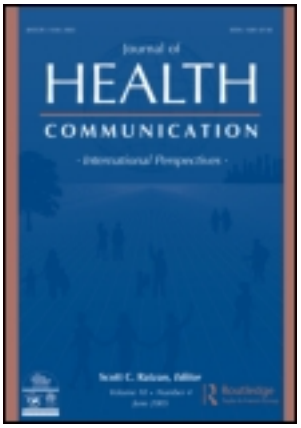

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The Influence of Sexually Explicit Internet Material on Sexual Risk Behavior: A Comparison of Adolescents and Adults

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This study had three goals: first, to investigate whether sexually explicit Internet material (SEIM) affects sexual risk behavior; second, to study whether these effects differ between adolescents and adults; and third, to analyze, separately for adolescents and adults, whether gender and age moderate an influence of SEIM on sexual risk behavior. The authors conducted a 2-wave panel survey among nationally representative random samples of 1,445 Dutch adolescents and 833 Dutch adults. SEIM use increased sexual risk behavior among adults, but not among adolescents. More specifically, moderator analyses showed that SEIM use increased sexual risk behavior only among male adults, but not among female adults. In the adolescent sample, no moderating gender effect occurred. Neither among adolescents nor among adults did age moderate the effects. Our study shows that SEIM may influence outcomes related to people's sexual health. It also suggests that male adults may present a potential risk group for adverse effects of SEIM.

Adolescents' sexual risk behavior, such as unsafe sex, is subject to various influences, ranging from psychological to social and cultural factors (e.g., DiClemente, Salazar, & Crosby, 2007; Kotchick, Shaffer, & Forehand, 2001). It is interesting to note that the media have received only little attention as a potential influence on adolescents' sexual risk behavior (Chandra et al., 2008; Wingood et al., 2003; Wingood et al., 2001). This lack of attention is particularly striking when it comes to sexually explicit Internet material (SEIM). Not only has evidence accumulated that many adolescents use SEIM (e.g., Brown & L'Engle, 2009; Peter & Valkenburg, 2006; Wolak, Mitchell, & Finkelhor, 2007). Recent longitudinal studies have also demonstrated that SEIM use affects adolescents' sexual attitudes as well as the initiation of sexual behavior (Brown & L'Engle, 2009; Peter & Valkenburg, 2008a, 2009).

The main goal of this study is to extend research on potential behavioral effects of SEIM by investigating whether SEIM use influences sexual risk behavior. In contrast to earlier studies, which were usually based on cross-sectional designs and convenience samples (Braun-Courville & Rojas, 2009; Carroll et al., 2008; Wingood et al., 2001), the present study is based on a longitudinal design and a representative

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sample. By SEIM, we mean professionally produced or user-generated (audio)visual material on or from the Internet that typically intends to arouse the viewer and depicts sexual activities and (aroused) genitals in unconcealed ways, usually with close-ups on oral, anal, and vaginal penetration. Sexual risk behavior refers to sex with casual partners without condoms. As studies have shown, many casual sexual partners and an inconsistent use of condoms are key components of sexual risk behavior (e.g., Aral, 2001; Eng & Butler, 1997).

Theoretical Background

There are two theoretical justifications that SEIM use may affect adolescents' sexual risk behavior. According to social cognitive theory (Bandura, 1986), people may learn sexual behavior from sexually explicit material because such material provides information about the rewards and punishments of sexual behavior (Seto, Maric, & Barbaree, 2001). Thus, when individuals perceive little punishment and considerable reward for a particular behavior in sexually explicit material, for example unsafe sex, they are likely to learn this behavior. Content analyses have shown that the depiction of the actors' gratification, typically the orgasm of the male actors, is a key characteristic of sexually explicit material (Brosius, Weaver, & Staab, 1993; Jensen & Dines, 1998), whereas negative consequences are virtually never portrayed. At the same time, safer sex is largely absent in sexually explicit material. As a recent content analysis of such material has demonstrated, actors used a condom in only 3% of scenes depicting penile-vaginal intercourse and in only 10% of scenes depicting penile-anal intercourse (Grudzen et al., 2009). Thus, social cognitive theory suggests that adolescents may learn unsafe sex from sexually explicit material.

A second theoretical justification for an effect of SEIM on adolescents' sexual risk behavior comes from developmental research. Adolescent sexual risk taking is often attributed to the still-developing sexual self, notably the curiosity, uncertainty, and sexual exploration that accompany this emerging sense of oneself as a sexual person (Breakwell & Millward, 1997; Brooks-Gunn & Graber, 1999; Buzwell & Rosenthal, 1996). Similarly, scholars have suggested that, as a result of sexual curiosity but limited sexual experience, many adolescents may not be able to understand the sexual reality portrayed in SEIM as a particular, pornographic representation of sex (Huston, Wartella, & Donnerstein, 1998; Thornburgh & Lin, 2002). As a result, adolescents may not only be prone to sexual risk taking, but they are also likely to be influenced in their sexual risk taking by SEIM.

Susceptible Teens—Unsusceptible Adults?

The developmental justification of an impact of SEIM on sexual risk behavior implicitly assumes that SEIM affects adolescents' sexual risk taking more strongly than adults' risk taking. However, this assumption has never been tested empirically. Several scholars have pointed out that much of our thinking about the effects of sexual media content follows an adult discourse of sex and sexuality (e.g., Bragg & Buckingham, 2009; Brown, Steele, & Walsh-Childers, 2002; Steele & Brown, 1995). In that discourse, adolescents are seen as uncritical and incompetent receivers of sexual media content. Adults, in turn, are implicitly associated with critical thinking skills and the competencies necessary to resist the influence of sexual media

content. Given the increased interest in the influence of SEIM on adolescents (Brown & L'Engle, 2009; Peter & Valkenburg, 2008a, 2009), it seems paramount to broaden the research perspective and compare whether SEIM affects adolescents and adults differently. Such a more encompassing approach to the effects of SEIM may not only help to put existing research on SEIM and adolescents in perspective, but it may also be relevant to theory formation and policymaking.

Several scholars have argued that a more encompassing approach to the effects of SEIM should include age and gender as potential moderators of the influence of SEIM on sexual risk behavior (e.g., American Psychological Association Task Force on the Sexualization of Girls, 2007; Peter, 2008; Ward, 2003). Because adolescence and adulthood are developmentally broad categories (e.g., Baltes, 1987; DeLamater & Friedrich, 2002; Lachman, 2004), such moderating effects are best investigated separately for adolescents and adults. A moderating effect of age is suggested by cognitive decision-making theories (Goldberg, Halpern-Felsher, & Millstein, 2002; Millstein & Halpern-Felsher, 2002b; Reyna & Farley, 2006). According to cognitive decision-making theories, a greater perceived risk and/or a lower perceived benefit of a risk behavior reduces the chance that people engage in the behavior. For adolescents, recent research has shown that younger adolescents perceive a greater risk of adverse health outcomes of risky sexual behavior than older adolescents do (Millstein & Halpern-Felsher, 2002a, 2002b). Similarly, research on sexually transmitted diseases (STDs) among older adults has suggested that many older adults may differ from younger adults in that they are either unaware of sexual risks (Lekas, Schrimshaw, & Siegel, 2005) or perceive the chance of adverse health outcomes of risky sexual behavior as low (Akers, Bernstein, Henderson, Doyle, & Corbie-Smith, 2007; Hillman, 2008). Thus, if a greater perceived risk of negative health outcomes of unprotected sex protects against the effects of SEIM on sexual risk behavior, SEIM may affect older individuals' sexual risk behavior more strongly than it affects younger individuals' behavior, both among adolescents and adults.

Scholars have also called for more attention to gender-contingent effects of sexual media content (American Psychological Association Task Force on the Sexualization of Girls, 2007; Ward, 2003). Sexual script theory (Gagnon & Simon, 1973) predicts a differential effect of SEIM on men's and women's sexual risk behavior. Sexual scripts refer to the sociosexual norms "that people use to guide and evaluate social and sexual interactions" (Rose & Frieze, 1993, p. 499). The dominant sexual script in Western culture attributes both to adolescent and adult men a recreational, physical, and pleasure-oriented approach to sexuality. In contrast, both adolescent and adult women are ascribed a rather relational, emotional, and person-oriented approach to sexuality (e.g., Bowleg, Lucas, & Tschann, 2004; DeLamater, 1987; Tolman, 2002).

Content analyses have shown that sexually explicit material portrays sex as primarily a physical and unaffectionate game between uncommitted partners (e.g., Brosius et al., 1993; Ertel, 1990; Jensen & Dines, 1998). The use of condoms does not seem to be compatible with the recreational, pleasure-oriented portrayal of sex in sexually explicit material (Grudzen et al., 2009). Compared with women, both adolescent and adult men may thus see a greater overlap between the dominant sexual script into which they have been socialized and the depiction of sex in sexually explicit material. As a result, men's sexual risk behavior may be more strongly affected by SEIM than women's sexual risk behavior.

Method

Sample and Procedure

We conducted a two-wave panel study among nationally representative samples of Dutch adolescents (aged 12–17 years) and Dutch adults (18 years of age and older). The first wave was fielded in May 2008; the second wave was fielded 6 months later, in November 2008. Before the study started, institutional approval and informed consent of all respondents were obtained. For minors, also parental consent was obtained. Respondents were randomly selected from an online pool of respondents administered by Veldkamp, a Dutch survey institute. At the start of the study, the respondent pool comprised 10,990 Dutch adolescents and 100,267 Dutch adults. In contrast to convenience online samples with their danger of self-selection biases, the pool of potential respondents was originally sampled randomly among the Dutch population and is continuously updated. In the Netherlands, more than 90% of the adults and 98% of adolescents have home Internet access (CBS, 2008). As a consequence, potential biases resulting from Internet access present hardly a problem for the representativity of the sample.

In the first wave, 2,092 adolescents and 1,266 adults were randomly contacted. The response rates was 84% ($N = 1{,}765$) among the adolescents, and 81% among the adults ($N = 1{,}026$), calculated according to the guidelines of the American Association for Public Opinion Research (2009). 1,445 adolescents and 833 adults also completed the questionnaire in the second wave, resulting in an attrition rate of 18% among adolescents and 19% among adults. Additional analyses indicated that those who completed both questionnaires did not systematically deviate from those respondents who dropped out after Wave 1. Thus, panel attrition did not reduce the generalizability of the findings.

Respondents were asked to fill in an online questionnaire. For sensitive issues, online surveys have been shown to be superior to other survey modes (Mustanski, 2001). Respondents were notified that the study was about sexual issues and that they could stop at any time they wished. Respondents were also told that the principal investigators had no chance to trace identifying information. Veldkamp only provided us with a unique number code for each respondent and did not link the answers to respondents' personal information. Filling in the questionnaire, which also included other measures and the questions irrelevant to this study, took about 15–20 minutes. The respondents received a voucher worth 5 euros for participation.

Measures—Key Variables

Use of SEIM

We asked respondents how often, in the 6 months before the interview, they had intentionally looked at (a) pictures with clearly exposed genitals; (b) video (clips) with clearly exposed genitals; (c) pictures in which people are having sex; (d) video (clips) in which people are having sex. The introduction of the question stated clearly that the items referred to sexually explicit, pornographic content on or from the Internet. Respondents were also informed that looking at such content did not require being online, but could refer to sexually explicit material downloaded from the Internet. Further, it was explained that genitals referred to the penis and the vagina and that "having sex" implied unconcealed vaginal, anal, or oral penetration.

Participants responded on a 7-point scale, as follows: 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*). This operationalization has successfully been used in a recent study (Peter & Valkenburg, 2006). In the adolescent and the adult sample and in Wave 1 and Wave 2, the items formed unidimensional scales, with a minimum explained variance of 88%. All Cronbach's alphas were at least .95 ($M_{\text{adolescents(t1)}} = 1.43$, $SD = 0.93$; $M_{\text{adults(t1)}} = 1.52$, $SD = 1.03$; $M_{\text{adolescents(t2)}} = 1.45$, $SD = 0.96$; $M_{\text{adults(t2)}} = 1.46$, $SD = 0.99$).

Sexual Risk Behavior

We asked the respondents: "How often in the past six months did you have sex with somebody that you did not know without using a condom?" Response categories were 1 (*never*), 2 (*once*), 3 (*2 times*), 4 (*3–5 times*), 5 (*6 times and more*) ($M_{\text{adolescents(t1)}} = 1.06$, $SD = 0.48$; $M_{\text{adults(t1)}} = 1.12$, $SD = 0.61$; $M_{\text{adolescents(t2)}} = 1.05$, $SD = 0.39$; $M_{\text{adults(t2)}} = 1.06$, $SD = 0.43$).

Gender

Men were coded 0 (adolescents: 51%; adults: 49), women were coded 1 (adolescents: 49%; adults: 51%).

Age

Respondents' age was computed for May 2008, the starting point of Wave 1. The mean age was 14.49 ($SD = 1.68$) in the adolescent sample, and 47.89 ($SD = 16.67$) in the adult sample.

Measures—Control Variables

Despite the robust analysis techniques we used, analyses of data from nonexperimental designs always run the risk of omitted variable bias. Therefore, we controlled for a number of alternative explanations of sexual risk behavior (Boyer et al., 2000; DiClemente et al., 2007; Kirby, 2002; Kotchick et al., 2001; Myers, Javanbakht, Martinez, & Obediah, 2003): sensation seeking, life satisfaction, attachment to friends, sexual orientation, relationship status, number of lifetime sex partners, and sexual risk behavior of friends.

Sensation Seeking

We used the Brief Sensation Seeking Scale (Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002). In earlier research (Peter & Valkenburg, 2008b), the experience-seeking items and the bungee-jumping item loaded on a different factor than the remaining five items of the scale. As a result, we operationalized the concept only with those five items (e.g., "I would love to have new and exciting experiences, even if they are illegal"). Responses were reported on a 5-point scale ranging from 1 (*applies completely*) to 5 (*does not apply at all*) and were reverse coded. The five items formed a unidimensional scale, both in the adolescent and the adult sample (explained variance 66% in the adolescent sample, Cronbach's $\text{alpha}_{\text{adolescents(t1)}} = .87$, $M_{\text{adolescents(t1)}} = 2.89$, $SD = 0.87$; explained variance 63% in the adult sample, Cronbach's $\text{alpha}_{\text{adults(t1)}} = .86$, $M_{\text{adults(t1)}} = 2.54$, $SD = 0.78$).

Life Satisfaction

This concept was operationalized with the 5-item Satisfaction With Life Scale (Diener, Emmons, Larsen, & Griffin, 1985). Responses were reported on a 5-point scale ranging from 1 (*applies completely*) to 5 (*does not apply at all*) and were reverse coded. Factor analyses revealed the unidimensionality of the scale for both samples (explained variance 66% in the adolescent sample, Cronbach's $\text{alpha}_{\text{adolescents(t1)}} = .87$, $M_{\text{adolescents(t1)}} = 3.47$, $SD = 0.74$; explained variance 72% in the adult sample, Cronbach's $\text{alpha}_{\text{adults(t1)}} = .90$, $M_{\text{adults(t1)}} = 3.48$, $SD = 0.79$).

Attachment to Friends

We operationalized this concept with four items from the inventory of parent and peer attachment (Armsden & Greenberg, 1987). We chose the four items with the highest factor loadings in a previous Dutch study based on the inventory (Van Ammers et al., 1998). The selected items were "When my friends know that something is bothering me, they ask me about it"; "I tell my friends about my problems and troubles"; "My friends help me to understand myself better"; and "When I am angry about something, my friends try to be understanding." Response categories ranged from 1 (*fully agree*) to 5 (*fully disagree*) and were reverse coded. In the adolescent sample and the adult sample, the items loaded on one factor (explained variance 72% in the adolescent sample, Cronbach's $\text{alpha}_{\text{adolescents(t1)}} = .87$, $M_{\text{adolescents(t1)}} = 3.47$, $SD = 0.81$; explained variance 75% in the adult sample, Cronbach's $\text{alpha}_{\text{adults(t1)}} = .89$, $M_{\text{adults(t1)}} = 3.24$, $SD = 0.83$).

Sexual Orientation

We geared our operationalization of respondents' sexual orientation toward the H-scale developed by Kinsey, Pomeroy, and Martin (1948). We asked respondents whether they felt sexually attracted 1 (*only to males*), 2 (*mainly to males, but also to females*), 3 (*equally to males and females*), 4 (*mainly to females, but also to males*), and 5 (*only to females*). We recoded the scale into a dichotomous variable with the categories 0 (*not exclusively heterosexual*) and 1 (*exclusively heterosexual*). Ninety-five percent of the adolescent sample and 91% of the adult sample were exclusively heterosexual.

Relationship Status

Singles were coded 0, people in a committed relationship (adolescents, adults) or registered partnership/ marriage (adults) were coded 1. Sixteen percent of the adolescents and 75% of the adults were in a relationship.

Lifetime Sexual Partners

Respondents were asked to indicate with how many different partners they had had sex so far($M_{\text{adolescents(t1)}} = 0.31$, $SD = 1.60$; $M_{\text{adults(t1)}} = 4.3$, $SD = 7.13$).

Friends' Sexual Risk Behavior

We asked respondents how often, in the past 6 months, they thought their friends had looked on the Internet for someone to have sex with. Respondents reported on a 5-point scale: 1 (*never*), 2 (*once*), 3 (*2 times*), 4 (*3–5 times*), 5 (*6 times and more*) ($M_{\text{adolescents(t1)}} = 1.22$, $SD = 0.61$; $M_{\text{adults(t1)}} = 1.29$, $SD = 0.62$).

Data Analysis

Our basic analysis strategy was to regress sexual risk behavior at Wave 2 on exposure to SEIM at Wave 1 and on sexual behavior at Wave 1, as well as on the control variables at Wave 1. The autoregressive component of the model (i.e., the control for previous levels of sexual risk behavior) reduces the chance of a spurious relation between the predictor and the outcome variable of interest. However, standard ordinary least squares (OLS) regressions were not suitable for our purpose because assumptions of OLS regression were not met: As Shapiro-Wilk tests revealed, our key variables, most of our control variables, and the pertinent residuals were not normally distributed, both in the adolescent and the adult sample. Further, the Breusch-Pagan/Cook-Weisberg test showed that, in both the adolescent and the adult sample, the residuals did not have a constant variance, that is, they were heteroscedastic. In such instances, OLS regressions may be inefficient and may lead to biased and inconsistent standard errors, often resulting in Type 1 errors (Cohen, Cohen, West, & Aiken, 2003).

As a consequence of these statistical complications, we decided to tackle the problems in our data with a two-step strategy.[1] First, to address the heteroscedasticity problem, we estimated our OLS models with the heteroscedasticity-consistent standard error HC3, following recommendations by Hayes and Cai (2007). Moreover, we bootstrapped the 95% confidence intervals for our estimates. In the bootstrapping method, a computer generates a series of samples by sampling cases, with replacement, from the original data set. Bootstrapping does not make assumptions about the distribution type of the variables or the sampling distribution of the statistic. As a result, bootstrapping produces more robust significance estimates than parametric tests when data violate assumptions of OLS regressions.

Second, to address the problem of our nonnormally distributed dependent variable in addition to the heteroscedasticity problem, we recoded our dependent variable in a dichotomous variable and ran logistic regressions. Logistic regression does not assume normally distributed variables and homoscedasticity, which may outweigh the loss of variance in dichotomizing our dependent variable. Testing our hypotheses thus in two steps, we accepted a particular finding only as statistically significant if the test with the heteroscedasticiy-consistent standard error and the bootstrapping test in the OLS regression as well as the logistic regression produced significant results.

Because our dependent variable was skewed, we also checked with the global influence measure Cook's D and the specific influence measure Dfbeta whether outliers unduly affected the model estimation in the OLS regression. In the logistic regression, we did the same with the Pregibon influence statistic. After inspecting each of the few cases that exceeded the specific cut-off values, we decided to remove

[1]Several other remedies were not applicable to our particular data. Data transformations, such as the log-transformation of skewed variables, often do not solve the problem of nonnormal distributions, in particular when interaction effects are investigated (Russell & Dean, 2000). Moreover, regression types designed for skewed dependent variables, such as Poisson and Tobit regression, were not useful because neither did we have a true count-data dependent variable (for Poisson regression, see Osgood, Finken, & McMorris, 2002) nor homoscedastic residuals (for Tobit regression, see Hutchinson & Holtman, 2005).

one case from the adolescent sample because of obvious misreporting. The number of cases in the adolescent sample thus dropped to 1,444 cases.

Results

Of the adolescents, 30.1% reported that they had intentionally watched sexually explicit material in the 6 months before the survey (Wave 1). Among adults, this percentage was nearly the same, with 30.4% reporting that they had done so (Wave 1; for detailed information on the various items, see Peter & Valkenburg, in press). Of the adolescents, 2.1% had had casual sex without using a condom in the 6 months before they were interviewed in Wave 2. Among adults, this percentage was 2.8% (Wave 2). Table 1 shows the zero-order correlations for the key variables of this study separately for adolescents (lower triangle, in bold) and adults (upper triangle). Among adolescents, the use of SEIM (Wave 1) was not significantly related to sexual risk behavior (Wave 2), $r = .05$, *ns.* Among adults, however, more frequent use of SEIM (Wave 1) was associated with more frequent sexual risk behavior (Wave 2), $r = .14$, $p < .001$.

Table 2 shows the results of the OLS regressions with heteroscedasticity-consistent standard errors (HCSE) and the bootstrap bias-corrected accelerated 95% confidence interval (bca 95% CI) in the adolescent sample. Table 3 displays the same results for the adult sample. The results of the logistic regressions are reported in the text. As Model 1 in Table 2 shows, no significant effect of SEIM use (Wave 1) on sexual risk behavior (Wave 2) occurred among adolescents, $B = -.009$, HCSE = .012, *ns*. The bootstrap bca 95% CI confirmed this nonsignificant result because it included zero, ranging from −.031 to .016 (Model 1, Table 2). The logistic regression also elicited a nonsignificant finding, with the odds ratio (OR) = .980, *ns*, and the 95% CI of the OR ranging from .658 to 1.459. In logistic regression, the CI indicates nonsignificance of the OR when it includes 1.

Among adults, the influence of SEIM use on sexual risk behavior was significant, $B = .044$, HCSE = .019, $p < .005$ (Model 1, Table 3). The bootstrap bca 95% CI confirmed this result as it did not include zero (.017/.090). The logistic regression also elicited a significant effect of SEIM use on sexual risk behavior, OR = 2.201, $p < .001$, 95% CI: 1.493/3.302. In conclusion, greater SEIM use in

Table 1. Zero-order correlations between the key variables, separately for adolescents and adults

	1	2	3	4	5
1. SEIM use (W1)	—	.09**	.14***	−.35***	−.08*
2. Sexual risk behavior (W1)	**.08****	—	.53***	−.06	.11**
3. Sexual risk behavior (W2)	**.05**	**.32*****	—	−.04	.10**
4. Female	**−.27*****	**−.02**	**.04**	—	−.09*
5. Age	**.17*****	**.05**	**.02**	**.00**	—

Note. The results for the adolescent sample appear in the lower triangle and appear in bold ($N = 1{,}444$). The upper triangle displays the results for the adult sample ($N = 833$).
*$p < .05$. **$p < .01$. ***$p < .001$ (two-tailed).

Table 2. Effect of SEIM use on adolescents' sexual risk behavior (Wave 2)

	Model 1		Model 2 Age-interaction model		Model 3 Gender-interaction model	
	B (HCSE)	bca 95% CI	B (HCSE)	bca 95% CI	B (HCSE)	bca 95% CI
SEIM use	−.009 (.012)	−.031/.016	.029 (.089)	−.128/.219	−.013 (.013)	−.036/.014
Sexual risk behavior	.248 (.097)*	.095/.468	.248 (.098)*	.086/.459	.248 (.097)*	.087/.450
Female	.007 (.021)	−.030/.054	.006 (.021)	−.033/.046	−.033 (.044)	−.118/.048
Age	.002 (.005)	−.008/.010	.005 (.010)	−.014/.024	.001 (.005)	−.009/.012
Sensation seeking	−.007 (.013)	−.032/.015	−.006 (.012)	−.033/.014	−.007 (.012)	−.032/.016
Life satisfaction	.019 (.014)	−.000/.058	.019 (.014)	−.002/.052	.019 (.014)	−.003/.055
Attachment	−.005 (.016)	−.041/.022	−.006 (.016)	−.041/.022	−.005 (.016)	−.040/.022
Heterosexual orientation	−.054 (.055)	−.215/.014	−.055 (.056)	−.210/.015	−.049 (.056)	−.255/.024
In a relationship	−.003 (.023)	−.042/.046	−.003 (.023)	−.040/.049	−.004 (.023)	−.042/.051
Number of lifetime sex partners	.003 (.008)	−.026/.027	.003 (.009)	−.028/.027	.004 (.008)	−.025/.025
Sexual risk behavior friends	.020 (.026)	−.075/.022	−.020 (.026)	−.077/.023	.020 (.026)	−.079/.024
Age × Exposure SEIM			−.003 (.006)	−.015/.008		
Gender × Exposure SEIM					.032 (.036)	−.033/.108
Constant	.891 (.242)		.842 (.287)		.888 (.242)	
ΔR^2			.000		.000	
R^2	.101		.101		.101	

Note. SEIM = sexually explicit Internet material, HCSE = heteroscedasticity-consistent standard error (HC3), bca 95% CI = bootstrap bias-corrected accelerated 95% confidence interval (1,000 bootstrap samples, $N = 1{,}444$ each). All predictors were measured at Wave 1.

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

Table 3. Effect of SEIM use on adults' sexual risk behavior (Wave 2

	Model 1		Model 2 Age-interaction model		Model 3 Gender-interaction model	
	B (HCSE)	bca 95% CI	B (HCSE)	bca 95% CI	B (HCSE)	bca 95% CI
SEIM use	.044 (.019)*	.017/.090	−.048 (.086)	−.254/.073	.052 (.022)*	.019/.103
Sexual risk behavior	.355 (.106)**	.181/.573	.353 (.106)**	.185/.576	.353 (.106)**	.118/.572
Female	.033 (.025)	−.006/.089	.033 (.025)	−.007/.090	.105 (.049)*	.024/.213
Age	.001 (.001)	−.000/.004	−.001 (.003)	−.007/.002	.001 (.001)	−.000/.003
Sensation seeking	.012 (.024)	−.021/.079	.012 (.024)	−.018/.082	.014 (.024)	−.019/.080
Life satisfaction	.019 (.018)	−.009/.056	.019 (.018)	−.010/.059	.019 (.018)	−.007/.056
Attachment	−.029 (.024)	−.084/.007	−.028 (.023)	−.089/.009	−.030 (.024)	−.086/.007
Heterosexual orientation	.084 (.044)	.013/.190	.084 (.044)	.016/.191	.082 (.043)	.027/.197
In a relationship	−.107 (.051)*	−.224/−.025	−.104 (.050)*	−.220/−.026	−.103 (.051)*	−.222/−.026
Number of lifetime sex partners	−.003 (.002)	−.009/.000	−.004 (.002)	−.010/−.000	−.003 (.002)	−.009/.000
Sexual risk behavior friends	.056 (.040)	−.155/.003	.061 (.039)	−.156/.001	.057 (.040)	−.148/.003
Age × Exposure SEIM			.002 (.002)	−.001/.007		
Gender × Exposure SEIM					−.056 (.025)*	−.113/−.016
Constant	.796 (.328)		.945 (.346)		.786 (.326)	
ΔR^2			.001		.002*	
R^2	.311		.312		.313	

Note. SEIM = sexually explicit Internet material, HCSE = heteroscedasticity-consistent standard error (HC3), bca 95% CI = bootstrap bias-corrected accelerated 95% confidence interval (1,000 bootstrap samples, $N = 833$ each). All predictors were measured at Wave 1.

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

Wave 1 increased risky sexual behavior at Wave 2 among adults, but not among adolescents.[2]

We expected that, in the adolescent sample and the adult sample, the effect of SEIM use on sexual risk behavior would be greater among older individuals than among younger individuals. To investigate this, we added an interaction term between age and SEIM use (Wave 1) to the model (see Model 2, the age-interaction model, in Tables 2 and 3). Because Hayes (2005) has shown that the centering of variables in interaction effects in multiple regressions is often ineffective, we did not center the variables that constitute the interaction term. Neither in the adolescent sample, $B = -.003$, HCSE = .006, *ns* (bca 95% CI: −.015/.008; Model 2, Table 2), nor in the adult sample, $B = .002$, HCSE = .002, *ns*, (bca 95% CI: −.001/.007; Model 2, Table 3), did a significant interaction effect between age and SEIM use occur. When we ran logistic regressions, we obtained the same results for the adolescent sample, OR = .942, *ns*, 95% CI: .747/1.187, and for the adult sample, OR = .996, *ns*, 95% CI: .769/1.021.

We also expected that SEIM use would more strongly influence male sexual risk behavior than female sexual risk behavior. Among adolescents, no significant interaction effect between gender and SEIM use emerged (see Model 3, the gender-interaction model, in Table 2), which was also confirmed in the logistic regression, OR = 1.770, *ns*, 95% CI: .749/4.181. Among adults, however, gender did moderate the effect of SEIM use on sexual risk behavior, $B = -.056$, HCSE = .025, $p < .05$ (bca 95% CI: −.113/−.016; Model 3, Table 3). This was supported in the logistic regression, OR = 1.43×10^{-24}, $p < .05$, 95% CI: 2.23×10^{-24}/.009. Post-hoc probing of the OLS regression results showed that SEIM use increased sexual risk behavior among male adults, $B = .052$, HCSE = .022, $p < .005$. Among female adults, SEIM use did not affect sexual risk behavior, $B = -.004$, HCSE = .045, *ns* (for an elaboration on post-hoc probing and relevant formulas, see Aiken & West, 1991).[3]

Discussion

To date, little research has investigated the influence of SEIM on sexual risk behavior. Further, adolescents are often considered more susceptible to the effects of

[2]Sexual risk behavior may not only be a consequence of exposure to SEIM, but also an antecedent. Individuals who have engaged in sexual risk behavior may be more likely to use SEIM as this material may reflect their sexual preferences better than other sexual media content. To test this possibility, we ran—separately for adolescents and adults—the same OLS regression model with heteroscedasticity-consistent standard errors and bca 95% CIs as described earlier with exposure to SEIM as the dependent variable. Among adults, sexual risk behavior (Wave 1) did not affect exposure to SEIM (Wave 2), $B = .047$, HCSE = .049, *ns*, (bca 95% CI: −.033/.182). Among adolescents, sexual risk behavior (Wave 1) negatively predicted exposure to SEIM (Wave 2), $B = -.126$, HCSE = .059, $p < .05$, (bca 95% CI: −.239/−.014). Thus, the less often adolescents engaged in sexual risk behavior, the more likely they were to use SEIM.

[3]It is plausible that our results may also be moderated by people's relationship status. Therefore, we ran the interaction-effect models with an interaction effect between relationship status (Wave 2) and SEIM use (Wave 1). No significant interaction effect emerged, neither among adolescents, $B = .028$, HCSE = .036, *ns* (bca 95% CI: −.019/.127), nor among adults, $B = .049$, HCSE = .050 (bca 95% CI: −.033/.174). Researchers should replicate this finding with bigger samples to preclude that power issues affected our results.

SEIM than are adults, but this assumption has never been tested. Last, it is unclear whether potential effects of SEIM depend on gender and age. This study is one of the first to relate SEIM use to people's sexual health. The study has shown that SEIM use did not affect adolescents', but adults' sexual risk behavior. In the adolescent and the adult sample, the influence of SEIM was unrelated to people's age. In the adult sample, however, this influence depended on gender: SEIM increased sexual risk behavior among adult men, but not among adult women.

While our study awaits replication, our findings suggest that adults, and not adolescents, present a potential risk group for an influence of SEIM on sexual risk behavior. This result dovetails with recent research on differences between adolescents and adults in risk perceptions. Several studies have shown that adolescents perceive a higher risk of experiencing adverse sexual health outcomes than adults do (Boone et al., 2003; Millstein & Halpern-Felsher, 2002a). This counterintuitive difference in risk perceptions between adolescents and adults may result from accumulated nonnegative experiences with sexual risk behavior (Reyna & Farley, 2006), notably the absence of adverse outcomes, such as STDs or unwanted pregnancies. Previous experience with sexual risk behavior was the strongest predictor of sexual risk behavior both among adolescents and adults (see Tables 2 and 3). Consequently, nonnegative experiences with sexual risk behavior are more likely to have accumulated among adults than among adolescents. In turn, these accumulated experiences may render adults less critical of the depiction of unsafe sex in SEIM and, ultimately, more susceptible to its influence. To investigate this idea further, future research may study whether previous adverse experiences with sexual risk behavior may moderate the effects of SEIM.

The result that SEIM affected sexual risk behavior among male adults, but not among female adults, resonates with sexual script theory (e.g., Bowleg et al., 2004; DeLamater, 1987; Tolman, 2002). The depiction of sex in SEIM, notably unsafe sex, merges with the dominant sexual script for men, which focuses on recreation and pleasure, while it contradicts the dominant script for women, which focuses on emotions and relationships. Hence, men may accept the messages in SEIM about safe sex more easily than women do. It is interesting to note that gender only moderated the effect of SEIM on sexual risk behavior among adults, but not among adolescents. Two explanations are possible. First, variance in sexual risk behavior was slightly lower among adolescents than among adults. Consequently, it may have been more difficult to detect effects of SEIM on sexual risk behavior among adolescents than among adults. Second, adolescents' and adults' sexual scripts may differ. There is tentative evidence that Dutch young people no longer strictly follow the traditional juxtaposition of desire guiding male sexual behavior and emotion and relationship concerns guiding female sexual behavior (Peter & Valkenburg, 2010). As a result, male and female adolescents may be more similar in their interpretation of SEIM than male and female adults, which diminishes the chance of gender moderating the influence of SEIM on sexual risk behavior.

Our study calls for an extension and differentiation of research on the effects of SEIM. We need to extend research by including sexual health as an additional outcome variable. Traditionally, the majority of studies on the effects of sexually explicit material on adults have dealt with sexual violence (Kingston, Malamuth, Fedoroff, & Marshall, 2009). Our study shows that SEIM may also affect people's sexual health. In that respect, it is important that adults not be neglected as a potential risk group. Similar to recent research on STDs and HIV that shows that adults

frequently have unsafe sex (Akers et al., 2007; Hillman, 2008), we found that adults, particularly men, may not be immune against the influence of SEIM on sexual risk behavior.

We need to differentiate research on the effects of SEIM by paying more attention to the difference between sexual health and healthy sexuality. This applies particularly to research among adolescents. Broadly speaking, SEIM has been shown to influence primarily aspects related to healthy sexuality among adolescents, such as sex-related attitudes and emotions (e.g., Peter & Valkenburg, 2008a, 2009). However, when it comes to sexual risk behavior and, thus, sexual health, other factors than SEIM may be more influential. Distinguishing effects of SEIM along the lines of healthy sexuality and sexual health may help us to develop a more nuanced view on what the use of SEIM means for adolescents' sexual development.

Our study suffers from some shortcomings that may limit its generalizability. First, the study was done in the Netherlands, a country with a liberal approach to (adolescent) sexuality. Notably, sexual initiation in adolescence is seen as developmentally appropriate and normal and contraceptives are easily available for adolescents. Our findings may look different in countries where this is not the case. Second, our data at Wave 1 are not a true baseline because our respondents, adults in particular, may have engaged in sexual risk behavior before Wave 1. Therefore, our results must not be interpreted in the sense that exposure to SEIM caused, or led to, sexual risk behavior. Third, the sizes of the effects found were small. This is common in media effects research and points to other factors that influence sexual risk behavior. Last, we encourage future researchers to conceive of the effects found as indirect rather than direct. Concepts such as perceived own vulnerability, attitudes toward condoms, and perceived norms of sexual risk behavior may be theoretically interesting and practically relevant mediators of the effects of SEIM on sexual risk behavior that we found.

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