

Adolescents' Exposure to Sexually Explicit Internet Material and Sexual Preoccupancy: A Three-Wave Panel Study

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The main aim of this study was to investigate whether adolescents' use of sexually explicit Internet material (SEIM) increased their sexual preoccupancy (i.e., a strong cognitive engagement in sexual issues). Further, we wanted to know (a) whether subjective sexual arousal mediated a potential influence of exposure to SEIM on sexual preoccupancy and (b) whether this process differed between male and female adolescents. Over the course of one year, we surveyed 962 Dutch adolescents aged 13–20 years three times. Structural equation modeling showed that exposure to SEIM stimulated sexual preoccupancy. This influence was fully mediated by subjective sexual arousal from SEIM. The effect of exposure to SEIM on subjective sexual arousal did not differ between male and female adolescents. The findings suggest that a sexualized media environment may affect adolescents' sexual development beyond traditionally studied variables, such as sexual attitudes and sexual behavior.

Scholars progressively agree that adolescents grow up in a sexualized media environment (e.g., Brown et al., 2006; Greenfield, 2004; L'Engle, Brown, & Kenneavy, 2006; Peter & Valkenburg, 2007; Strasburger & Donnerstein, 1999). There also is evidence that adolescents adjust their sexual attitudes and expectations to the messages conveyed in a sexualized media environment (e.g., Eggermont, 2006; Ward, 2002; Ward & Friedman, 2006). Moreover, adolescents' exposure to a sexual media environment appears to result in an earlier initiation of sexual behavior (e.g., Brown et al., 2006; R. L. Collins

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et al., 2004; Martino, Collins, Kanouse, Elliott, & Berry, 2005). However, despite the evidence that a sexualized media environment affects adolescents' attitudes, expectations, and behaviors, a more basic question has not been posed yet: Does a sexualized media environment also sexualize adolescents in the sense that it leads to sexual preoccupation? By sexual preoccupation, we mean a strong cognitive engagement in sexual issues, sometimes at the exclusion of other thoughts. We prefer the term sexual preoccupation to the term sexual preoccupation, which other authors have used to describe an obsessive, pathological tendency to become immersed in thoughts about sex (e.g., Snell, Fisher, & Schuh, 1992; Snell & Papini, 1989; Wiederman & Allgeier, 1993). Sexual curiosity peaks in adolescence (e.g., Savin-Williams & Diamond, 2004) and a strong cognitive engagement in sexual matters does not necessarily imply obsessive or pathological inclinations.

The fact that sexual curiosity is so characteristic of adolescence renders sexual preoccupation an interesting concept to be studied as a potential outcome of adolescents' exposure to a sexualized media environment. If we find that adolescents develop sexual preoccupation beyond their typical sexual curiosity, we may have another indication of how a sexualized media environment affects adolescents. Another reason for dealing with adolescents' sexual preoccupation is related to the character of the variables that are typically investigated as outcomes of adolescents' exposure to sexual content. Brown, Steele, and Walsh-Childers (2002) have emphasized that the dominant adult discourse of adolescent sexuality focuses too much on media effects on sexual behavior and neglects other important aspects of adolescents' sexuality that also may be affected by sexual media content. One of these aspects may be adolescents' sexual preoccupation with sexual issues. Earlier research suggests that sexual preoccupation may be linked with more specific sex-related concerns of adolescents, such as wishes and desires, but also uncertainties and worries about sexual issues (e.g., Snell et al., 1992). Similarly, sexual preoccupation also may influence how young people define other key dimensions of adolescent sexuality, such as the role of sex in relationships (and vice versa) and the importance of sexual attractiveness (Brown et al., 2002). Focusing on adolescents' sexual preoccupation as a result of their exposure to a sexualized media environment may not only help us to deepen our knowledge about the implications of adolescents' exposure to a sexualized media environment, more generally, it also may inform approaches that look for a broader view of adolescent sexuality in a media-saturated age.

This study centers on adolescents' exposure to sexually explicit Internet material (SEIM), that is, (audio-)visual content on the Internet that depicts sexual activities in unconcealed ways, often with close-ups of (aroused) genitals and of oral, anal, and vaginal penetration. There is consistent evidence from diverse cultures that many adolescents are exposed to SEIM (Flood, 2007; Lo & Wei, 2005; Peter & Valkenburg, 2006a; Wolak, Mitchell,

& Finkelhor, 2007). Moreover, SEIM seems to present one of the defining forces of adolescents' sexualized media environment. For example, Peter and Valkenburg (2007) found that SEIM was the only significant correlate of adolescents' beliefs that women are sex objects, even when adolescents' exposure to nonexplicit and semiexplicit sexual content was controlled. Despite this beginning interest in the implications of adolescents' exposure to SEIM (see also Lo & Wei, 2005; Peter & Valkenburg, 2006b), we still lack internally valid evidence of the effects of SEIM on adolescents' sexual cognitions and attitudes as well as of the processes that may underlie such effects.

This study initially tries to close this gap. First, we will investigate whether SEIM, as an important part of adolescents' sexualized media environment, affects adolescents in that it increases their preoccupation with sex. Next, we will study which processes may underlie an effect of adolescents' exposure to SEIM, focusing on subjective sexual arousal. Finally, we will test whether these underlying processes differ among male and female adolescents. In our focus on adolescents' exposure to SEIM, we do not imply that adolescents who use SEIM are morally wrong. Rather, our study responds to researchers from various disciplines who have emphasized that we need to understand whether and how adolescents' exposure to SEIM affects their sexual development (Brown et al., 2006; Huston, Wartella, & Donnerstein, 1998; Malamuth & Impett, 2001; Wolak et al., 2007) in order to inform both scholarly and public discussions of the issue.

CAUSAL RELATIONS BETWEEN EXPOSURE TO SEIM AND SEXUAL PREOCCUPANCY

To date, no study has compellingly demonstrated how adolescents' exposure to SEIM and particular outcome variables are causally related. The existing studies do show that exposure to SEIM is linked to a number of sexual attitudes (Lo & Wei, 2005; Peter & Valkenburg, 2006b, 2007). But, due to their correlational design, the studies were not able to specify whether exposure to SEIM is the cause or the effect of particular sexual attitudes. This inconclusive state of research impedes clear predictions about unidirectional causal relations between exposure to SEIM and sexual preoccupation. As a result, it seems the safest strategy to assume a reciprocal relation between exposure to SEIM and sexual preoccupation and to try to substantiate this claim with theoretical models as well as with more specific evidence from related research fields.

Reciprocal relations between adolescents' use of sexual media content and their sexual interests have been most explicitly formulated in Steele and Brown's (1995) media practice model. Among other things, the media practice model assumes that adolescents select sexual content that corresponds

with their ideas about sex. Further, the model predicts a reciprocal nature between adolescents' use of sexual content and its effects. A specific type of sexual media content may affect particular sexual ideas, but this effect cannot be separated from the influence that the particular ideas exert on the selection of the specific type of sexual content. Steele (1999) and Steele and Brown (1995) have illustrated such reciprocal relations between the use of sexual content and its effects. Others have demonstrated a comparable type of association between violent media content and aggressiveness in adolescents (e.g., Slater, Henry, Swaim, & Anderson, 2003). The media practice model, thus, helps to substantiate more generally the claim that adolescents' exposure to SEIM and sexual preoccupation may be reciprocally related.

Research from related fields provides more specific evidence of both the influence of SEIM on sexual preoccupation and the impact of sexual preoccupation on SEIM. Generally, scholars have argued that, due to its obtrusive visual character, sexually explicit material is likely to elicit strong effects in adolescents (Greenberg, Linsangan, & Soderman, 1993). More specifically, researchers have suggested that adolescents may not be able to put into perspective the sexual and social reality portrayed in sexually explicit material, given their limited sexual experience (e.g., Check, 1995; Huston et al., 1998; Strasburger & Donnerstein, 1999; Thornburgh & Lin, 2002). Content analyses of sexually explicit material support the idea that the social reality depicted in sexually explicit material may overburden adolescents with potentially age-inappropriate content. These content analyses refer to sexually explicit material in offline outlets, but the social reality depicted in offline sexually explicit material does not seem to differ from the social reality portrayed in SEIM (Schetsche, 2002). The content analyses consistently found that dominant themes in sexually explicit material are unaffectionate, uncommitted sex, male dominance, and the objectification of women (Brosius, Weaver, & Staab, 1993; Cowan, Lee, Levy, & Snyder, 1988; Ertel, 1990; Jensen & Dines, 1998; Palys, 1986).

The dominant themes of sexually explicit material may conflict with what research has identified as key values that many Western adolescents learn during their sexual socialization. The theme of unaffectionate, uncommitted sex collides with the fact that the majority of adolescents consider an affectionate, committed relationship important for having sex (e.g., Kraaykamp, 2002; Sprecher & Hatfield, 1996). The theme of male dominance, that is, the depiction of sex as a one-sided activity in which the man controls the situation and commands the woman, conflicts with the "ethics of negotiation" (Schmidt, 2005, p. 10). The ethics of negotiation emphasizes consensus between sex partners as a basis for sexual activities to prevent abusive sexual relations. Finally, the theme of female objectification, that is, the reduction of women to their sexual appeal in terms of their outer appearance and a focus on their body parts, is at odds with an "equality model of sexuality" (Luker, 2006, p. 244). The equality model of sexuality highlights the reciprocity of

sexual activities and responsiveness to the partner's wishes as a prerequisite for healthy sexual relations.

If SEIM is obtrusive and at the same time depicts a sexual and social reality that conflicts with values that adolescents learn in their sexual socialization, then the likelihood that adolescents strongly think about what they see in SEIM is significantly increased. Research on fantasy and imagination has shown that young people may become especially absorbed in recurrent thoughts about a stimulus when they try to assimilate that stimulus to their existing schemas (e.g., Klinger, 1990; Pope & Singer, 1976). Given their limited sexual experience, adolescents may not be able to qualify SEIM as a particular—pornographic—depiction of sex. Therefore, they may try to assimilate what they see in SEIM into their existing schemas about sex and, at the same time, accommodate these schemas to what they encounter in SEIM. Thus, exposure to SEIM may eventually result in strong cognitive engagement in sexual issues, that is, sexual preoccupation.

However, evidence from related research fields also suggests that sexual preoccupation may cause exposure to SEIM. Research from the selective exposure approach has demonstrated that people select media content that matches their cognitions, whereas they avoid material that does not conform to their cognitions (for reviews, see Oliver, 2002; Zillmann & Bryant, 1985). More specifically, Slater (2007) has argued that cognitions are most likely to affect selective exposure to media content when they are related to people's personal identity. The sexual self often is seen as a central component of adolescents' personal identity (Buzwell & Rosenthal, 1996), and absorption in sexual issues is part of the development of the sexual self (Savin-Williams & Diamond, 2004). Consequently, adolescents' greater sexual preoccupation also may lead to a more frequent use of SEIM.

Overall, the media practice model and research from related fields suggest that exposure to SEIM may be both a cause and an effect of sexual preoccupation. Exposure to SEIM and sexual preoccupation, thus, may be related reciprocally. Accordingly, our first hypothesis reads:

H1a/b: (a) As adolescents use SEIM more frequently, their sexual preoccupation will increase. (b) At the same time, stronger sexual preoccupation will result in a more frequent exposure to SEIM.

PROCESSES UNDERLYING THE RELATION BETWEEN EXPOSURE TO SEIM AND SEXUAL PREOCCUPANCY

In outlining processes that may underlie the relation between exposure to SEIM and sexual preoccupation, we will only focus on the potential effect of exposure to SEIM on sexual preoccupation. There are good reasons to assume that the potential impact of sexual preoccupation on exposure to

SEIM is also not direct. However, current scholarly and public debates about the implications of adolescents' exposure to SEIM primarily call for a deeper understanding of how SEIM influences adolescents. Although several studies on the use of SEIM have been published (Flood, 2007; Lo & Wei, 2005; Peter & Valkenburg, 2006a; Wolak et al., 2007), internally valid evidence of what underlies a potential influence of SEIM on adolescents' sexual thinking is still missing.

Researchers have used several models and approaches to explain how people respond to sexually explicit material, for example the arousal/hedonic valence model (Zillmann, Bryant, Comisky, & Medoff, 1981), the excitation transfer model (Zillmann, 1971), and the sexual behavior sequence approach (D. Byrne, 1977). In all of these models or approaches, sexual arousal plays a central role in explaining the processes that underlie the effects of sexually explicit material. Given the scarcity of research on the processes that bring about the effects of adolescents' exposure to SEIM, a focus on sexual arousal may present a good starting point to study what triggers a potential effect of SEIM on sexual preoccupation. In this study, we deal with subjective sexual arousal, that is, the extent to which people perceive themselves as aroused when they use sexual stimuli. We prefer subjective sexual arousal to physiological sexual arousal because it seems to explain people's affective and cognitive responses to sexually explicit material better than physiological arousal (e.g., Laan, Everaerd, van Bellen, & Hanewald, 1994; Laan, Everaerd, Vandervelde, & Geer, 1995; Rosen & Beck, 1988).

In line with the arousal/hedonic valence model and the sexual behavior sequence approach, we assume, at this stage of our reasoning, that exposure to SEIM elicits subjective sexual arousal. The influence of subjective sexual arousal on sexual preoccupation may be understood in terms of affect priming (e.g., Bower, 1981; Isen, Shalcker, Clark, & Karp, 1978), which researchers also have employed to explain effects of arousal on cognitions (Clark, Milberg, & Erber, 1984; Clark, Milberg, & Ross, 1983). Affect priming is based on the assumption that, when an information item is stored in memory, information about the arousal experienced at the same time also is stored in memory. Drawing on network models of memory (e.g., A. M. Collins & Loftus, 1975), it is further assumed that arousal, like any other information item, is represented by a node in memory. This arousal node is connected by associative links with the information item to which it originally pertained. Because the structure of the network is organized by the similarity and associative proximity of information items, items with a similar meaning lie close to each other, and items with a similar associative history are connected by strong paths. Along these paths, the activation of a particular node can spread to other connected nodes. Thus, if arousal is connected with particular information items, it is likely that these information items are activated when an individual is aroused. Further, because the accessibility of both arousal and pertinent information items in memory depends on prior

activation, more frequent arousal may lead to more frequent retrieval of the pertinent information items up to a point when this information becomes chronically accessible (for a review, see Higgins, 1996).

For a potential mediating role of sexual arousal in the relation between exposure to SEIM and sexual preoccupation, this means: Sexual arousal that is experienced during exposure to SEIM is stored in memory together with information taken from SEIM, which we broadly call here cognitions about sex. When sexual arousal reoccurs as a result of exposure to SEIM, the sexual arousal stored in memory is reactivated and activates, in line with the spreading activation principle, cognitions about sex with which it is linked by paths. Because the strength of the paths depends on a similar associative history, the paths between sexual arousal and SEIM-related cognitions about sex may be well developed for those adolescents who use SEIM. Further, because the accessibility of both stored sexual arousal and the pertinent cognitions about sex depends on prior activation, sexual arousal may most easily cue cognitions about sex among those adolescents who use SEIM frequently. As a consequence of frequent exposure to SEIM and the resulting sexual arousal, these adolescents may retrieve cognitions about sex recurrently, up to a point when they are chronically accessible. Eventually, these adolescents may show strong cognitive engagement in sexual issues, that is, sexual preoccupation.

In conclusion, if exposure to SEIM elicits sexual arousal and if, in turn, sexual arousal leads to sexual preoccupation, then sexual arousal will mediate the effect of exposure to SEIM on sexual preoccupation. Therefore, we hypothesize:

- H2a: Exposure to SEIM exerts a positive impact on subjective sexual arousal.
- H2b: Subjective sexual arousal positively affects sexual preoccupation.
- H2c: When subjective sexual arousal is included as an additional influence on sexual preoccupation, the original impact of SEIM (proposed in H1a) on sexual preoccupation disappears.

Gender Differences

Research has pointed out several gender differences in sexual attitudes and behavior. For example, males hold more permissive sexual attitudes than females and engage in casual sex more often (for a meta-analysis, see Oliver & Hyde, 1993). These attitudinal and behavioral tendencies of men seem to correspond with some of the characteristics of sexually explicit material, most notably the depiction of casual, unaffectionate sex outside relational ties (Brosius et al., 1993; Ertel, 1990). Consequently, many studies have shown that men consume such material more often than do women (e.g., Ertel, 1990; Hald, 2006). Various investigations also have confirmed this gender

difference for adolescents' use of SEIM (Flood, 2007; Lo & Wei, 2005; Peter & Valkenburg, 2006a; Wolak et al., 2007).

However, gender differences do not only seem to occur in the use of sexually explicit material, but also in the responses to sexually explicit material. More specifically, women typically report lower levels of subjective sexual arousal from sexually explicit material than do men (e.g., Janssen, Carpenter, & Graham, 2003; Steinman, Wincze, Sakheim, Barlow, & Mavisakalian, 1981).¹ There is currently no research evidence that this gender difference in subjective sexual arousal from sexually explicit material may be different for adolescents and their response to SEIM. Accordingly, we expect that the influence of exposure to SEIM on subjective sexual arousal depends on adolescents' gender. The hypothesis reads:

H3: Exposure to SEIM exerts a stronger impact on subjective sexual arousal among male adolescents than among female adolescents.

METHOD

Sample and Procedure

The first wave of our three-wave panel survey was fielded in May and June 2006 among 2,341 Dutch adolescents aged 13 to 20 years, the second wave was fielded six months later, in November and December 2006, and the last wave was fielded in May and June 2007. We included post-adolescents because the development of the sexual self and the accompanying thinking about sexual issues seem to continue in late adolescence and emerging adulthood (Steinberg & Morris, 2001). In the absence of any research on optimal time lags to draw upon, our choice of a 6-month time interval between the waves was based on two pragmatic considerations. First, previous research has shown that adolescents can reasonably well assess their frequency of SEIM use for a 6-month period (Peter & Valkenburg, 2006a). Second, in surveys on sex-related issues, adolescents present a volatile group of respondents, which results in high attrition rates (Zimmer-Gembeck & Helfand, 2008). We did not want to run the risk of losing too many respondents by choosing too long time lags. Moreover, panel studies that span a total period of one year have proven feasible in earlier research (e.g., R. L. Collins et al., 2004).

Respondents were interviewed online. For the study of sensitive issues, online surveys or, more generally, computer-mediated surveys have proven superior to other modes of interviewing (e.g., Mustanski, 2001). In 2005, more than 95% of Dutch adolescents had home access to the Internet (Duimel & De Haan, 2007). As a result, problems typically associated with online surveys such as systematically biased samples may be less troublesome in

the Netherlands than in countries where adolescents' home Internet access is more limited.

Sampling and fieldwork were done by Qrius, a Dutch research institute specializing in research among adolescents. Respondents were recruited, by means of a quota sample, from an existing online panel managed by Qrius. The members of Qrius' online panel had been sampled in all parts of the Netherlands. In each wave, they were contacted by email with an invitation to participate in the survey. The sample was quoted for participants' gender and age. In surveys on sensitive issues, respondents' gender and age generally affect their willingness to participate and respond (e.g., Ross, Daneback, Mansson, Tikkanen, & Cooper, 2003; Wiederman, 1993). The resulting sample mirrored the national distributions of age and gender among Dutch adolescents. Prior to the first wave, institutional approval, parental consent for minors' participation, and adolescents' informed consent were obtained. In all waves, adolescents were notified that the study would be about sexuality and the Internet and that they could stop the survey at any time they wished.

We took the following measures to improve the confidentiality and privacy of the answering process (Mustanski, 2001). On the introduction screen of each online questionnaire, we emphasized that the answers would be analyzed only by us, the principal investigators. Moreover, respondents were asked to make sure that they completed the questionnaire in privacy. Finally, we explained explicitly that there was no possibility for the principal investigators to identify who had filled in the questionnaire. Qrius did not link respondents' answers in our questionnaire to their names or contact information and provided us only with the answers to our questionnaire. This procedure has proven successful in earlier research on sensitive issues (e.g., Peter & Valkenburg, 2006a). Completing the questionnaire, which was largely identical in all three waves, took about 15 minutes.

Of the 2,341 adolescents who had completed the questionnaire in the first wave, 404 (17.3%) terminated their membership in the online panel in the period between the first and the third wave and, thus, were no longer eligible for wave 2 or wave 3. For the third wave, we only recontacted those 1,426 respondents who had completed the questionnaire in wave 2 because we interpreted nonparticipation or an incomplete questionnaire in wave 2 as respondents' wish to no longer participate in the study. In the third wave, 1,123 adolescents participated, and 1,052 returned a complete questionnaire, which is also the number of respondents that completed the questionnaires in all three waves. Across all three waves, then, the cooperation rate was 54%, calculated according to the guidelines of the American Association for Public Opinion Research (2006) on the basis of the eligible cases in wave 3. Attrition could not be reduced further although, in both waves 2 and 3, respondents were reminded three times to participate in the study. In waves 2 and 3, they were finally also offered an extra bonus of 10 Euros

for participation, in addition to the 2.50 Euros that they received for filling in each questionnaire and the final bonus of 5 Euros that they received for completing all three questionnaires.

Younger adolescents were less likely to participate in all three waves of the survey than older adolescents ($M_{part.} = 16.78$, $SD = 2.26$, $M_{non-part.} = 16.18$, $SD = 2.28$), $t(1935) = -5.76$, $p < .000$. Boys (49%) participated less often than girls (60%) in all three waves, $\chi^2(1, N = 1937) = 13.85$, $p < .001$. Further analyses revealed that participants differed from nonparticipants in that they had less permissive sexual attitudes, felt less involvement with SEIM, and had more critical attitudes toward pornography. Moreover, they tended to be older at their first sexual experiences. Because gender and age are related to sexual attitudes, involvement with and attitudes toward pornography, and sexual behavior (Brooks-Gunn & Graber, 1999; Oliver & Hyde, 1993; Traeen, Spitznogle, & Beverfjord, 2004), these two variables may underlie both the participation in the survey and the clusters of variables in which participants and nonparticipants differed. When we controlled for gender and age, the differences between participants and nonparticipants largely vanished.

In sum, although the response rate in our three-wave panel survey was suboptimal, nonparticipation caused little unexplainable systematic differences in the data. However, attrition is generally high in sex-related surveys among adolescents (Zimmer-Gembeck & Helfand, 2008). Moreover, the gender and age differences in participation merge with other sex-related research and point to a more general problem in this type of research (e.g., Ross et al., 2003; Wiederman, 1993). Most importantly, with respect to the variables used in this study, respondents who participated in all waves had similar levels of exposure to SEIM, subjective sexual arousal, and sexual preoccupation compared with adolescents who only participated in the first wave.

Measures

Exposure to SEIM. For the most part, we followed an operationalization used by Peter and Valkenburg (2006a). Respondents were asked to indicate how often, in the 6 months prior to the interview, they had intentionally looked at (a) pictures with clearly exposed genitals; (b) movies with clearly exposed genitals; (c) pictures in which people are having sex; (d) movies in which people are having sex. Adolescents were informed that the question referred to sexually explicit, pornographic Internet content. Moreover, adolescents were told that looking at such content did not imply being online, but could also refer to sexually explicit material downloaded from the Internet. The response categories were 1 (*never*), 2 (*less than once a month*), 3 (*1–3 times a month*), 4 (*once a week*), 5 (*several times a week*), 6 (*every day*), and 7 (*several times a day*). In all three waves, the items

formed a uni-dimensional scale (explained variance 88% in wave 1, 89% in waves 2 and 3). Cronbach's alpha was .95 in all three waves. Information on the convergent and discriminant validity of the measure can be found in Peter and Valkenburg (2006a). For information about the means and standard deviations of the measure, see Table 1.

Sexual Preoccupancy. The three items that we used to measure this construct all started with "In the past six months..." The three items were "...I have been distracted by thinking of sex," "...I have thought frequently of sex," and "...I have been very interested in sex." Response categories ranged from 1 (*disagree completely*) to 5 (*agree completely*). For the selection of the items, we geared to Wiederman and Allgeier's (1993) revision of Snell and Papini's (1989) sexual preoccupation scale. However, we adjusted the items for the use among adolescents. Moreover, in line with our conceptual definition of sexual preoccupancy, we forewent items that tapped pathological or obsessive tendencies. The three items formed a uni-dimensional scale (explained variance in all waves 79%). Cronbach's alpha was .87 in all waves. For means and standard deviations of sexual preoccupancy, see Table 1.

Our measure of sexual preoccupancy showed satisfactory convergent and discriminant validity. Earlier research has demonstrated that permissive sexual attitudes are positively related to tendencies to become preoccupied with sex (Snell et al., 1992). Further, men become more easily sexually preoccupied than women (Snell & Papini, 1989). Snell et al. (1992) also have found that sexual preoccupation is unrelated to depression. In line with these results from previous research, sexual preoccupancy was positively correlated with permissive attitudes toward sex. The average correlation across the three waves was $r = .33$, $p < .001$. Further, male adolescents had higher levels of sexual preoccupancy than female adolescents (see

TABLE 1 Zero-Order Correlations Between the Variables in the Model and Means and Standard Deviations

	Exposure SEIM (w1)	Exposure SEIM (w2)	Exposure SEIM (w3)	Sexual arousal (w1)	Sexual arousal (w2)	Sexual arousal (w3)	Sexual preoccup. (w1)	Sexual preoccup. (w2)	Sexual preoccup. (w3)
Exposure SEIM (w2)	.69								
Exposure SEIM (w3)	.66	.73							
Sexual arousal (w1)	.61	.52	.50						
Sexual arousal (w2)	.54	.64	.57	.68					
Sexual arousal (w3)	.48	.52	.63	.62	.69				
Sexual preoccup. (w1)	.41	.32	.27	.46	.31	.27			
Sexual preoccup. (w2)	.37	.40	.34	.34	.44	.36	.57		
Sexual preoccup. (w3)	.30	.30	.40	.32	.34	.49	.47	.56	
Female	-.50	-.53	-.57	-.41	-.44	-.45	-.19	-.21	-.20
Mean	2.08	2.13	2.13	2.68	2.67	2.64	2.92	2.99	2.97
SD	1.40	1.48	1.45	1.23	1.26	1.24	1.00	1.01	1.02

Note. All correlations are significant at $p < .001$. SEIM = Sexually explicit Internet material; w1 = wave 1; w2 = wave 2; w3 = wave 3.

Table 1). Finally, as expected sexual preoccupation was not associated with adolescents' life satisfaction. The average correlation across the three waves was $r = -.03$, *ns*.

Subjective Sexual Arousal. We measured this construct with the two items "I find sex on the Internet arousing" and "I find sex on the Internet exciting." Respondents were notified that the items referred to pornographic material on or from the Internet. Response categories ranged from 1 (*does not apply at all*) to 5 (*applies completely*). We took the two items from the sexual arousal scale developed by Mosher, Barton-Henry, and Green (1988). Because Mosher et al.'s items were semantically extremely similar, we decided to use only the two items with the highest face validity. (Mosher et al. did not report any factor loadings or item-total correlations that could have further informed that decision.) The items correlated $r = .86$, $p < .001$ in waves 1 and 2, and $r = .78$, $p < .001$ in wave 3. Table 1 shows the means and standard deviations of subjective sexual arousal.

The convergent and discriminant validity of our measure of subjective sexual arousal were satisfactory. Earlier studies have shown that men report more subjective sexual arousal from sexually explicit material than do women (Janssen et al., 2003; Steinman et al., 1981). Research also has suggested that subjective sexual arousal from sexually explicit material may be higher among high sensation seekers than among low sensation seekers (Bogaert, 1996; Peter & Valkenburg, 2006a). Conversely, on the basis of existing research, there are neither empirical nor theoretical reasons to assume that subjective sexual arousal from sexually explicit material is related to general life satisfaction.

In line with previous studies, we found that male adolescents reported higher subjective sexual arousal from SEIM than female adolescents did (see Table 1). Further, subjective sexual arousal was positively associated with sensation seeking, with an average correlation of $r = .23$, $p < .001$ across the three waves. Finally, subjective sexual arousal was unrelated to life satisfaction. The average correlation was $r = -.03$, *ns* across the three waves.²

Adolescents can only assess their sexual arousal from SEIM validly if they have ever been in contact with SEIM. In the first wave of our three-wave panel survey, 90 respondents (9% of the respondents that completed all three waves) reported that they had never been in touch with such material. As a result, we had to exclude these 90 respondents from the analysis because the analysis technique we used (see below) does not accept missing cases. Missing cases imputation is not possible because the missing answers in wave 1 were valid "non-answers" and not random ones. As a result, the number of cases available for analysis was 962. All statistics presented in this article are based on these 962 respondents.

Gender. The measurement of gender was straightforward. Male adolescents were coded zero, female adolescents were coded one.

Data Analysis

We tested our model with structural equation modeling, using AMOS 7.0. For the constructs of exposure to SEIM and sexual preoccupation, item parcels served as indicators. These item parcels were created using a procedure suggested by Russell, Kahn, Spoth, and Altmaier (1998). First, we factor analyzed the items meant to measure each variable. Based on the sizes of the factor loadings, we alternately assigned each item to the first or second item parcel. For example, in a 4-item construct, items ranked 1 and 3 on the factor formed the first item parcel, and items ranked 2 and 4 on the factor formed the second item parcel.

Item parceling has become common in structural equation modeling, most notably in psychology, education, and organizational research (for a review, see Bandalos & Finney, 2001). It is advised to use item parcels rather than individual items to estimate latent constructs because item parcels lead to more parsimonious models; reduce the chances for double loadings to occur; and diminish the impact of the various sources of sampling error (e.g., Little, Cunningham, Shahar, & Widaman, 2002). Moreover, individual items are more likely than item parcels to violate the assumption of normal distribution (e.g., Little et al., 2002). However, item parceling should only be used if researchers are interested in relations among the latent constructs and not among the items (Little et al., 2002). This is clearly the case in this study. Further, item parceling is allowed only if the underlying construct is unidimensional (Bandalos & Finney, 2001; Little et al., 2002). As reported above, all of our variables met this condition.

Variables in sex research are typically skewed (Weinhardt, Forsyth, Carey, Jaworski, & Durant, 1998), and the distribution of our variables presented no exception to that rule. Shapiro-Wilk tests revealed that none of the variables of the model were normally distributed. To alleviate problems that can arise from the violation of normality assumptions, scholars have suggested the bootstrap method (Efron & Tibshirani, 1993), whereby a computer generates a series of data sets that would be obtained if the estimation study were repeated many times. Each bootstrap sample results from sampling, *with replacement*, from the original data. In all the bootstrap samples, the value of interest is computed. The most desirable characteristic of bootstrapping is that it constitutes a nonparametric approach that estimates values of interest without making assumptions about the distribution type of the variables or the sampling distribution of the statistic. As a result, the bootstrap method produces more accurate results if assumptions such as the normal distribution of variables and test statistics are violated. The bootstrap method, thus, may offer important additional information on the validity of our estimates. Therefore, we tested our hypotheses also with the bootstrap method.

RESULTS

Causal Relations Between Exposure to SEIM and Sexual Preoccupancy

Our first hypothesis predicted that adolescents' sexual preoccupancy would increase as they used SEIM more frequently (H1a). Further, the hypothesis stated that stronger sexual preoccupancy would result in a more frequent exposure to SEIM (H1b). As Table 1 shows, exposure to SEIM (in wave 1) was positively related to sexual preoccupancy (in wave 3), $r = .30$, $p < .001$. Sexual preoccupancy (in wave 1) also was positively associated with exposure to SEIM (in wave 3), $r = .27$, $p < .001$. Table 1 also indicates that, compared to female adolescents, male adolescents used SEIM more frequently, reported greater subjective sexual arousal from SEIM, and showed higher levels of sexual preoccupancy.

Although the zero-order correlations between exposure to SEIM and sexual preoccupancy are based on temporally ordered variables, they present no rigorous causal analysis of the relation between the two variables. Next to a clear temporal order of the variables, a rigorous causal analysis has to include the temporally preceding levels of the dependent variable of interest, along with the simultaneous influence of the independent variable, to eliminate potentially confounding influences (Cole & Maxwell, 2003). Figure 1 presents a model that meets these requirements. The ellipses represent latent constructs. The rectangles represent the item parcels of the manifest indicators. All coefficients in Figure 1 are standardized estimates. They quantify the influence of latent constructs on each other; the covariance between latent constructs or their disturbance terms (rounded arrows); the factor loadings, and the impact of measurement error on the manifest item parcels. In line with recommendations by Russell et al. (1998) and Cole and Maxwell (2003), we allowed error terms of the same item parcel to covary over time. For clarity reasons, however, Figure 1 does not show error variances and the covariances between error terms.

We used three indices to assess the fit of our models: the χ^2 test, the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). A good model fit is indicated by a nonsignificant χ^2 value, an RMSEA-value close to .06, and a CFI-value close to .95. However, with larger samples the χ^2 test often underestimates the model fit (B. M. Byrne, 2001). Therefore, we rely on the CFI and the RMSEA as goodness-of-fit indices.

The fit of our model in Figure 1 was good, $\chi^2(10, N = 962) = 8.08$, $p = .62$, CFI = 1.00, RMSEA = .001, with the 90% confidence interval (CI) of the RMSEA being between .000 and .030. In line with H1a, more frequent exposure to SEIM (in wave 1) led to greater sexual preoccupancy (in wave 3), $\beta = .12$, $B = .084$, $SE = .023$, $p < .001$. (Figure 1 only shows the standardized coefficients.) However, in contrast to our expectations, sexual preoccupancy

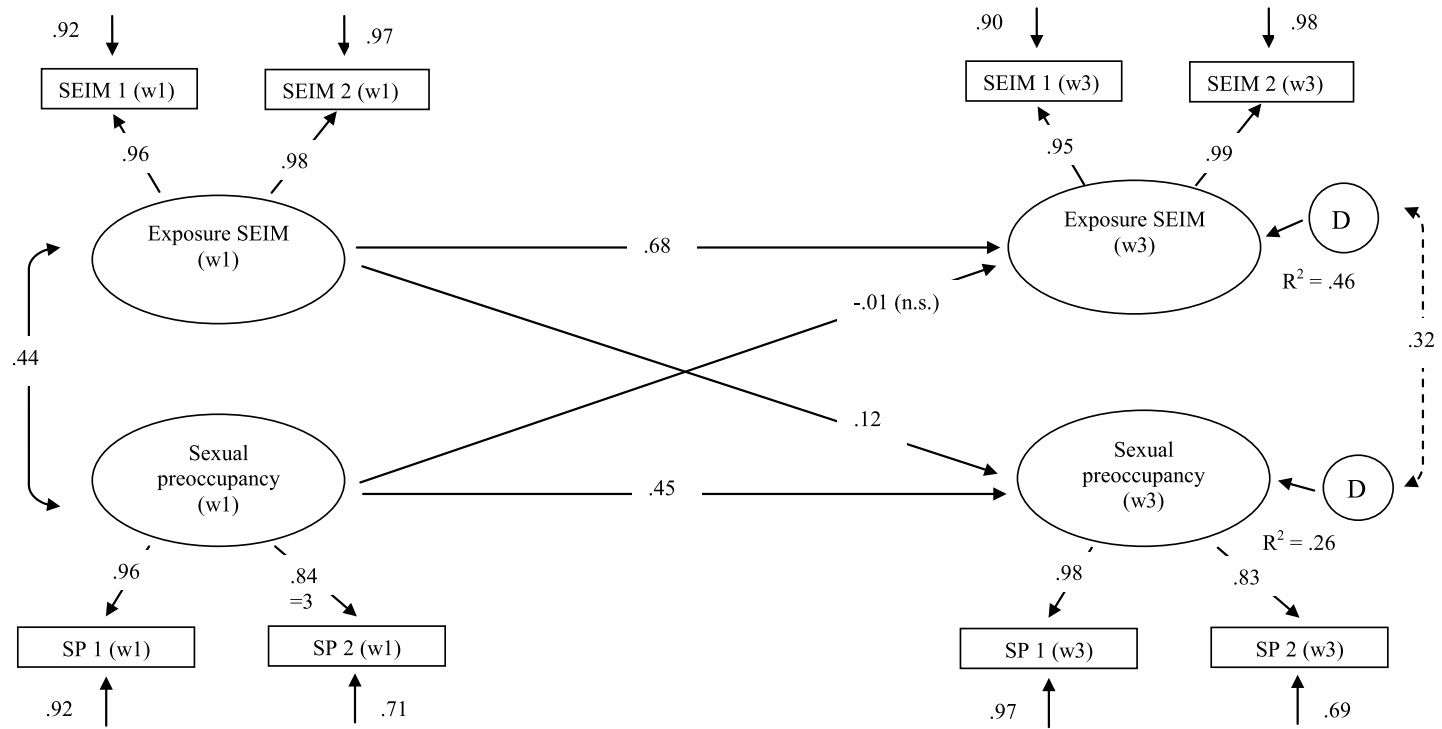


FIGURE 1 Exposure to sexually explicit internet material (SEIM) leads to sexual preoccupancy (SP). *Note.* Coefficients represent standardized estimates, significant at least at $p < .001$, unless indicated otherwise. The dashed line indicates covariance between disturbance terms (D). Error variances and covariances between error terms are not displayed for clarity reasons. w1 = wave 1; w3 = wave 3.

(in wave 1), did not significantly influence exposure to SEIM (in wave 3), $\beta = -.01$, $B = -.012$, $SE = .043$, $p = .79$. H1b was not supported.

In Figure 1, we focus on the effect of SEIM (in wave 1) on sexual preoccupation (in wave 3) because this influence will be tested below for mediation by subjective sexual arousal. A model that included also the measurements of exposure to SEIM and sexual preoccupation in the second wave elicited similar results. The fit of that model was good, $\chi^2(32, N = 962) = 144.06$, $p < .001$, CFI = .991, RMSEA = .060 (90% CI: .051–.071). Exposure to SEIM (in wave 1) increased sexual preoccupation (in wave 2), $\beta = .14$, $B = .099$, $SE = .022$, $p < .001$. This also applied to the influence of exposure to SEIM (in wave 2) on sexual preoccupation (in wave 3), $\beta = .07$, $B = .045$, $SE = .021$, $p < .05$. Sexual preoccupation (in wave 1) had no influence on exposure to SEIM (in wave 2), $\beta = .03$, $B = .049$, $SE = .041$, *ns*. There also was no influence of sexual preoccupation (in wave 2) on exposure to SEIM (in wave 3), $\beta = .04$, $B = .063$, $SE = .038$, *ns*.

We tested the strength of the two hypothesized influences also with the bootstrapping method. On the basis of 5,000 bootstrapping samples ($N = 962$ each), we estimated a 90% bias-corrected confidence interval (CI) for the impact of exposure to SEIM (in wave 1) on sexual preoccupation (in wave 3) and for the influence of sexual preoccupation (in wave 1) on exposure to SEIM (in wave 3). When the bias-corrected CI does *not* include zero, the effect can be assumed to differ significantly from zero. The 90% bias-corrected CI for the impact of exposure to SEIM (in wave 1) on sexual preoccupation (in wave 3) was between .046 and .123 and, thus, did not include zero. For the influence of sexual preoccupation (in wave 1) on exposure to SEIM (in wave 3), the 90% bias-corrected CI ranged from $-.089$ to .065 and, thus, included zero. In conclusion, the bootstrapping analysis also revealed that only the influence of exposure to SEIM (in wave 1) on sexual preoccupation (in wave 3) differed significantly from zero.

Processes Underlying the Relation Between Exposure to SEIM and Sexual Preoccupation

Our mediational hypotheses predicted that adolescents' subjective arousal would mediate the influence of exposure to SEIM on sexual preoccupation. For a rigorous test of the causality implied in these hypotheses, the independent variable must precede the mediating variable in time, which, in turn, must temporally precede the dependent variable (Cole & Maxwell, 2003). Further, to preclude spurious influences, prior levels of the mediating and the dependent variable must be included in the model as control variables, along with the simultaneous influences of the other variables in the model (Cole & Maxwell, 2003). Finally, if an influence of a variable is expected in one particular time period (e.g., between waves 1 and 2), this influence needs to be modeled also between the two variables in other time periods

(e.g., between waves 2 and 3). Meeting these requirements results in a model as shown in Figure 2. For a more detailed explanation of how mediation is tested with structural equation modeling in longitudinal designs, we refer to Cole and Maxwell (2003).

The fit of our mediational model in Figure 2 was good, $\chi^2(98, N = 962) = 387.42, p < .001, CFI = .985, RMSEA = .055$, with the 90% CI of the RMSEA being between .049 and .061. As predicted by H2a, exposure to SEIM (in wave 1) positively affected the mediating variable subjective sexual arousal (in wave 2), $\beta = .18, B = .145, SE = .025, p < .001$. (Figure 2 only shows the standardized coefficients.) In line with H2b, subjective arousal (in wave 2) had a positive influence on sexual preoccupation (in wave 3), $\beta = .07, B = .064, SE = .027, p < .05$. The bootstrap analyses confirmed these results (5,000 bootstrap samples, $N = 962$ each). The 90% bias-corrected CI was between .102 and .191 for the effect of exposure to SEIM on sexual arousal, and ranged from .013 and .114 for the effect of sexual arousal on sexual preoccupation. None of the two CI's contained zero. H2a and H2b also were supported on the basis of the bootstrapping analysis.

H2c stated that the direct influence of exposure to SEIM on sexual preoccupation, as shown in Figure 1, would disappear when sexual arousal was taken into account as a mediator of the link between the two variables. To investigate this hypothesis, we tested the model in Figure 2 with the nested-model logic under two conditions: when the (added) direct path from exposure to SEIM (in wave 1) to sexual preoccupation (in wave 3) was allowed to vary and when it was constrained to zero. If the model with the constrained path does not change the model's overall fit, sexual arousal can be said to mediate fully the influence of exposure on sexual preoccupation because, in that case, the influence of exposure on sexual preoccupation is not significant. The model with the constrained path did not change the model's fit, $\Delta\chi^2(1, N = 962) = 0.784, p = .38$. As predicted by H2c, sexual arousal (in wave 2) fully mediated the effect of exposure to SEIM (in wave 1) on sexual preoccupation (in wave 3).

Statisticians agree that a rigorous mediation analysis includes a formal test of the significance of the mediation effect (i.e., the product of the unstandardized effect of the independent variable on the mediating variable and the unstandardized effect of the mediating variable on the dependent variable). However, the traditionally used Sobel test has been shown to be based on unrealistic assumptions about the distribution of the test-statistic. As a remedy, researchers have recommended to bootstrap the mediation effect (for an elaborate discussion of the issue, see Preacher & Hayes, 2004). A bootstrap analysis of our mediation effect (i.e., $.145 \times .064 = .009$) on the basis of 5,000 bootstrap samples ($N = 962$ each) revealed that the 90% bias-corrected CI for the mediation effect was between .002 and .019. Thus, the CI did not include zero. The effect of exposure to SEIM (in wave 1) on sexual preoccupation (in wave 3), mediated by sexual arousal (in wave 2), was significant.

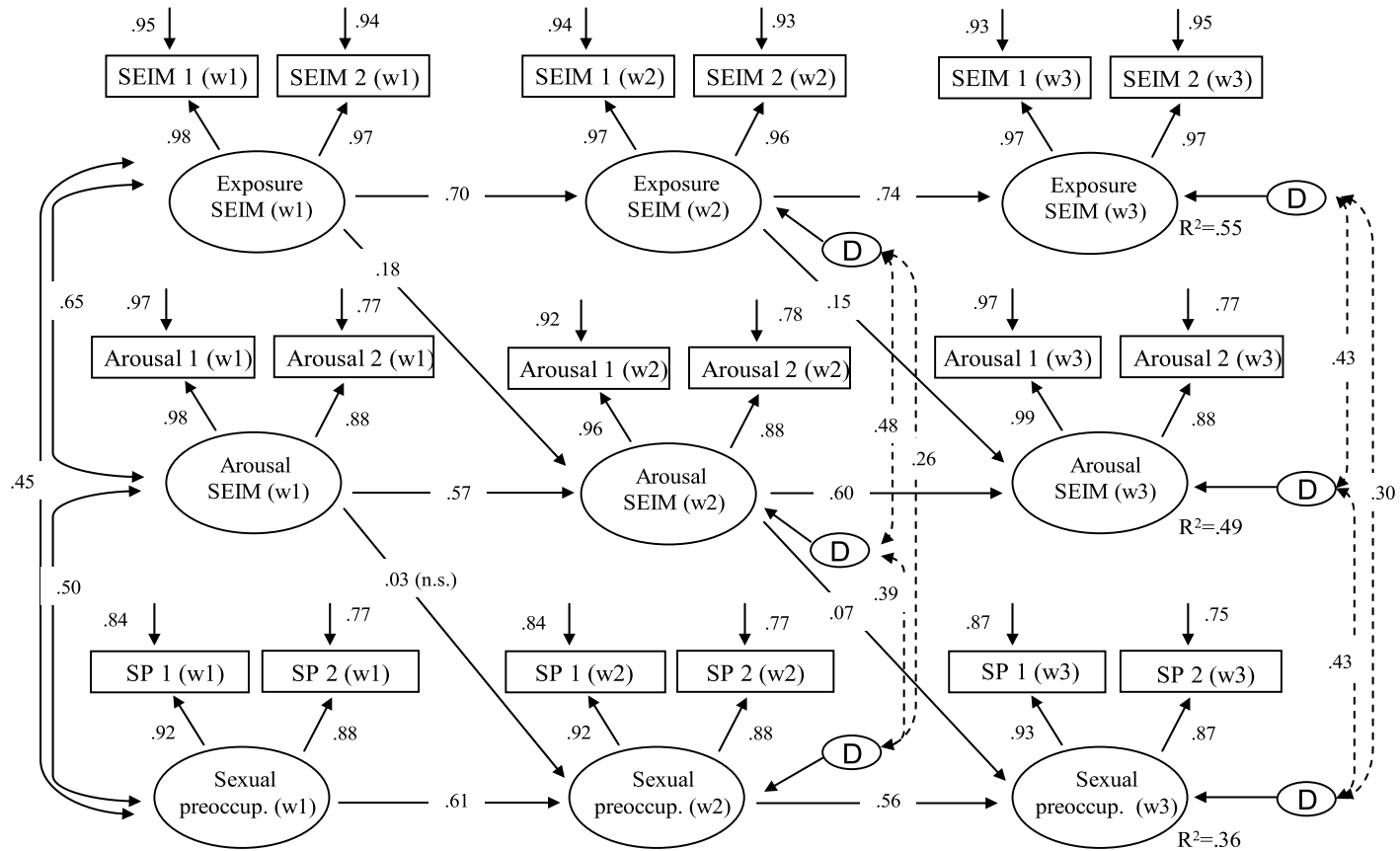


FIGURE 2 Sexual arousal mediates the link between exposure to sexually explicit internet material (SEIM) and sexual preoccupation (SP). *Note.* Coefficients represent standardized estimates, significant at least at $p < .05$, unless indicated otherwise. The dashed lines indicate covariances between disturbance terms (D). Error variances and covariances between error terms are not displayed for clarity reasons. w1 = wave 1; w2 = wave 2; w3 = wave 3.

Gender Differences

H3 predicted that exposure to SEIM would exert a stronger impact on subjective sexual arousal among male adolescents than among female adolescents. We tested first with a multiple-group analysis whether the impact of exposure to SEIM (in wave 1) on sexual arousal (in wave 2) would be moderated by adolescents' gender. When interaction effects are analyzed with a multiple-group analysis, two models are estimated. In the first model, the parameter in question (i.e., the impact of SEIM on sexual arousal) is allowed to vary between the groups. In the second model, the parameter of interest is constrained to be equal across the groups. A significant chi-square difference in the fit of the two models suggests that an interaction effect exists (Rigdon, Schumacker, & Wothke, 1998).

The fit of the model in which the impact of exposure to SEIM (in wave 1) on sexual arousal (in wave 2) was allowed to vary (while all other structural weights and factor loadings were constrained to be equal) fit the data well, $\chi^2(216, N = 962) = 498.11, p < .000, CFI = .983, RMSEA = .037$ (90% CI: .033–.041). The second model in which the effect of SEIM on sexual arousal was constrained to be equal among male and female adolescents had a similar fit, $\chi^2(217, N = 962) = 498.54, p < .000, CFI = .983, RMSEA = .037$ (90% CI: .033–.041). The chi-square, thus, did not differ significantly between the two models, $\Delta\chi^2(1, N = 962) = 0.426, p = .51$. This suggests that adolescents' gender did not moderate the effect of SEIM (in wave 1) on sexual arousal (in wave 2).

Given this unexpected finding, we also analyzed the potential moderation effect of gender by including an interaction term between gender and exposure to SEIM (in wave 1) into the model presented in Figure 2. The logic of including such an interaction term is similar to how interaction effects are investigated in multiple regression analyses. Generally, statistics has not solved the problem of how to model interaction effects in structural equation models without having to convert the latent variables involved in the interaction term into single-indicator latent variables (for a discussion of the problem, see Tomarken & Waller, 2005). Therefore, we changed exposure to SEIM (in wave 1) into a single-indicator latent variable. In that single-indicator latent variable, we used the centered additive scale of exposure to SEIM (in wave 1) as a manifest indicator of the latent construct exposure to SEIM (in wave 1). Because we know the reliability of the additive scale, we could compute the error variance of the latent construct as the product of the scale's variance and one minus the scale's reliability (Bollen, 1989). We added gender and the interaction term between gender and the centered additive scale of SEIM (in wave 1) to the model shown in Figure 2. In addition to all the influence paths shown in Figure 2, we modeled an influence path of both gender and the interaction term on sexual arousal (in wave 2), while allowing SEIM (in wave 1), gender, and the interaction effect between SEIM and gender to covary.

No significant interaction effect between gender and exposure to SEIM (in wave 1) on sexual arousal (in wave 2) occurred, $\beta = .03$, $B = .045$, $SE = .047$, $p = .34$. Again, the effect of exposure to SEIM on subjective arousal did not differ between female and male adolescents. A bootstrap analysis on the basis of 5,000 bootstrap samples ($N = 962$) yielded the same result. The 90% bias-corrected confidence interval of the interaction effect was between $-.034$ and $.124$ and, thus, included zero. In sum, none of our different analyses supported H3.³

DISCUSSION

Despite consistent evidence that a sexualized media environment influences adolescents' sexual attitudes and behaviors, no study to date has investigated whether sexual media content may affect adolescents in the sense that it leads to sexual preoccupation. Focusing on adolescents' exposure to SEIM, this study has shown on the basis of a three-wave panel survey that adolescents' exposure to SEIM resulted in sexual preoccupation. In contrast to our expectations, sexual preoccupation at the outset of our study did not increase adolescents' exposure to SEIM over the course of the study. Additional analyses showed that the influence of exposure to SEIM on sexual preoccupation was not direct but mediated by adolescents' subjective sexual arousal. Exposure to SEIM elicited sexual arousal, which in turn led to sexual preoccupation. The effect of exposure to SEIM on subjective sexual arousal did not differ for female and male adolescents.

Our finding that exposure to SEIM caused sexual preoccupation in adolescents calls for a broader look at the types of effects that adolescents' use of SEIM may elicit. Several scholars have pointed out that research has focused too much on adolescents' sexual behavior as an outcome of their use of sexual media content (e.g., Brown et al., 2002; Ward, 2003). As a result, other important aspects of adolescent sexuality, particularly long-term cognitions and emotions about sex, have been neglected. Our study shows that it may be worthwhile to extend our notion of how sexual media content may affect adolescent sexuality. Even when observed over the course of one year, adolescents' use of SEIM increased their cognitive engagement in sexual issues. The more frequently adolescents used SEIM, the more often they thought about sex, the stronger their interest in sex became, and the more frequently they became distracted because of their thoughts about sex. Thus, SEIM leaves its traces in adolescents' thinking about sex. At least in terms of adolescents' cognitive engagement in sexual issues, the implications of using SEIM are not limited to short-term consequences surrounding the immediate exposure to SEIM, but include long-term effects on the extent to which adolescents think about sex. This suggests that, if we want to understand the effects of SEIM on adolescents' sexual development more

thoroughly, we need to integrate long-term cognitive effects of exposure to SEIM more strongly into our research agenda.

Our finding that the use of SEIM led to sexual preoccupation whereas sexual preoccupation did not affect the use of SEIM also attests to the sexualizing role of SEIM in adolescents' lives. Exposure to SEIM seems to augment adolescents' cognitive engagement with sexual issues beyond the sexual curiosity that characterizes adolescence (Savin-Williams & Diamond, 2004). Although this result fits in with the broader notion that a sexualized media environment leads to sexualized adolescents, several qualifications of this finding are important. First, our finding demonstrates only *that* adolescents think more about sex when they use SEIM, but it does not show *how* adolescents think about sex as a result of using SEIM. We do not know what the valence of their cognitive engagement in sex is, that is, whether their thoughts are positive or negative. As a result, we are currently unable to indicate the extent to which adolescents' sexual preoccupation might present a troublesome outcome of exposure to SEIM. Second, although it is plausible to assume that adolescents become sexually preoccupied because they may not be able to put the reality depicted in SEIM into perspective, our study is not able to substantiate this assumption compellingly. We need additional research to indicate if and to what extent adolescents are overwhelmed by what they encounter in SEIM. Therefore, future studies should also include affects other than arousal when they try to explain the effect of SEIM on sexual preoccupation. Finally, on the basis of our conceptual and operational definition of sexual preoccupation, the cognitive engagement in sexual issues investigated in this study can neither be described as obsessive nor as pathological. It might be that adolescents become so preoccupied with sex as a result of exposure to SEIM that their functioning in everyday life is impaired. However, this needs to be established in future research. In addition, we urge future researchers to place outcomes such as excessive thinking about sex as well as the use of SEIM in the context of adolescents' sexual development and study them in long-term perspectives to distinguish developmentally appropriate, temporary sexual preoccupation from a potentially problematic, chronic obsession with sex.

Adolescents' subjective sexual arousal fully mediated the effect of SEIM on sexual preoccupation. Generally, this result underlines the importance of Ward's (2003) request that the processes that underlie the effects of sexual content on adolescents receive more research attention. The result also merges with recent studies that have suggested that the influence of sexual content is not direct, but mediated (Martino et al., 2005; Peter & Valkenburg, 2006b). More specifically, the result suggests that sexual arousal as a result of exposure to SEIM may cue sex-related cognitions in memory. This process occurs more often among frequent users of SEIM and may eventually lead to chronically accessible sex-related cognitions, that is, sexual preoccupation. Although our results are in line with predictions based on

affect priming, it is possible that the mediating mechanism is more complex than demonstrated in this study. For example, several scholars have pointed to the link between subjective sexual arousal after exposure to sexual content and positive resulting affective reactions, such as an increased liking of the content (D. Byrne, 1977; Laan et al., 1994). Consequently, exposure to SEIM may elicit sexual arousal, which may increase the liking of SEIM, which eventually may trigger sexual preoccupation. This example may be just one illustration of patterns of multiple-step-mediation that include both subjective arousal and affective responses as mediators of the link between exposure to SEIM and cognitive outcomes. However, the combination of the two seems indispensable for a more thorough understanding of the processes that underlie the effects of SEIM on sex-related cognitions.

The effect of SEIM on subjective sexual arousal did not vary between male and female adolescents. A first reason for the nonsignificant gender differences may lie in the crude operationalization of gender as a dichotomous variable. Gender, as a social construction, may require a more differentiated view of gender in terms of degrees of masculinity and femininity on a continuum. Although this conceptualization seems to be difficult to operationalize, it calls at least for some more sophisticated attempts to liberate one of the crucial categories in our thinking about the effects of SEIM from its proxy status.

A second explanation of the lacking gender differences refers to the conceptualization of gender influence. Previous studies were largely concerned with a main effect of gender on subjective sexual arousal (Janssen et al., 2003; Laan et al., 1994; Steinman et al., 1981). In line with these previous studies, our zero-order correlations between gender and subjective sexual arousal showed strong gender differences: Male adolescent reported significantly greater arousal from SEIM than female respondents. However, when we focused on gender as a moderator of the impact of SEIM on sexual arousal, gender differences did not occur. Thus, the effect of SEIM on sexual arousal appears to be the same for male and female adolescents, although the absolute level of both exposure to SEIM and subjective sexual arousal may differ between male and female adolescents. Therefore, future researchers should more strongly distinguish between main and moderating effects of gender and pay more attention to absolute values of variables as opposed to changes in one variable in relation to another. If the lacking moderating influence of gender can be replicated in further studies, we may have another indication of the impact of SEIM on adolescents' sexual development.

Despite its clear findings, our study has some limitations worth noting. First, although longitudinal survey studies are clearly superior to cross-sectional survey studies in addressing causality issues, they do not have the internal validity of experiments. However, research ethics precludes the use of experiments in sensitive research with minors. Experimental research with young adults may help to assess the internal validity of our findings. Second,

our study referred to adolescents' general use of SEIM and did not focus on the specific content of SEIM. It may be that the strength of our effects may vary depending on the specific content of SEIM adolescents choose to use. Finally, we conducted our study in the Netherlands, a country known for its liberal policy toward pornography and adolescent sexuality. It may be that our results may look different in cultural contexts with less liberal approaches to sexual matters. However, if a sexually liberal cultural context does impact our effects, then the effect we found should be stronger in less liberal cultures. We need cross-nationally comparative research to study the potential context-sensitivity of our results.

In conclusion, this study has indicated that the sexualized media environment in which adolescents grow up affects adolescents in that their cognitive engagement in sex increases. In our view, this finding does not call for a general protection of adolescents from the Internet. Rather, our result suggests that adolescents need to be educated about the SEIM they encounter. Adolescents' cognitive engagement in sexual issues after using SEIM may tentatively point to the fact that they have a lot of questions about what they see. We should help them in finding the answers.

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NOTES

1. Laan et al. (1994) have shown that women react with higher subjective sexual arousal to women-targeted pornography than to men-targeted pornography. However, the share of women-targeted SEIM in all SEIM available to adolescents can be assumed to be small. Therefore, we do not distinguish between women-targeted and men-targeted SEIM.
2. The operationalization of the variables used for the validation analyses are available from the first author upon request.
3. From a developmental perspective our sample is relatively broad. This raises the question of whether our results differ depending on adolescents' age. Therefore, we tested whether adolescents' age would moderate the influences shown in Figures 1 and 2. When including the interaction effects with age in our structural equation models, we employed the same procedure that we outlined in the text for testing the moderating influence of gender. The influence of exposure to SEIM (wave 1) on sexual preoccupation (wave 3) as shown in Figure 1 remained unaffected by age. As to the results of Figure 2, age moderated neither the impact of exposure to SEIM (wave 1) on sexual arousal (wave 2) nor the influence of sexual arousal (wave 2) on sexual preoccupation (wave 3). This suggests that our results do not vary by adolescents' age. The full documentation of the interaction analyses for age is available from the first author.

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