.4$, $P < 0.0001$) [61]. There was a significant relationship between the publication year and publication type, $\chi^2(4) = 10.1$, $P = 0.04$, $\Phi = 0.26$ (see Figure 4). While the number of publications on hypersexuality generally rose from year to year, the proportion of articles that was empirical relative to the proportion of articles that was review articles fell between 2011 to 2012 ($\chi^2(1) = 5.0$, $P = 0.04$, $\Phi = 0.18$) and 2012 to 2013 ($\chi^2(1) = 4.8$, $P = 0.03$, $\Phi = 0.18$). The experimental portion of those empirical articles was very small (see Figure 3). Taken together, the oft-repeated link between ED and VSS might be perpetuated by data-poor literature.

¹Search terms “hypersexu*” OR “sex addiction” OR “sexual addiction” OR “sex addict” OR “sexual addict” OR “porn addiction” OR “pornography addiction” OR “compulsive sexual” was entered in PubMed and PsychInfo databases for 2011, 2012, and 2013. One hundred fifty-one unique articles were identified.

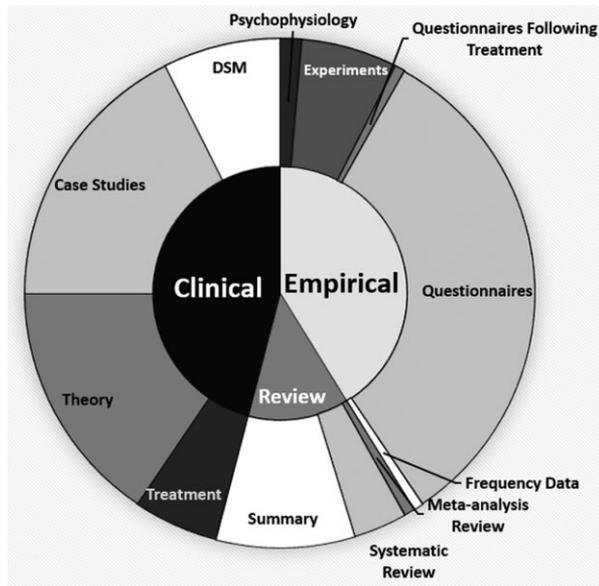


Figure 4 Types of publications addressing hypersexuality from 2011 to 2013. DSM = Diagnostic and Statistical Manual of Mental Disorders.

A secondary analysis approach was taken to provide the first data directly investigating the potential impacts of VSS, and limitations are inherent in such an approach. There were relatively fewer individuals with data on the measure of sexual functioning with a partner. This raises the possibility of a statistical error, where a small effect may be undetectable. The 127 men included in this analyses were sufficient to detect an effect, conservatively estimated using analysis of variance assumptions, down to $f = 0.28$ at $1 - \beta = 0.8$ and $\alpha = 0.05$. Examination of these raw data suggested that current data pattern actually was suggestive of patterns of lesser erectile problems with more VSS use, so it appears a larger sample would be very unlikely to switch the direction of this effect. Also, these data are consistent with clinical reports that men reporting problems with hypersexual behaviors deny ED [14]. Another limitation of these data is that no physiological genital response data were included to support men's self-reported experience. While men's genital and self-reported sexual arousal typically correspond strongly [62], measures of genital response would offer additional support of the patterns reported by the men. Additionally, it is unclear to what extent viewing sexual films in a laboratory that were not self-selected and were time-limited reflects VSS viewing behaviors in the home environment. Such a strategy should have decreased sexual arousal, because the VSS used had a small breadth of behaviors, lower

novelty, and did not progress to very high arousal states such as orgasm. While it would be worthwhile to characterize more naturalistic viewing behaviors, the pattern observed in this laboratory study was opposite of the issues (e.g., high stimulus novelty) those data might test. Finally, it is worth reiterating that these data did not include hypersexual patients. Results are probably best interpreted as limited to men with normal, regular VSS use. It would be useful to recruit men stratified on VSS use to very high ranges to characterize whether this benefit of VSS actually may be curvilinear (i.e., become detrimental at very high use).

The type of erectile problem(s) associated with VSS has not been specified. Getting versus maintaining an erection appears to be dissociable processes [63]. It may be that some aspect of erection is affected that was not surveyed. These data may reflect erection attainment (i.e., sexual arousal in response to brief sexual films) and maintenance (i.e., IIEF item "During sexual arousal, how difficult was it to maintain your erection to the completion of intercourse?"). However, perhaps the erections took longer to reach maximum rigidity or were less rigid, or self-reported sexual arousal does not reflect erections as strongly in those who view more VSS. It would be useful in the future to assess erection maintenance directly.

Regular VSS use could facilitate erectile functioning in a number of ways. Regular VSS use may prime sexual thoughts and, hence, sexual response. For example, viewing VSS led to men in one study recalling more of the physical features of the female experimenter than those men who had viewed a neutral film [64]. VSS also may serve an education function that promotes sexual responses. For example, men who view VSS more also engage in more oral and anal sex [65]. VSS may suggest or normalize sexual behaviors, providing a wider repertoire of stimuli for which men may experience desire. Finally, VSS use has been associated with more positive attitudes about sex [66]. If this is causal from VSS use, VSS use might be reducing some anxieties about sexual interactions that are a common cause of erectile problems.

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