

ORIGINAL ARTICLE

Adolescents' Exposure to Sexually Explicit Online Material and Recreational Attitudes Toward Sex

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Previous research has largely ignored the implications of adolescents' exposure to sexually explicit online material for their sexual attitude formation. To study whether adolescents' exposure to sexually explicit material on the Internet is related to recreational attitudes toward sex, we conducted an online survey among 471 Dutch adolescents aged 13–18. In line with an orientation 1 – stimulus – orientation 2 – response (O_1 -S- O_2 -R) model, we found a pattern of multiple mediated relationships. Male adolescents (O_1) used sexually explicit online material (S) more than female adolescents, which led to a greater perceived realism of such material (O_2). Perceived realism (O_2), in turn, mediated the relationship between exposure to sexually explicit online material (S) and recreational attitudes toward sex (R). Exposure to sexually explicit online material, then, is related to more recreational attitudes toward sex, but this relationship is influenced by adolescents' gender and mediated by the extent to which they perceive online sexual material as realistic.

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On the Internet, access to sexually explicit material is simple, anonymous, and largely free. This triple-A engine of accessibility, anonymity, and affordability of online sexual content (Cooper, 1998) has sparked public speculation about its consequences for adolescents' sexual socialization (Paul, 2004; Runkel, 2005). For three reasons, such speculations may be justified. First, a great number of adolescents use the Internet extensively, usually with advanced computing skills (Madden & Rainie, 2003). Second, teenagers are generally eager to learn about sexuality and frequently search for sexual content (Savin-Williams & Diamond, 2004). Finally, adolescents are less sexually experienced than adults and may have more difficulty putting sexually explicit material into perspective (e.g., Huston, Wartella, & Donnerstein, 1998).

Scholars from different disciplines have repeatedly called for research into the relationship between sexually explicit online material and adolescents' sexual

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socialization (e.g., Brown, 2000; Fisher & Barak, 2001; Goodson, McCormick, & Evans, 2001; Huston et al., 1998; Thornburgh & Lin, 2002). However, with the exception of a recent study (Lo & Wei, 2005), systematic research is very scarce or centers nearly exclusively upon the epidemiological implications of the consumption of sexually explicit material (Haeggstroem-Nordin, Hanson, & Tydén, 2005; Rogala & Tydén, 2003; Tydén & Rogala, 2004). As a result, cognitive-emotional aspects of adolescents' sexual development are largely unexplored. This research gap is surprising for at least three reasons. First, there is strong and consistent meta-analytic evidence that, among adults, exposure to sexually explicit material is associated with sexual attitudes and behaviors (Allen, D'Alessio, & Brezgel, 1995; Allen, Emmers, Gebhardt, & Giery, 1995). Second, meta-analyses have demonstrated that, in non-criminal samples, exposure to sexually explicit material is less strongly related to physiological arousal and subsequent sexual behavior than in criminal samples (Allen, D'Alessio, & Emmers-Sommer, 1999; Hall, Shondrick, & Hirschman, 1993; Lalumiere & Quinsey, 1994). This suggests that the function of sexually explicit material may differ in noncriminal and criminal samples. When dealing with non-criminal samples, it may therefore be recommendable to focus on sexual attitudes rather than on physiological or behavioral variables. Third, research evidence has accumulated that adolescents' sexual attitudes are associated with their exposure to sexually nonexplicit material, such as soap operas (for reviews, see Malamuth & Impett, 2001; Ward, 2003). As a result, it seems necessary that we more thoroughly study the relationship between sexually explicit material on the Internet and adolescents' sexual attitudes.

The goal of this study is to investigate the relationship between adolescents' exposure to sexually explicit material on the Internet and their recreational attitudes toward sex. By exposure to sexually explicit material, we mean the active, conscious, and purposeful contact with material, "which depicts sexual activity in obvious, unconcealed ways" (Kelley, Dawson, & Musialowski, 1989, p. 58). A recreational attitude toward sex refers to the notion of sexual contacts as purely physical activities in which the fulfillment of one's own pleasures is more important than relational aspects. Our choice of this dependent variable is motivated by content analyses on the social and sexual reality depicted in sexually explicit material (Brosius, Weaver, & Staab, 1993; Cowan & Campbell, 1994; Mehta, 2001). These content analyses have consistently found that sexually explicit material presents sex as a merely physical, self-indulgent activity between casual, uncommitted partners that ignores social and relational aspects of sexuality. Because of the prevalence of this portrayal of sex in sexually explicit material, it appears crucial to investigate whether adolescents' exposure to sexually explicit material on the Internet is associated with recreational attitudes toward sex.

Lay notions of the relationship between adolescents' exposure to sexually explicit online material and their sexual attitudes are often implicitly based on a stimulus-response model: Here, adolescents straightforwardly imitate what they see in sexually explicit online material (e.g., see the quotations in Hubler, 2005; Paul, 2004). Such

a model falls short of recognizing that adolescents' exposure to sexually explicit online material may at first result from a set of orientations that reflects their socio-demographic background and developmental status. For example, male adolescents may approach sexually explicit online material differently than female adolescents and older adolescents may differ from younger adolescents. Such initial orientations may shape adolescents' exposure to sexually explicit online material and, as a result, influence the relationship between exposure to such material and sexual attitudes.

However, the stimulus-response model not only overlooks how exposure to sexually explicit material on the Internet may differ among adolescents but also ignores the possibility that the relationship between exposure to sexually explicit online material and sexual attitudes may not be direct: The relationship may be mediated by a second set of orientations, which, in contrast to those described earlier, partly change along with the exposure to sexually explicit online material. For example, there is some evidence that the relationship between media depictions of health risks and health-related cognitions is mediated by perceptions of how realistic the depictions are (e.g., Bahk, 2001a, 2001b). This suggests that the perceived realism of sexually explicit online material may mediate the relationship between adolescents' exposure to such material and their sexual attitudes.

A perspective that integrates the media stimulus into two sets of recipient orientations corresponds with the orientation 1 – stimulus – orientation 2 – response (O_1 -S- O_2 -R) model. The O_1 -S- O_2 -R model was originally proposed by Markus and Zajonc (1985) to explain social psychology's turn away from behavioristic stimulus-response models to more complex social cognitive approaches. Since then, scholars have also successfully applied it to explicate the consequences of political communication (for review, see McLeod, Kosicki, & McLeod, 2002). However, no study to date has applied the O_1 -S- O_2 -R model to the potential association of sexually explicit online material and adolescents' sexual attitudes. Given the conceptual clarity and theoretical parsimony of the model as well as its integrative potential, this study uses an O_1 -S- O_2 -R model to investigate how sexually explicit material on the Internet may be related to adolescents' recreational attitudes toward sex.

An O_1 -S- O_2 -R model of adolescents' exposure to sexually explicit online material

Figure 1 shows an O_1 -S- O_2 -R model of how adolescents' exposure to sexually explicit online material may be linked to recreational attitudes toward sex. As will become clear later, the various arrows represent the hypotheses that are necessary in order to fully test the model. In the O_1 -S- O_2 -R model used for this study, the first set of orientations (O_1) constitutes the sociopsychological background against which sexually explicit material on the Internet (S) may be related to a recreational attitude toward sex (R). In this study, these initial orientations include two variables that are crucial in research on adolescents—gender and age. The second set of orientations (O_2) comprises factors that may be connected with the exposure to sexually explicit

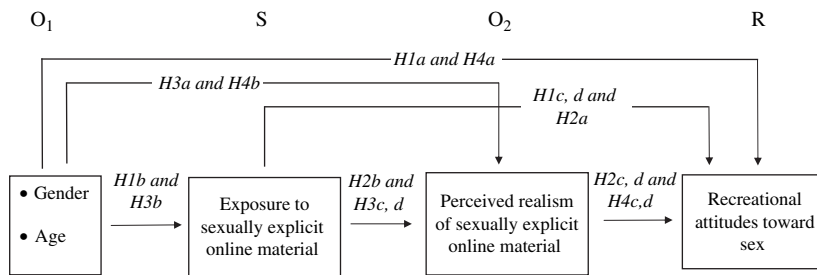


Figure 1 O_1 -S- O_2 -R model of adolescents' exposure to sexually explicit online material and its relationship with recreational attitudes toward sex.

online material; consequently, such factors may mediate the relationship between exposure to sexually explicit online material and recreational attitudes toward sex. In a meta-analysis of the association between television violence and antisocial behavior, Paik and Comstock (1994) point out the generally important role that the perceived realism of the depicted content may play in such relationships. More specifically, following related research on the impact of television sex on adolescents' sexual attitudes (Ward & Rivadeneyra, 1999), this study focuses on the perceived realism of sexually explicit online material (O_2) as a potential mediator of the relationship between exposure to sexually explicit online material and recreational attitudes toward sex.

The most rigorous interpretation of the O_1 -S- O_2 -R model sees the model as constituted by four mediated relationships. The first of these is the O_1 -S- O_2 component of the model. The relationship between gender/age (O_1) and perceived realism of sexually explicit online material (O_2) is mediated by exposure to sexually explicit online material (S). The second of the four mediated relationships is the O_1 -S-R component: Exposure to sexually explicit online material (S) mediates the association of gender/age (O_1) and recreational attitudes toward sex (R). The third of the mediated relationships is constituted by the O_1 - O_2 -R component of the model where the association between gender/age (O_1) and recreational attitudes toward sex (R) is mediated by perceived realism of sexually explicit online material (O_2). Finally, the fourth of the mediated relationships is the S- O_2 -R component of the model: The perceived realism of sexually explicit online material (O_2) mediates the relationship between exposure to sexually explicit online material (S) and recreational attitudes toward sex.

Three conditions must be met to test whether a relationship is mediated (Baron & Kenny, 1986). Because the logic of this mediation analysis is crucial to the understanding of our hypotheses below, we illustrate these three conditions with the O_1 -S-R component of the model with gender as the O_1 variable. For the first condition of the mediation analysis to be met, gender (O_1) has to be related to recreational attitudes toward sex (R). To fulfill the second condition, gender (O_1) additionally must be

associated with exposure to sexually explicit online material (S, the presumed mediating variable). Meeting the third condition of a mediation analysis requires the following: When the impact of *both* gender and exposure to sexually explicit online material on recreational attitudes toward sex is investigated, (a) an effect of sexually explicit online material has to be found, whereas (b) the effect of gender disappears or decreases significantly.

A rigorous test of the O_1 -S- O_2 -R model should be based on a mediation analysis of all four mediated relationships, resulting in a total of 12 analyses. However, as becomes clear from Figure 1 and the labeling of the arrows (that represent the hypotheses necessary to test the model), some hypotheses may be identical in different mediation analyses. For example, the hypothesis regarding the effect of gender (O_1) on exposure to sexually explicit online material (S) refers to condition two in the O_1 -S-R mediation analysis (labeled H1b in Figure 1) and also to condition two in the O_1 -S- O_2 mediation analysis (H3b in Figure 1). In what follows, we will therefore avoid formulating redundant hypotheses but all will be labeled. Figure 1 shows all hypotheses regarding the various mediation analyses.

Gender/age–sexually explicit online material–recreational attitudes (O_1 -S-R)

There is evidence that male adolescents as well as older adolescents (O_1) generally tend to have more permissive, recreational attitudes toward sex (R) than female and younger adolescents (e.g., Lo & Wei, 2005; Taris, Semin, & Bok, 1998; Ward & Rivadeneyra, 1999). This lends support to the first condition that must be met in the O_1 -S-R mediation analysis. Therefore, we hypothesize:

H1a: Compared with female and younger adolescents, male and older adolescents will more strongly endorse recreational attitudes toward sex (O_1 -S-R component, first condition).

Male adolescents generally use sexually explicit online material (S) more often than female adolescents (Cameron et al., 2005; Lo & Wei, 2005). There is also evidence from a qualitative study that older adolescents (O_1) expose themselves more frequently to sexually explicit online material (S) than younger adolescents (Cameron et al., 2005). Our hypothesis that reflects the second condition of the O_1 -S-R mediation analysis reads:

H1b: Compared with female and younger adolescents, male and older adolescents will be exposed more frequently to sexually explicit online material (O_1 -S-R component, second condition).

For the relationship between gender and recreational attitudes toward sex to be mediated by exposure to sexually explicit online material, it must first be shown theoretically that exposure to such material is associated with recreational attitudes toward sex. Research on the effects of sexually nonexplicit material has demonstrated that adolescents' exposure to such content is linked to more permissive attitudes toward sex (for reviews, see Malamuth & Impett, 2001; Ward, 2003). This has recently also been shown for adolescents' exposure to sexually explicit material on the Internet (Lo & Wei, 2005). In conjunction with Hypotheses 1a and 1b, exposure

to sexually explicit online material may thus mediate the association between gender and recreational attitudes toward sex. The hypotheses for the third condition of the O_1 -S-R mediation analysis read:

H1c: Adolescents' exposure to sexually explicit online material will be positively related to their recreational attitudes toward sex (O_1 -S-R component, third condition).

H1d: If exposure to sexually explicit online material is included in the model, the relationship between gender/age and recreational attitudes toward sex as hypothesized in H1a will disappear (O_1 -S-R component, third condition).

Sexually explicit online material–perceived realism–recreational attitudes (S- O_2 -R)

We have just outlined that adolescents' exposure to sexually explicit online material (S) may be connected with recreational attitudes toward sex (R). Therefore, we will not formulate another hypothesis although we additionally label this hypothesis H2a because it reflects the first condition of the S- O_2 -R mediation analysis.

We expect greater exposure to sexually explicit online material to be associated with a greater perceived realism of such material (O_2). Perceived realism of sexually explicit online material refers to adolescents' subjective impressions of the extent to which the sexual activities depicted are similar to sexual activities in the real world and would thus appear useful to learn about sex. Several studies have suggested that the perceived realism of various types of media content is related to the exposure to such types of media content (Bahk, 2001a, 2001b; Rubin, Perse, & Taylor, 1988). More specifically, we expect that, with more frequent exposure to sexually explicit online material, adolescents will perceive such material to be more realistic. In line with the second condition of the S- O_2 -R mediation analysis, we hypothesize:

H2b: Greater exposure to sexually explicit online material is associated with a greater perceived realism of such material (S- O_2 -R component, second condition).

Several studies have suggested that perceived realism plays a mediating role between media exposure and attitudes toward the depicted content (Bahk, 2001a, 2001b; Rubin et al., 1988). This presupposes that perceived realism of sexually explicit material is related to adolescents' recreational attitudes toward sex. There is evidence that the perceived realism of sexually nonexplicit content is associated with sexual attitudes in general and with permissive attitudes toward sex in particular (Taylor, 2005; Ward & Rivadeneyra, 1999). Given the much more blatant messages in sexually explicit material (Brosius et al., 1993), we assume that this pattern also holds for adolescents' perceived realism of sexually explicit online material and their recreational attitudes toward sex. Along with Hypotheses 2a and 2b, perceived realism of sexually explicit online material may mediate the relationship between exposure to sexually explicit online material and recreational attitudes toward sex. The hypotheses regarding the third condition of the S- O_2 -R mediation analysis read:

H2c: Adolescents' perceived realism of sexually explicit online material will be positively related to recreational attitudes toward sex (S- O_2 -R component, third condition).

H2d: The relationship between exposure to sexually explicit online material and recreational attitudes toward sex as hypothesized in H2a will disappear if perceived realism of sexually explicit online material is included in the model (S-O₂-R component, third condition).

Gender/age–sexually explicit online material–perceived realism (O₁-S-O₂)

Researchers from various backgrounds often emphasize that sexually explicit material is created by males for males and predominantly caters to male notions of sex (Brosius et al., 1993; Cowan & Campbell, 1994). We therefore predict that male adolescents (O₁) will be more likely than female adolescents to perceive sexually explicit online material to be realistic (O₂). The perceived realism of mediated content usually declines as adolescents get older (for review, see Potter, 1988), and we also expect this pattern for the relationship between age and the perceived realism of sexually explicit online material. In line with the first condition of the O₁-S-O₂ mediation analysis, we therefore hypothesize:

H3a: Male and younger adolescents will perceive sexually explicit online material as more realistic than female and older adolescents will (O₁-S-O₂ component, first condition).

We have outlined, in the rationale for Hypothesis 1b, why we expect gender and age to affect adolescents' exposure to sexually explicit online material (S). Because this influence also constitutes the second condition of the O₁-S-O₂ mediation analysis, we additionally refer to this hypothesis as H3b. In the rationale for Hypothesis 2b, we explained why exposure to sexually explicit material on the Internet may be associated with the perceived realism of such material; as a result, we expect exposure to sexually explicit online material to mediate the impact of gender and age on the perceived realism of such material. In line with the third condition of the O₁-S-O₂ mediation analysis, the hypotheses read:

H3c: Adolescents' exposure to sexually explicit online material will be positively related to the perceived realism of such material (O₁-S-O₂ component, third condition).

H3d: The relationship between gender/age and the perceived realism of sexually explicit online material as hypothesized in Hypothesis 3a will disappear if exposure to sexually explicit online material is included in the model (O₁-S-O₂ component, third condition).

Gender/age–perceived realism–recreational attitudes toward sex (O₁-O₂-R)

The O₁-O₂-R mediation analysis finally includes a test of the following relationships: first, the relationship between gender/age (O₁) and recreational attitudes toward sex (R); second, the association between gender/age and perceived realism (O₂); and third, the relationship between perceived realism and recreational attitudes, with the concurrently disappearing association between gender/age and recreational attitudes. We provided the rationale for all of these relationships in the reasoning leading to Hypotheses 1a, 3a, and 2c and 2d. For reasons of clarity, we refer to the hypothesis that pertains to the first condition of this mediation analysis as H4a and to the hypothesis that pertains to the second condition as H4b. The hypotheses that test the third condition of this mediation analysis read:

H4c: Adolescents' perceived realism of sexually explicit online material will be positively related to recreational attitudes toward sex (O₁-O₂-R component, third condition).

H4d: The relationship between age/gender and recreational attitudes toward sex as hypothesized in Hypothesis 4a will disappear if the perceived realism of sexually explicit online material is included in the model (O₁-O₂-R component, third condition).

Control variables

Scholars have identified several other influences on the key variables of the model (i.e., exposure to sexually explicit online material and recreational attitudes toward sex). These influences may present rival explanations of the relationship patterns hypothesized in the mediation hypotheses sets. A rigorous test of the model should therefore include the following variables: ethnicity (e.g., Ward & Rivadeneyra, 1999), pubertal status (e.g., Brown, Halpern, & L'Engle, 2005), religiosity (e.g., Collins et al., 2004), adolescents' relationship status (e.g., Miller, Christopherson, & King, 1993), the age of adolescents' friends (e.g., Collins et al., 2004), and exposure to sexual content in media other than the Internet (e.g., Ward, 2003).

The moderating influence of sexual experience

Real-life experience with content depicted in the media generally affects the extent to which people perceive media content as realistic (for review, see Potter, 1988). Youth are only starting to accumulate sexual experiences. As a result, their perceptions of the extent to which sexually explicit online material actually resembles real-life sex may differ according to their own sexual experience. Content analyses of sexually explicit material consistently suggest that the social reality depicted in such material differs from real-life sex and in particular from adolescents' real-life sex (Brosius et al., 1993; Cowan & Campbell, 1994; Mehta, 2001). As a result, the extent to which exposure to sexually explicit online material is associated with the perceived realism of such material may depend on adolescents' own sexual experiences. Adolescents' own sexual experiences may moderate the relationship between exposure to sexually explicit online material and the perceived realism of such material. Specifically, we hypothesize:

H5: As adolescents' sexual experience increases, the relationship between exposure to sexually explicit online material and the perceived realism of such material will decrease.

Method

Sample and procedure

In March and April 2005, an online survey was conducted among 745 Dutch adolescents between 13 and 18 years of age. For the study of sensitive issues, online surveys or, more generally, computer-mediated surveys have generally proven superior to other modes of interviewing (e.g., Mustanski, 2001). Sampling and fieldwork were done by Intomart GfK, an established audience and media research institute in

the Netherlands. Respondents were partly recruited from an existing online panel managed by Intomart GfK. The response rate was 60%. Analyses showed that the gender, age, and formal education of our respondents did not deviate from official statistics. It should be noted that, in 2003, over 90% of Dutch adolescents had home access to the Internet (Sociaal en Cultureel Planbureau, 2005).

Prior to the implementation of the survey, institutional approval, parental consent, and adolescents' informed consent were obtained. Adolescents were notified that the study would be about sexuality and the Internet and that they could stop participation at any time they wished. Of the 745 adolescents who started the questionnaire, 690 fully completed it. Given that the key measure of perceived realism of online sexually material may be difficult to assess for adolescents, we included a *don't know* response category in the answers to that question. Two hundred nineteen of the 690 respondents who filled in the questionnaire completely answered with *don't know* to at least one of the four items with which we measured perceived realism (see below). As a consequence, we could compute the perceived realism index score only for the remaining 471 respondents (i.e., those who had given substantive answers to all of the four items with which perceived realism was operationalized). Therefore, the actual sample size for the analysis is 471 adolescents. However, the results presented in this study do not differ from the results obtained when all *don't know* answers to the perceived realism items were recoded to the neutral *agree/disagree* middle category (for details of the operationalization, see the measures section). As a result, we opted for a sample that excluded those adolescents that had chosen the *don't know* option to answer one or more of the perceived realism items.

We took the following measures to improve the confidentiality, anonymity, and privacy of the response process (Mustanski, 2001). On the introduction screen of the online questionnaire, we emphasized that the answers would be analyzed only by us, the principal investigators. Moreover, we assured the respondents that their answers would remain anonymous. Finally, respondents were asked to make sure that they filled in the questionnaire in privacy. Completing the questionnaire took about 15 minutes.

Measures—key variables of the O₁-S-O₂-R model

Age and gender (O₁)

The measurement of age ($M = 15.5$, $SD = 1.70$) and gender was straightforward. Boys were coded as 0 (52% of the sample), and girls as 1 (48%).

Exposure to sexually explicit online material (S)

Based on research into the wording of sensitive questions (Bradburn, Sudman, & Wansink, 2004), the question on exposure to sexually explicit online material read "Sex sites are among the most often visited sites on the Internet. Some teenagers use the sexual content of such sites, while other teenagers don't. Would you please indicate how often you looked at the following sexual content on the Internet on average in the last six months? We would like to remind you that all your answers remain

anonymous.” The sexual content we referred to was (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, and (e) erotic contact sites. Pretests revealed that adolescents did not need more elaborate explanations as to the content and were aware that this question and the pertinent items were about sexually explicit content and their purposeful exposure to them. The response categories were 1 (*never*), 2 (*less than once a month*), 3 (*one to three times a month*), 3 (*once a week*), 5 (*several times a week*), and 6 (*every day*). We created a scale by averaging the five items ($\alpha = .92$, $M = 1.78$, $SD = 1.08$).

Our operationalization of exposure to sexually explicit online material includes a time component because the relationship between exposure to sexually explicit online material and recreational attitudes toward sex can be assumed to develop over time. In cross-sectional research, asking respondents about their exposure to particular media content in a specified period prior to the interview presents a possibility to tentatively make sure that exposure precedes the attitude studied. This is important for adequately testing the proposed O₁-S-O₂-R model in a correlational design. Further information about the operationalization of this measure and elaborate descriptive statistics can be found in Peter and Valkenburg (2006).

Perceived realism (O₂)

This variable was operationalized with four items, which we took from a scale by Busselle (2001) and which we adjusted to perceptions of sexually explicit online material. The items were “I find sex on the Internet realistic,” “Sex on the Internet is similar to sex in real life,” “You can learn a lot about sex by watching sex pictures or sex movies on the Internet,” “By watching sex pictures or sex movies on the Internet I learn how to behave when having sex.” Response categories ranged from 1 (*fully disagree*) to 5 (*fully agree*) with 3 (*agree/disagree*) as neutral middle category. Respondents were also provided with a *don't know* option. The items formed a unidimensional scale and Cronbach's alpha was .85 ($M = 2.21$, $SD = .88$).

Recreational attitudes toward sex (R)

We measured this construct with six items: “Sex is primarily physical,” “The main goal of sex is that you yourself have a good time,” “Sex is a game between males and females,” “It is okay to seduce somebody, although you know that you do not want a relationship with him/her,” “Sex is a physical need, like eating,” and “It is okay to have sexual relationships with more than one partner.” Response categories ranged from 1 (*fully disagree*) to 5 (*fully agree*). The items formed a unidimensional scale and Cronbach's alpha was .72 ($M = 2.95$, $SD = .66$).

Sexual experience (moderator)

We operationalized sexual experience with three items: mutual masturbation, oral sex, and coital sex. Pretests revealed that adolescents had no problems understanding the terms. Respondents were asked whether they had performed one or more of the three behaviors. Experience with a particular sexual behavior was coded as 1, lacking

experience with a particular behavior was coded as 0. To avoid problems with the log-transformation of the resulting scale, we recoded experience with a particular behavior to 2, and lacking experience to 1 (see section on data analysis). The three items loaded on one factor in a factor analysis (explained variance 80%) and were averaged to form a scale. The resulting alpha was .87 ($M = 1.37$, $SD = .43$).

Measures—control variables

Ethnicity

We operationalized respondents' ethnicity as a dichotomy where 0 meant *non-Dutch* and 1 meant *Dutch*. About 7% of the sample were not Dutch, 93% were Dutch.

Pubertal status

Pubertal status was operationalized with the Pubertal Status Scale developed by Petersen, Crockett, Richards, and Boxer (1988). The most valid version of the scale contains four items for boys—body hair, voice change, growth spurt, and facial hair—and four items for girls—body hair, breast change, growth spurt, and menarche. Adolescents could indicate on a 4-point scale whether each bodily change had already begun (coded as 1) or had already finished (coded as 4). We did not provide girls with the response category *has already finished* for the menarche item because the menarche cannot end during adolescence. The internal consistency of the scale was .87 for male adolescents ($M = 3.04$, $SD = .76$) and .82 for female adolescents ($M = 3.25$, $SD = .52$).

Religiosity

Whether adolescents are religious was measured with the item "I am religious." Response categories ranged from 1 (*does not apply at all*) to 5 (*applies completely*) ($M = 2.22$, $SD = 1.31$).

Age of friends

This measure was tapped with the question "Is the majority of your friends as old as you are, more than one year older than you are, or more than one year younger than you are?" Response categories were 1 (*younger than I am*), 2 (*as old as I am*), and 3 (*older than I am*) ($M = 2.21$, $SD = .53$).

Relationship status

Relationship status was measured with the question "Are you currently in a romantic relationship?" Adolescents who were single were coded as 0 (63.5%), adolescents who had a relationship were coded as 1 (36.5%).

Exposure to sexual content other than on the Internet

This measure was operationalized with adolescents' frequency of exposure to three R-rated television programs (Sexcetera, Sex court, Latin lover), porn movies, and erotic magazines. Response categories ranged from 1 (*never*) to 5 (*several times a week*). When the five items were entered into a factor analysis, they formed a unidimensional scale. Cronbach's alpha was .85 ($M = 1.42$, $SD = .64$).

Data analysis

We ran hierarchical multiple regression analyses to test our hypotheses. Multiple regressions assume the variables to have normal distributions, but sexual measures are typically positively skewed (Weinhardt, Forsyth, Carey, Jaworski, & Durant 1998). Prior to the multiple regression analysis, we conducted Shapiro-Wilk tests for normality to determine whether the metric variables were normally distributed. As a result of the test, we had to log-transform the measures of religiosity, age of friends, pubertal status, sexual experience, exposure to sexually explicit material on the Internet, exposure to sexual content on media other than the Internet, perceived realism, and recreational attitude toward sex.

Because some of our measures may be strongly correlated, we also checked whether there was evidence of multicollinearity between the variables. This was not the case; all variance inflation factors were clearly below the critical value of five.

Results

Gender/age–sexually explicit online material–recreational attitudes toward sex (O₁-S-R)

Hypotheses 1a to 1d predicted that the relationship between both adolescents' gender and age (O₁) and their recreational attitudes toward sex (R) would be mediated by the exposure to sexually explicit online material (S). The zero-order correlations in Table 1 already present some tentative evidence that gender, exposure to sexually explicit online material, and recreational attitudes toward sex are related. Models H1a in column 5 of Table 2; H1b in column 1; and H1c, d in column 6 show the results of our hypotheses tests. As predicted in Hypothesis 1a, male adolescents held more recreational attitudes toward sex than female adolescents, meeting the first condition of the O₁-S-R mediation analysis ($b = -.07, p < .01$; see column 5 in Table 2). Hypothesis 1b was also confirmed: Male adolescents used sexually explicit online material significantly more often than female adolescents ($b = -.47, p < .001$; see column 1). This fulfilled the second condition of the O₁-S-R mediation analysis. When entering exposure to sexually explicit online material in the model, the relationship between gender and recreational attitudes toward sex disappeared ($b = -.01, ns$; see value formatted in italic in column 6), whereas exposure to sexually explicit online material was positively related to recreational attitudes toward sex ($b = .06, p < .05$; see column 6). This confirmed Hypotheses 1c and 1d and met the third condition of the O₁-S-R mediation analysis. As expected, the relationship between gender and recreational attitudes toward sex was mediated by exposure to sexually explicit online material.

For age, we hypothesized the same relationship patterns as for gender. Models H1a (column 5), H1b (column 1), and H1c, d (column 6) in Table 2 document that, with respect to age, Hypotheses 1a to 1d had to be rejected. Already at the level of zero-order correlations, age was unrelated to recreational attitudes toward sex ($r = .03, ns$; see Table 1) and, as a consequence, could logically not be mediated by exposure to sexually explicit online material.

Table 1 Zero-Order Correlations Between Key and Control Variables in the O₁-S-O₂-R Model

	1	2	3	4	5	6	7	8	9	10	11
1 Recreational attitudes	1.00										
2 Female	-.15										
3 Age	.03	.04									
4 Exposure to SEOM	.24	-.45	.08								
5 Perceived realism of SEOM	.35	-.28	-.10	.45							
6 Sexual experience	.07	.12	.52	.13	-.06						
7 Dutch ethnicity	.01	-.04	.08	.01	.02	-.01					
8 In relationship	-.04	.18	.24	.01	-.11	.50	.08				
9 Age of friends	-.06	.22	.08	-.14	-.12	.15	.01	.07			
10 Religiosity	-.09	.02	-.05	-.03	.08	-.21	-.03	-.02	-.06		
11 Pubertal status	.02	.16	.65	.06	-.11	.37	.04	.18	.13	-.01	
12 Exposure to sexual content in other media	.24	-.34	.05	.60	.35	.19	.03	.03	-.12	-.02	.06

Note: Correlations $\geq .10$ are significant at $p < .05$, Correlations $\geq .12$ are significant at $p < .01$, Correlations $\geq .17$ are significant at $p < .001$ (two-tailed). SEOM = Sexually explicit online material.

Sexually explicit online material–perceived realism–recreational attitudes (S-O₂-R)

Hypotheses 2a to 2d predicted that the association between adolescents' exposure to sexually explicit online material (S) and recreational attitudes toward sex (R) would be mediated by the perceived realism of such material (O₂). The three hypotheses, and with them the three conditions of the S-O₂-R mediation analysis, were supported, as models H2a (column 6), H2b (column 3), and H2c, d (column 7) in Table 2 show. Exposure to sexually explicit online material was positively related to recreational attitudes toward sex, meeting the first criterion of a mediation analysis ($b = .06$, $p < .05$; see column 6). Exposure to sexually explicit online material was also positively associated with the perceived realism of such material, thereby fulfilling the second condition of the mediation analysis ($b = .31$, $p < .001$; see column 3). Perceived realism had a positive influence on recreational attitudes toward sex ($b = .19$, $p < .001$; see column 7), whereas the relationship between exposure to sexually explicit online material and recreational attitudes toward sex disappeared when perceived realism was included in the model ($b = .00$, *ns*; see value formatted in italic in column 7). This met the third condition of the S-O₂-R mediation analysis. Perceived realism thus mediated the relationship between adolescents' exposure to sexually explicit online material and their recreational attitudes toward sex.

Gender/age–sexually explicit online material–perceived realism (O₁-S-O₂)

Hypotheses 3a to 3d stated that the relationship between adolescents' gender/age (O₁) and the perceived realism of sexually explicit online material (O₂) would be mediated by their exposure to sexually explicit online material (S). Male adolescents

Table 2 Hierarchical Regressions on Adolescents' Exposure and Perceived Realism of SEOM and Their Recreational Attitudes Toward Sex

Dependent Variable	Exposure to SEOM			Perceived Realism of SEOM			Recreational Attitudes Toward Sex							
	1		2	3		4	5		6		7		8	
Hypotheses Tested	H1b and H3b		H3a and H4b	H2b and H3c,d		Moderator	H1a and H4a		H1c, d and H2a	H2c, d		H4c,d		
	B	SE (B)	B	SE (B)	B	SE (B)	B	SE (B)	B	SE (B)	B	SE (B)	B	SE (B)
N = 471														
Female	-.47***	.04	-.21***	.04	.00	.04	-.07**	.02	-.01	.03	-.01	.03	-.03	.02
Age	-.01	.01	-.03	.02	-.02	.02	.00	.01	.00	.01	.01	.01	.00	.01
Exposure to SEOM					.31***	.04	.32***	.04	.06*	.03	.00	.03		
ΔR^2					.16***				.04***					
Perceived Realism of SEOM											.19***	.03	.20***	.03
ΔR^2											.08***		.11***	
Exposure to SEOM \times Sexual Experience						-.12	.11							
ΔR^2						.00								
Constant	.67	(.26)	1.21	.87	.24	.85	.24	(.22)	.04	(.03)	1.05	.89	.15	.89
R^2 (adjusted R^2)	.26		.08	.24	.24	.24	.24	(.22)	.04	(.06)	.08	.16	(.14)	(.14)

Note: All models were controlled for sexual experience, ethnicity, relationship status, age of friends, religiosity, pubertal status, and exposure to sexual content in other media. SEOM = sexually explicit online material.

* $p < .05$. ** $p < .01$. *** $p < .001$ (t -test, two-tailed).

perceived sexually explicit online material as more realistic than female adolescents did, supporting Hypothesis 3a and meeting the first condition of the O_1 -S- O_2 mediation analysis ($b = -.21, p < .001$; see column 2 in Table 2). Male adolescents also consumed sexually explicit online material more frequently than female adolescents did ($b = -.47, p < .001$; see column 1). This supported Hypothesis 3b and, with it, the second condition that must be met for a mediated influence. As predicted in Hypotheses 3c and 3d, the relationship between gender and perceived realism disappeared as exposure to sexually explicit online material was included in the model ($b = .00, ns$; see value formatted in *italic* in column 3), whereas exposure to sexually explicit online material was positively associated with the perceived realism of such material ($b = .31, p < .001$; see column 3). The O_1 -S- O_2 mediation hypothesis set was thus confirmed for gender. Male adolescents used sexually explicit online material more often than female adolescents, which in turn was positively associated with the perceived realism of such material.

We expected a similar mediation pattern for age. However, there was no indication whatsoever that the relationship between age and perceived realism of sexually explicit online material was mediated by exposure to such material (see columns 2, 1, and 3 in Table 2).

Gender/age-perceived realism-recreational attitudes toward sex (O_1 - O_2 -R)

We also found support for Hypotheses 4a to 4d with respect to gender but not with respect to age (O_1). As already mentioned above, male adolescents held more recreational attitudes toward sex (R) ($b = -.07, p < .01$; see column 5 in Table 2) and perceived it as more realistic than female adolescents did ($b = -.21, p < .001$; see column 2). Apart from the first two conditions of the O_1 - O_2 -R mediation analysis, the third condition was also met. Greater perceived realism of sexually explicit online material was positively related to more recreational attitudes toward sex ($b = .20, p < .01$; see column 8), whereas gender lost its significant impact ($b = -.03, ns$; see value formatted in *italic* in column 8).

Moderating influence of sexual experience

To analyze whether sexual experience moderated the impact of exposure to online sexually material on the perceived realism of such material, we first centered both the exposure and the sexual experience variable around their mean. Centering variables around their mean avoids multicollinearity problems. We subsequently created a multiplicative term between the two variables. As the Moderator model in column 4 of Table 2 shows, there was no evidence that sexual experience moderated the relationship between exposure to sexually explicit online material and perceived realism ($b = -.12, ns$). Independent of adolescents' own sexual experiences, exposure to sexually explicit online material was positively associated with the perceived realism of such material. Hypothesis 5 was not supported.

In summary, our analyses supported an O_1 -S- O_2 -R model for adolescents' initial orientation (O_1) defined by gender but not for those defined by age. Male

adolescents used sexually explicit online material more often than female adolescents. This increased exposure was associated with a higher perceived realism of such material, which in turn was related to more recreational attitudes toward sex. This model held although we controlled for a number of alternative explanations. (To facilitate the readability of Table 2, the regression coefficients of the various control variables were not shown.)

Discussion

This study has met the request of various scholars to study the ramifications of adolescents' exposure to sexually explicit online material (e.g., Brown, 2000; Fisher & Barak, 2001; Goodson et al., 2001; Huston et al., 1998; Thornburgh & Lin, 2002). In line with a recent Taiwanese study (Lo & Wei, 2005), our investigation presents further evidence that we can no longer ignore sexually explicit material on the Internet when addressing adolescents' sexual attitudes. Exposure to sexually explicit online material was, via the perceived realism of such material, associated with recreational attitudes toward sex. This held true even when contact with sexual content in media other than the Internet, as well as several other alternative influence factors, were controlled for. As a result, research on the role of the media in adolescents' formation of sexual attitudes needs to widen its focus and more strongly concentrate on adolescents' exposure to sexually explicit material on the Internet.

Limitations and generalizability of the study

We note that this study is only a first step into the underresearched area of the potential relationships between sexually explicit online material and adolescents' sexual attitudes. Our study, with its correlational design, is not able to rigorously demonstrate that exposure to such material causes more recreational attitudes toward sex. It could be that adolescents with more recreational attitudes toward sex use sexually explicit online material more frequently, or that recreational attitudes and exposure to sexually explicit online material influence each other reciprocally. This is a very important caveat for the interpretation of the results of this study. To compellingly substantiate causal claims as to whether adolescents' exposure to sexually explicit online material affects recreational attitudes toward sex, longitudinal designs are needed. Furthermore, given that research ethics does not permit experimental research on the issue with adolescents, researchers may think about replicating our findings in experimental designs with young adults. Only if we have evidence from internally more valid design types than correlational designs will we be able to solve the causation problem that pervades this study.

Regarding the generalizability of our results, the technological and the sociosexual situation in the Netherlands deserves attention. In terms of Internet adoption, the Netherlands is one of the most advanced countries in the world. Already in 2003, 90% of Dutch adolescents had home access to the Internet and this figure can be assumed to have increased since then (Sociaal en Cultureel Planbureau, 2005). In

terms of matters of adolescent sexuality, the Netherlands is usually referred to as an example of an open, pragmatic approach (UNICEF, 2001). However, we do not think that these characteristics reduce the generalizability of our results. Home Internet access has grown to a similar extent in many Western European, North American, and Asian countries such as Japan and Korea, and Internet use is predicted to keep on growing (OECD, 2005). In many rich Western and Northern European countries and the United States, adolescent sexual behavior has developed similarly, which shows in a median age of about 17 at coital debut, the tendency to have sex at an earlier age, and the predominant occurrence of sex in a premarital context (Francoeur, 1997). In sum, both technological and sociosexual developments in many Western and North American countries suggest that this study may not only be relevant to an assessment of Dutch adolescents' exposure to sexually explicit online material but may also have implications for research done in other Western and Northern European countries and in the United States. That said, we urge future researchers to approach the role of the Internet for adolescents' sexual socialization also from a cross-nationally comparative perspective.

Theoretical implications

Research at the intersection of media effects and sexual socialization has typically drawn on either cultivation theory, social cognitive learning theory, or priming theory (for a review, see Ward, 2003). Interestingly, however, no study in that area has employed a theoretically more integrative O_1 -S- O_2 -R model, such as the one presented here, to conceptualize how sexual media content may relate to adolescents' sexual attitudes. Our study shows that an O_1 -S- O_2 -R model may parsimoniously capture the underlying mechanisms of adolescents' exposure to sexually explicit online material and its relationship to recreational attitudes toward sex. The model shows that exposure to sexually explicit online material is determined by adolescents' gender. Perhaps, even more importantly, the model demonstrates that adolescents' exposure to sexually explicit online material is not directly related to recreational attitudes toward sex but is instead mediated by the extent to which adolescents consider such material realistic. When adolescents use sexually explicit online material more often—and this applies predominantly to male adolescents—they tend to perceive this material as realistic. This perception, in turn, is associated with more recreational attitudes toward sex. As our mediation analyses consistently demonstrated, there is no universal use of sexually explicit online material, nor is there a universal and direct effect of the exposure to such material. Therefore, future research needs to deepen our understanding of the factors that, besides gender, constitute the sociopsychological background against which sexually explicit online material may be related to sexual attitudes. Moreover, we need to thoroughly study which factors may moderate the relationship between exposure to sexually explicit online material and recreational attitudes toward sex.

Our O_1 -S- O_2 -R model of the association between adolescents' exposure to sexually explicit online material and recreational attitudes toward sex relates to existing

theories about media effects on sexual socialization in at least two ways. First, in line with critical approaches to cultivation theory (e.g., Potter, 1988; Rubin et al., 1988), the model showed that the concept of perceived realism is crucial to our understanding of how sexually explicit online material relates to recreational attitudes toward sex. Going beyond cultivation approaches, the O₁-S-O₂-R model additionally specified the relationships between the exposure to sexually explicit online material, the perceived realism of such material, and recreational attitudes toward sex. Second, in contrast to what would be expected on the basis of social-cognitive learning theory (Bandura, 2001), the O₁-S-O₂-R model remained unaffected by adolescents' sexual experience. More specifically, the association between exposure to sexually explicit online material and the perceived realism of such material was independent of adolescents' own sexual experiences. On the one hand, this may result from the fact that adolescents' sexual experience is limited. On the other hand, the lacking moderating influence of sexual experience may testify to the impact of the overwhelmingly consistent messages in sexually explicit material (Brosius et al., 1993), which generally constitutes an important condition of powerful media effects (e.g., Peter, 2004).

Practical implications

Speculations and worries abound regarding sexually explicit material on the Internet and how it relates to adolescents' sexual attitudes. Parents may feel overwhelmed by the question of how to deal with their children consuming sexually explicit material on the Internet; practitioners may observe effects of adolescents' exposure to sexually explicit online material and may want to know more about the underlying mechanisms. Our study tentatively shows that exposure to sexually explicit online material has broader ramifications. In contrast to several other potential predictors of recreational attitudes toward sex, such as ethnicity, relationship status, pubertal status, and sexual experience, it was exposure to sexually explicit online material that was, via the perceived realism of such material, related to those attitudes. We caution parents and practitioners against prematurely interpreting these findings in the sense that adolescents' exposure to sexually explicit online material causes recreational attitudes toward sex. Currently, we can only demonstrate that there is a relationship between adolescents' exposure and recreational attitudes.

However, it seems safe to say that the perceived realism of sexually explicit online material plays a key role in this relationship. There is meta-analytic evidence that, in a research setting, effects of exposure to sexually explicit material can be undone by reminding research participants of the staged nature of what is depicted in sexually explicit material (Allen, D'Alessio, Emmers, & Gebhardt, 1996). This is where concerned parents and practitioners could start. Educational attempts may emphasize that, although the sexual acting in sexually explicit material is real, the depicted social reality is not (for more information on this aspect, see Brosius et al., 1993; Cowan & Campbell, 1994). These educational attempts may focus on the degrading portrayal of women, the depiction of sex as readily available service, or the portrayal of sexuality as purely physical performance that ignores social and relational aspects of human

behavior. Clearly, we are only at the beginning of researching and understanding the implications of the role of sexually explicit online material in adolescents' lives. However, both from a theoretical and a practical perspective, more research on this issue is indispensable.

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