

It Works Both Ways: The Relationship Between Exposure to Sexual Content in the Media and Adolescent Sexual Behavior

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Using a longitudinal Web-based survey of adolescents 14–16 years of age, we estimate regression models where self-reported sexual behavior and content analytic-based exposure to sex in the media are related cross-sectionally and longitudinally. We find evidence for both cross-sectional nonrecursive and prospective longitudinal relationships even after adjusting for both established predictors of sexual behavior (e.g., physical development, having a romantic partner, parental monitoring, peer and parental norms, respondent's age) and of exposure to sexual media content (e.g., time the respondent goes to bed, extracurricular activities, television in the bedroom, total time spent with television, music, video games, and magazines). Sexually active adolescents are more likely to expose themselves to sex in the media and those exposed to sex in the media are more likely to progress in their sexual activity. These findings are consistent with others in the literature that demonstrate a causal effect of exposure to sexual content on sexual behavior but extend established results by also looking at the causal effect of sexual behavior on exposure both cross-sectionally and over time.

The nature of the relationship between exposure to sexual content in the media and adolescent sexual development has not been clearly established. On an average day, youth use media almost 6.5 hours (Roberts, Foehr, & Rideout, 2005), thus media are clearly a considerable presence in their lives. Moreover, sexual content in television is well documented (Kunkel,

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Eyal, Finnerty, Biely, & Donnerstein, 2005) despite conflicting views about patterns of change in such content over time (Hetsroni, 2007). Media have the potential to shape or reinforce adolescents' notions of sex and sexuality during this important time in their social and sexual development (Ward, 2003).

Previous research investigating media exposure and sexual behavior has assumed that exposure to sexual content is a *precursor* to sexual behavior (Brown et al., 2006; Collins et al., 2004; Martino et al., 2006), but it is both plausible and likely that there is a *nonrecursive* (i.e., *simultaneous*) relationship between sexual content exposure and sexual behavior: Sexually active youth and adolescents interested in sex may selectively expose themselves to more sexual content in the media and this exposure may, in turn, lead to an increase in sexual activity. A nonrecursive relationship is one in which the variables of interest, in this case *exposure to media sexual content* and *sexual activity*, are specified as both causes and effects (Kline, 2005); another way of describing this relationship is as a "reinforcing spiral" (Slater, 2007). Throughout this article, we refer to the nature of the hypothesized relationship between sexual content exposure and sexual activity as nonrecursive, but the terms "simultaneous" (Kennedy, 2003, chap. 10), "nonrecursive" (Duncan, 1975), and "feedback loop" (Loehlin, 1998) are typically used interchangeably throughout the research literature.

HOW EXPOSURE TO SEXUAL CONTENT MAY INFLUENCE SEXUAL ACTIVITY

A number of theories have been proposed to explain why and how media affect behavior. Bandura (1997; Bandura, Ross, & Ross, 1963) argues that whereas all children learn from media, learning is more likely to be translated into behavior when: a) the role model is similar to the viewer (e.g., gender matched), b) the behavior and/or context are "realistic" (i.e., similar to real life), c) the role model is attractive, and d) the behavior is positively reinforced. Thus, social cognitive theory (Bandura, 1977, 1997) suggests that adolescents seeing other adolescents in media enjoying sexual behavior with no negative consequences have an increased probability of observational learning and behavioral imitation. Research suggests that this process take place through processes of "priming" and/or acceptance of sexual stereotypes and schemas (Eggermont, 2004; Hansen & Krygowski, 1994; Martino et al., 2006; Ward, 2003; Ward & Friedman, 2006).

The theories of Reasoned Action (Fishbein & Ajzen, 1975) and Planned Behavior (Ajzen, 1991) provide a theoretical mechanism for the effects of media sexual content on behavior. According to these theories, the underlying behavioral and normative beliefs that guide behaviors are learned

from direct experience or significant others. Children and adolescents, who may not all have first hand sexual experience, learn and make inferences about sex and relationships from media. If sexual portrayals in media shape adolescent beliefs, attitudes, and perceived norms about sex and sexual behavior, then sexual portrayals will influence the adolescents' intentions to engage in various sexual behaviors. These intentions are the primary predictors of actual behavior.

Consistent with both explanations is the assumption that media give normative guidance for adolescents around issues of sex and sexuality in the same way that a friend does. Some research supports the idea that the media act as a "super peer" and are sources of information about sex when or if adolescents are unable to learn from their peer group (Brown, Halpern, & L'Engle, 2005). Another study shows that using friends, media, or both as sources of information about sex is associated with increased self-efficacy for having sex (Bleakley, Hennessy, Fishbein, & Jordan, 2009). Thus, adolescents may turn to the media, as they do their friends, to gauge social norms around sex as well as for more "practical information" (e.g., "how-to" articles in magazines) about overcoming barriers associated with sexual activity.

Research provides some empirical support for a causal effect of exposure to sexual content on sexual initiation. Narrative summaries on media effects and literature pertaining to adolescent sexual attitudes and behavior are provided by Ward (2003), Escobar-Chaves et al. (2005), and Annenberg Media Exposure Research (2008). Here we summarize a few of the more important recent articles. Using a national sample of 12–17 year old adolescents, Collins et al. (2004) found that watching sex on television predicted sexual initiation and advanced sexual activity one year later. Brown and colleagues (2006) report similar findings in a sample of youth ages 12 to 14 years from public schools in North Carolina; they found that among White adolescents high exposure to sexual content in music, movies, television, and magazines predicted precoital sexual activity and sexual intercourse two years after the adolescents were first interviewed. Additionally, Martino et al. (2006) showed that listening to music with degrading sexual lyrics (when compared to nondegrading sexual content) hastened sexual initiation and resulted in more advanced precoital activity. These studies, however, did not assume any feedback between exposure and sexual behavior. However, when Kim et al. (2006) examined predictors of exposure to sexual content among adolescents, they observed initial evidence for a nonrecursive relationship with their finding that noncoital sexual experience predicted exposure to sexual content. Their interpretation of this finding led them to speculate on the appropriateness of a nonrecursive relationship. Like the other studies cited, however, they did not estimate any simultaneous effects between sexual behavior and media exposure.

HOW SEXUAL ACTIVITY MAY INFLUENCE SEXUAL CONTENT EXPOSURE

The “uses and gratifications” paradigm in communication research provides a framework for understanding how sexual activity might affect exposure to sexual content (Katz, Blumler, & Gurevitch, 1974). From this perspective, the dependent variable of interest is a *communication* behavior (i.e., media use), as opposed to a *health* behavior (i.e., sexual initiation). One of the assumptions of the uses and gratifications approach is that media use is purposive and motivated: people are active audience members who select specific media and use it to satisfy their needs, interests, and/or desires. Although uses and gratifications is not so much an explanatory theory as much as it is a research hypothesis, there is a body of literature that supports the incorporation of its tenets into media effects research (Rubin, 2002).

As applied to sexual content, sexually active youth may intentionally seek out sexual content in their media. The reasons why they expose themselves to sexual content may vary, ranging from information gathering to seeking normative validation for their behavior. Sexually active youth also may be more interested in media sex because of other social or environmental factors such as communication with friends or family members about sex, or about sex in the media. The idea of sexually active youth using sexual content in media to “gratify” their needs is also consistent with the behavioral theories outlined earlier.

In summary, it is plausible that media exposure to sexual content shapes beliefs about sex that ultimately lead to adolescent sexual activity and that sexual activity, in turn, shapes media use. Slater (2007) has more recently outlined the theoretical justification for nonrecursive relationships as an approach to media effects research. He argues that “the fullest and most accurate depiction of a media effects process can typically be modeled by assessing both selectivity and effects within the same analysis” (p. 282). We know of no studies that examine whether such a nonrecursive relationship exists between adolescent exposure to sexual content and adolescent sexual activity. In this study, we estimate a structural model that assumes a nonrecursive relationship between sexual content exposure and adolescent sexual activity and present results that provide an initial test of a hypothesis of simultaneous effects.

ANALYTIC MODEL

Figure 1 shows the generic model proposed here. It includes a nonrecursive relationship between sexual media content exposure and sexual behavior at Time 1 and a longitudinal component of Time 1 sexual behavior predicting exposure at Time 2, and exposure to sexual media at Time 1 predicting

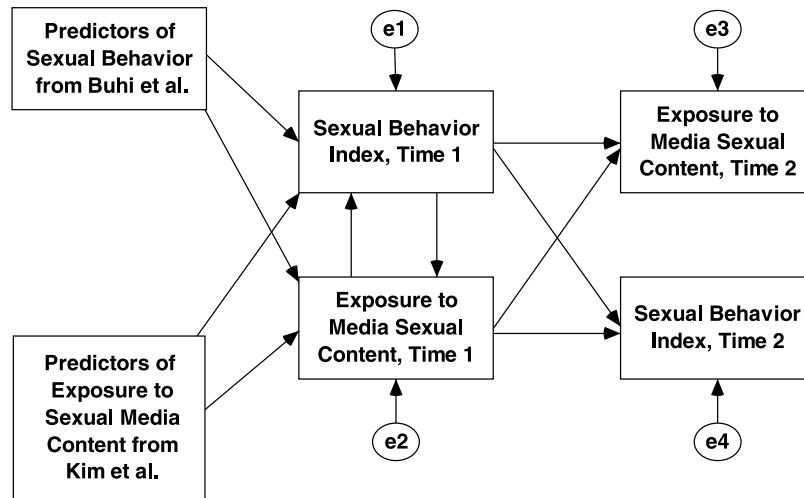


FIGURE 1 Generic two stage least squares model of sexual behavior and exposure to media sexual content. *Note.* For clarity, correlations between exogenous variables and between endogenous error terms not shown.

sexual behavior at Time 2. The generic model also includes the lagged endogenous exposure and sexual behavior variables at Time 1 predicting the same outcome at Time 2. The exogenous variables for the equation predicting sexual behavior are identified using the theoretical review of Buhi and Goodson (2007). For predicting exposure to sexual media, we relied primarily on Kim et al. (2006) among others, though there are a few exogenous predictors that are shared by both the equation for sexual behavior and the equation for exposure to sexual media. The error terms e1 through e4 are assumed to be mutually correlated within and across the two time periods because correlated errors are a necessary feature of nonrecursive models and there is also serial correlation between the errors due to the repeated measures. The rationale for the predictors in each equation follows.

Equation 1: Predicting Sexual Activity at Time 1

We included the following variables as predictors of sexual activity: parental monitoring/supervision, parental approval of sex, peer approval of sex, physical development or maturity, relationship status, and respondent age. Buhi and Goodson (2007) reviewed predictors of adolescent sexual behavior and intention from 69 studies. In their review, they conclude that studies consistently found that parental monitoring/supervision was associated with protective effects on a variety of sexual behaviors (e.g., later initi-

ation, fewer sex partners). Perceived parental attitudes toward sex (e.g., disapproval of sex) were also associated with more favorable behavioral outcomes (e.g., lower occurrence of sexual intercourse). Similarly, perceived peer disapproval of sex weakened intentions to have sex and delayed initiation. Previous research investigating the effects of exposure to sexual content in media showed significant associations between sexual behavior and physical development or maturity (Brown et al., 2006) as well as sexual behavior and religion and parental education (Brown et al., 2006; Collins et al., 2006). In our data, however, religiosity and parental education were excluded from the prediction equation due to near zero correlations with sexual activity.

Equation Two: Predicting Exposure to Sexual Content in Multiple Media at Time 1

Using a national sample of adolescents, Kim et al. (2006) examined how psychosocial characteristics, sexual attitudes and experiences, and household television policies were related to the amount of sexual content on television to which adolescents were exposed. They found that exposure to sexual content was predicted over time by friends' approval of sex, unsupervised time after school, participation in sports after school, average television viewing time, having a television in the bedroom, and precoital sexual activity. These relationships were statistically significant after controlling for several demographic variables (e.g., age, race, gender) that were associated with increased exposure to sexual content. Motivation to learn from television and active viewing of television, both constructs of viewer involvement, were also related to increased exposure to sexual content. Unfortunately, we did not have measures of viewer involvement in our survey.

Our sexual content exposure equation expands the model of Kim et al. (2006). First, we include a measure of perceived parental disapproval of sexual intercourse. As noted above, studies have shown the protective effects of parental disapproval on *sexual activity* but it is unknown how this normative belief concerning parents' disapproval might operate on *exposure to sexual content*. Second, we did not limit our participation in after school activities solely to sports. Instead we created a count of the number of extracurricular activities in which adolescents participated. In addition, we include average weekly bedtime as a predictor based on studies that show bedtime associated with increased time spent with media (Eggermont & Van den Bulck, 2006; Van den Bulck, 2004). Finally, since our study focuses on exposure to sex in *multiple media* as opposed to only television, we include a measure of total time engaged with four media (i.e., watching television, reading magazines, listening to music, and playing video games). Details on the specific measures are discussed below.

METHODS

The Annenberg Sex and Media Study

The Annenberg Sex and Media Study (ASAMS) is a five-year study that includes a three-wave longitudinal survey of youth 14–16 years of age at recruitment. Formative research informed the survey instrument, which included sections on a) media use; b) subjective judgments of the amount and quality of sexual content in television, movies, music, magazines, and video games; c) potential moderator variables; d) prior sexual behavior; and e) the psychosocial determinants (i.e., behavioral, normative, and control beliefs, attitudes, perceived norms, and self-efficacy) of the adolescents' intentions to engage in (or abstain from) sexual intercourse. ASAMS also included a content analysis of television shows, music, magazines, movies, and video game titles. The content analysis was designed to capture the breadth of sexual content in the media listed above; details on the content analysis sample and ratings are described below.

Study Design

We conducted a Web-based survey with a quota sample of youth from the greater Philadelphia area. The first wave of data collection occurred in the spring and summer of 2005; Wave 2 occurred one year later in the spring and summer of 2006. Adolescents were recruited through print and radio advertisements, direct mail, and word of mouth to complete the survey. Eligibility criteria for the initial survey included age at the time of the survey (14, 15, or 16) and race/ethnicity (White, African American, or Hispanic). We used a quota sampling design in an attempt to achieve equal strata of adolescents by age, gender, and race. Written parental consent and teen assent were collected for all participants and study protocols were approved by the University of Pennsylvania Internal Review Board.

The Web-based survey was accessible from any computer with Internet access. Participants were given the option of taking the survey at the university or an offsite location (e.g., home, school, or community library). The majority of the participants at Wave 1 (84.9%) took the survey at home or another offsite location; 15.1% took the survey at the university. Enrolled adolescents were given a password to access the survey as well as an ID number and personal password to ensure confidentiality and privacy protection. On average, adolescents took one hour to complete the survey and were given compensation of \$25.

After submitting participant assent/parental consent forms, 547 adolescents successfully completed the survey at Wave 1. The sample was 40.4% male and 42.7% African American, 41.2% White, 13.4% Hispanic, and 2.8% other. The mean participant age was 15 years ($SD = 0.81$) and approximately

40% of respondents' mothers graduated from college. Of the 547 adolescents from Wave 1, 501 were retained at Wave 2, resulting in a retention rate of 92%. Thus, the final study sample for this analysis is comprised of the 501 adolescents with completed surveys at both Time 1 and 2. Forty-two percent of the final sample were African American, 38.3% were male; 33.1% were 15 years of age, 34.7% were 16 years of age, and 32.1% were 17 years of age.

Measures

Dependent variable: index of adolescent sexual activity. We used a count measure of adolescent sexual behavior that was based on lifetime sexual experience for seven behaviors (Hennessy, Bleakley, Fishbein, & Jordan, 2008). Respondents were asked to indicate how often (lifetime, more than a year ago, or within the past year) they engaged in the sexual behaviors listed in Table 1. Each behavior was dichotomized into lifetime experience to create a set of seven dichotomies that were scaled using Mokken (1971) procedures. The Loevinger's H coefficient indicates the extent to which respondents can be ordered based on the marginal proportions of the set of dichotomous items. As Ringdal et al. (1999) summarize, "... H is interpreted as an index for the degree to which subjects can be accurately ordered by means of k items" (p. 27) and a value of 0.5 or more is considered a strong scale (see also Mokken, 1971). The fit of our sexual behavior index is excellent: Loevinger's H is .70 or above for both genders. These dichotomous sexual behaviors were also scaled using a correlational definition of unidimensionality. The KR20 coefficients are .84 and .85 for

TABLE 1 Mokken (1971) Scaling Results for Sex Behavior Dichotomies

Sexual behavior	Time 1		Time 2	
	Males ($N = 217$)	Females ($N = 315$)	Males ($N = 185$)	Females ($N = 298$)
Deep kissing	67%	69%	74%	80%
Touching breasts	61%	NA	66%	NA
Breasts touched	NA	63%	NA	71%
Genital touching	56%	54%	54%	52%
Oral sex, receive	27%	32%	38%	39%
Vaginal sex	26%	28%	39%	39%
Oral sex, give	20%	22%	24%	33%
Anal sex, receive	NA	5%	NA	9%
Anal sex, give	16%	NA	13%	NA
Loevinger's H	0.70	.83	0.71	0.85
KR20	0.84	.85	0.83	0.84
Scale mean (SD)	2.76 (2.22)	2.74 (2.12)	3.52 (2.26)	3.59 (2.30)

Notes. NA: not applicable. The percentages represent males or females at Times 1 and 2 that reported having engaged in the above sexual behaviors at any point in their lifetime.

male and female respondents, respectively; KR20 is similar to Cronbach's alpha but is appropriate for dichotomous items (Streiner, 2003). The scaling results for Time 2 are similar (see Table 1).

As shown in Table 1, the resulting scale orders the behaviors from least to most difficult into a progression of sexual activity that occurs in the following sequence: kissing, touching breasts (for females, having breast touched), genital touching, receiving oral sex, vaginal intercourse, giving oral sex, and giving anal sex (for females, receiving anal sex). Thus, a score of 0 indicates that an adolescent did not engage in any of the sexual behaviors; a score of 3 suggests having engaged in kissing, touching breasts/having them touched, and genital touching; and a score of 7 assumes experience with all seven behaviors. However, in Year 2 for males, the order of receiving oral sex and reporting vaginal sex is reversed compared with Year 1; the order of the behaviors is consistent across data collection points for females. In spite of the single category reversal over time for males, the correlations between the sex indexes at Time 1 and Time 2 are high: for males it is .82 ($p < .05$) and for females it is .85 ($p < .05$), indicating good test-retest reliability.

Dependent variable: exposure to sexual content in multiple media. A measure of exposure to sexual content in multiple media was calculated based on two types of variables: respondents' exposure to selected media titles in four media (i.e., television, music, magazines, and video games) and a rating of sexual content in each of the media titles generated by content analysis. Using an ordinal measure of exposure on a 4-point scale (*never, rarely, sometimes, often*) adolescents indicated how frequently within the last 12 months they watched each show, listened to each artist, read each magazine, and played each video game. The lists of media titles were constructed to reflect popular titles for teenagers and the general public at the time of the survey. Popular titles were provided by Web site rankings (including: www.top5s.com/tvweek; www.boxofficemojo.com; www.imdb.com/boxoffice/rentals; www.billboard.com; www.gamerankings.com) and from an audience research company (TRU data), as well as pilot surveys conducted in the year prior to the administration of the baseline survey. The titles were designed to provide a sense of the depth and breadth of media use by teens, although we recognized that they could not possibly capture all that teens viewed, played, heard, or read. To that end, we included opportunities for respondents to write in their "favorite" title for each medium.

From the survey data, we identified the most commonly used titles among distinct gender (male/female) and racial groups (Black/White) for the content analysis. For each title identified, the sample included three randomly selected television episodes (from the 2004–2005 season for Year 1 and from the 2005–2006 season for Year 2), three randomly selected magazine issues from the 12 months prior to the survey (September 2004 through August 2005 for Year 1, September 2005 through August 2006 for Year 2), the three most popular songs for artists in the previous year (same month/year parameters

as magazine sample for Years 1 and 2), and the 90 minutes of game play for the video game). The unit of analysis was the television episode, the song, 90 minutes of recorded video game play, and the magazine issue. The sexual content variables were developed according to the Integrated Model and were informed by prior content analyses of sexual content (Kunkel et al., 2005). Codebooks were unique to media, however the same variables were assessed across media. The number of titles coded for each media in Year 1 is as follows: 29 television shows, 26 music artists, 4 video games, and 15 magazines. In Year 2, the coded titles included 52 television shows, 31 music artists, 26 video games, and 14 magazines.

A team of undergraduates was trained over the course of an academic year to recognize and code the variables. Interrater agreement was calculated and only variables achieving a minimum of 75% agreement were used in analysis. For the present study, the rating of "overall sex content" was defined as the prevalence of sexual talk and behavior within the media unit. Coders were asked to indicate if there was *none/a little* (1), *some* (2), or *a lot* (3). Interrater agreement on this measure was 83.3%; the Kappa coefficient was .75.

To calculate the sexual content exposure measure, the cross product of a respondent's reported exposure measure and the content analysis based sexual content rating for each title was summed within each type of media, resulting in sexual content exposure measures specific to television, music, magazines, and video games. The total (multiple media) sexual content exposure measure was created by summing the four media specific measures. The correlation between total media exposure in Year 1 ($M = 56.71$, $SD = 27.74$) and Year 2 ($M = 58.01$, $SD = 28.84$) is $r = 0.69$ ($p < .01$). In the final analysis, we standardized the exposure measures since there were different numbers of titles in Years 1 and 2.

Exogenous predictors of sexual activity. The following variables were included in the prediction of sexual activity: parental monitoring/supervision, unsupervised time at home, parental approval of sex, peer approval of sex, physical development or maturity (Kirby, Lepore, & Ryan, 2005), relationship status, and age. *Parental monitoring* is the average of two items: "In general, how often does at least one of your parents/caregivers know what you are doing when you are away from home?" and "In general, how often does at least one of your parents/caregivers have a pretty good idea of your plans for the coming day?" Both items were on a 4-point scale (1 = *never*, 2 = *rarely*, 3 = *sometimes*, and 4 = *often*) and were correlated at 0.61 ($M = 3.26$, $SD = 0.69$). *Unsupervised time alone at home* was assessed in hourly increments on a 5-point scale from *none* to *about 4 hours or more* ($M = 2.84$, $SD = 1.43$). *Parental disapproval of sex* is an average of both mother and father approval of sex. Respondents answered "Does your mother/female guardian think that you should not/should have sexual intercourse in the next 12 months?" and "Does your father/male guardian think that you should not/should have

sexual intercourse in the next 12 months?" Similarly, *friend approval of sex* was based on the average of items: "Does your best friend think that you should not/should have sexual intercourse in the next 12 months?" and "Do your friends think that you should not/should have sexual intercourse in the next 12 months?" Responses to all four of the above measures were on a 7-point scale ranging from 1 = *should not have sex* to 7 = *should have sex*. There were also two additional response options: "Don't have this person in my life," which was recoded into missing, and "Don't know/not sure," which was recoded into a value of 4 (the midpoint/neutral option on the scale). For parental approval, the items were averaged together and reverse coded into a single item, *parental disapproval of sex*, so that a high score on the scale indicates high parental disapproval ($M = 6.15$, $SD = 1.36$). The mean for *friend approval of sex* is 3.82 ($SD = 1.95$); high scores indicate friend approval of having sex. Respondents reported on their *physical maturity* by answering the question "Compared to other teens your age, how advanced are you in your physical development?" on a 5-point scale (1 = *I look younger than most*, 2 = *I look younger than some*, 3 = *I look about average*, 4 = *I look older than some*, 5 = *I look older than most*; $M = 3.33$, $SD = 1.04$). Finally, since our outcome of interest involves *lifetime* sexual behaviors, we assessed *relationship status* by asking the respondent "During your lifetime, have you ever had a boyfriend or girlfriend?" Eighty-five percent of adolescents responded affirmatively. For this equation we also include the respondent's age because (unlike standard demographic variables) it reflects other developmental processes not specifically included in the previous list.

Exogenous predictors of exposure to sexual content in multiple media. Predictors of exposure to sexual content included bedtime, participation in extracurricular activities, having a television in the bedroom, and total time spent with media, as well as parental monitoring, unsupervised time at home, parental disapproval of sex, and peer approval of sex (the last four measures described earlier). We measured respondents' *bedtime* (or time that they went to bed) by asking, "On a typical day during the week, what time do you usually go to bed?" and then repeated the same question for "a typical day on the weekend." There were 12 categories of responses beginning with "before 5:59 PM" and continuing in hourly increments until "after 4 AM." Weekday bedtime category was multiplied by 5, weekend bedtime category was multiplied by 2, and the results were summed and divided by 7 to create a typical average weekly bedtime score ($M = 7.71$, $SD = 1.45$), which represents an average bedtime of approximately midnight.

Participation in extracurricular activities is a count of the following outside of school activities in which respondents reported participating in the past 12 months: "music, dance, theater," "athletic teams or organized sports," "internship program," "youth group sponsored by church, synagogue, mosque, etc.," "another club, activity, or volunteer work," "paid em-

ployment,” or “other.” Actual respondent values ranged from 0 to 6 activities, with a mean of 2.00 activities ($SD = 1.36$). For *television in the bedroom*, respondents answered yes or no to, “In your bedroom, do you have a TV?” Seventy-four percent of adolescents indicated they had a television in their bedroom. *Total time spent with media* was created by adding self-reported estimates of time spent on an average day with television, music, magazines, and video games. For each media, time spent on an average day was a derived estimate generated from self-reported time spent watching television, listening to music, reading magazines, and playing video games on a school day and on a weekend day. Using television as an example, respondents were asked: “How much time do you usually spend watching TV on a school day (for example, a Tuesday)?” They then selected a response from a list that ranged from “none” to “14 hours or more” in 30 minute increments (response options for time spent under an hour were in 15 minute increments). The same question was then repeated about a weekend day. After converting the data into hours (e.g., 15 minutes = .25, 2-1/2 hours = 2.5), the weekday estimate was multiplied by 5, the weekend day estimate by 2, and the total was divided by 7, resulting in time spent on an average day. Estimates for each of the four media were calculated in this way, and then added to result in a total media time (hours) measure ($M = 9.40$, $SD = 5.83$). Note, this does not account for more than one media being used at the same time and, therefore, is most likely an overestimate of the time spent with media.

Statistical Analysis

When nonrecursive relationships are included in a statistical model, ordinary least squares (OLS) regression produces biased estimates of all regression coefficients because the endogenous variables involved in the nonrecursive relationships are not independent of the error terms of their equations (Kennedy, 2003, p. 158). This non-independence inflates or attenuates the regression coefficients depending on the sign of the correlation between the errors and the predictors (Wonnacott & Wonnacott, 1987, pp. 281–283). Two-stage least squares (TSLS) is a solution to this problem because it first computes predicted values (“instrumental variables”) for the endogenous variables (i.e., sexual activity and exposure to sexual content) involved in the nonrecursive relationship based on all the exogenous variables (i.e., predictor variables such as parental monitoring and peer approval) included in the model (Kline, 2005, pp. 252–254). Because the exogenous variables are assumed to be independent of the error terms of the nonrecursive equations, *all linear predictions based on the exogenous variables of the model are also independent*. Estimating these instrumental variables as a function of only the exogenous (i.e., predictor) variables is “Stage 1” of the TSLS approach. The equation used in this first stage includes only exogenous

variables as predictors and is therefore referred to as the “reduced form” (Bollen, 1989, pp. 87–88). In our analysis, we also included gender and race as exogenous variables in the reduced form equation (in addition to the predictor variables discussed earlier) because we know from prior research that race and gender are associated with both of our dependent variables and including these variables helps to increase the precision of the instrumental variable estimates (Greene, 1993, p. 603). With the exception of age in the sexual activity equation, we do not include the demographic variables as direct predictors of sexual content exposure and sexual activity because their effects are mediated through the included variables. In “Stage 2,” the instrumental variables are substituted for the original endogenous variables and the regression coefficients for all the equations are estimated.

One unconventional feature of TSLS when compared with OLS is that the R-squared statistic can no longer be used to partition the variances of the dependent variables into “explained” and “residual” variance components (Bentler & Raykov, 2000). This is because the instrumental variables used in the estimation equations are not perfectly identical to the original endogenous variables and with TSLS estimation the R-squared can sometimes be zero or negative. Thus, for all four equations in our analysis, we also show the reduced form R-squared (which underestimates the true value because they only include exogenous variables that are the predictor variables shown in Figures 2 and 3). These reduced form R-squares give a better picture of the variance explained by each equation even though they do not include our endogenous variables as predictors.

RESULTS

Figure 2 shows the results of the regression analysis and includes the lagged endogenous predictors; Figure 3 presents the results without these predictors. (The coefficients in the cross-sectional equations are identical for both.) See Table 2 for correlations of the error terms of the endogenous variables in the model depicted in Figure 1. In the cross-sectional equations (Time 1

TABLE 2 Correlations Between the Error Terms of the Four Analytic Equations of Figure 1

	Sexual behavior (Time 1)	Sexual content exposure (Time 1)	Sexual behavior (Time 2)
Sexual content exposure (Time 1)	−0.54		
Sexual behavior (Time 2)	−.019	0.052	
Sexual content exposure (Time 2)	0.026	−0.21	0.05

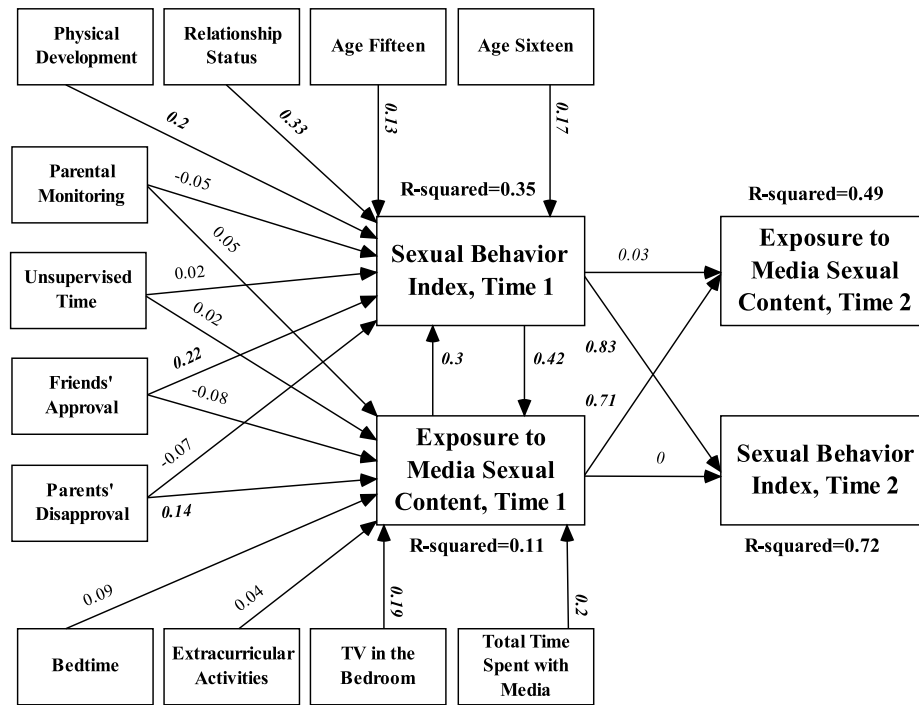


FIGURE 2 Two stage least squares standardized regression results for nonrecursive and longitudinal prediction of sexual behavior index and sexual content exposure with lagged endogenous predictors ($N = 441$). Notes. Regression coefficients are standardized. Statistically significant coefficients are in bold italics. See Table 2 for correlations of the error terms of the endogenous variables.

variables only), we found support for a nonrecursive, simultaneous relationship between sexual activity and exposure to sexual content; that is, sexual activity successfully predicted exposure to sexual content in the media ($\beta = 0.42, p < .01$) and sexual content exposure predicted a progression of sexual activity ($\beta = 0.30, p < .01$). Increased sexual activity is also related to a mature physical development, having ever had a boyfriend or girlfriend, and friends' approval of sex. Parental disapproval is associated with increased exposure to sexual content: the more a parent disapproves of sex, the higher adolescents' exposure to sexual content ($\beta = 0.14, p < .01$). Other variables associated with higher exposure to sexual content include having a television in the bedroom, and total time spent with television, music, video games, and magazines.

The longitudinal analysis component of Figure 2 shows that sexual activity at Time 1 explained 72% of the variance in sexual activity at Time 2, while the effect of exposure to sexual content at Time 1 on sexual activity at Time 2 was not significant. The same results are found for the sexual content exposure outcome at Time 2: Sexual content exposure at Time 1

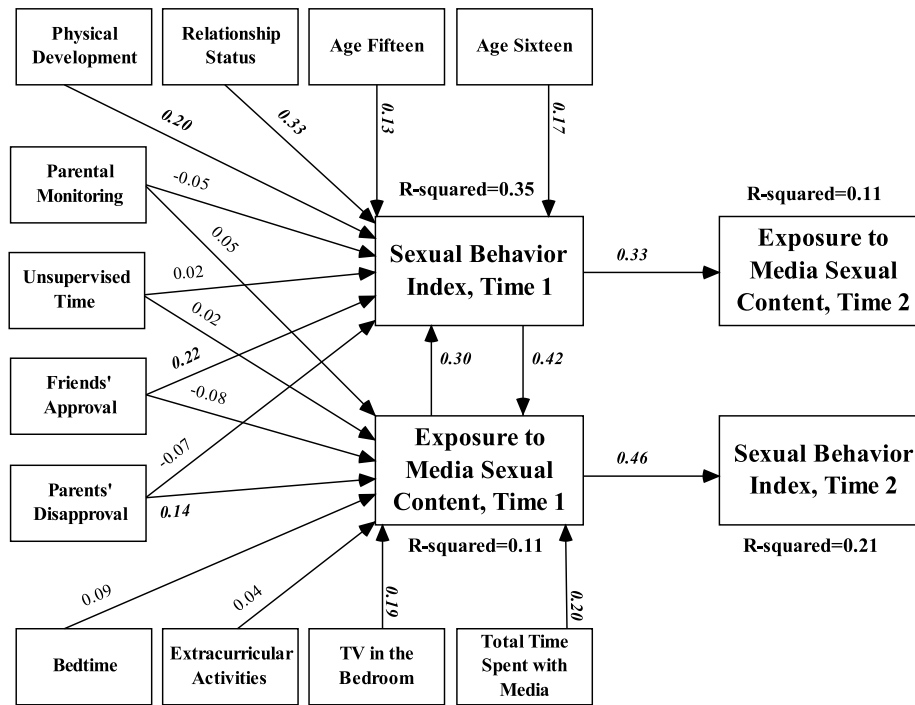


FIGURE 3 Two stage least squares standardized regression results for nonrecursive and longitudinal prediction of sexual behavior index and sexual content exposure without lagged endogenous predictors ($N = 441$).

was a strong predictor of sexual content exposure at Time 2, explaining 49% of the variance. Here too, the effect of sexual behavior at Time 1 was unrelated to exposure at Time 2. However, the fact that past behavior is an excellent predictor of subsequent behavior is hardly a profound psychological insight. With the endogenous predictors removed (Figure 3), the longitudinal component shows that sexual activity at Time 1 was associated with increased exposure to sexual content at Time 2 and that exposure to sexual content at Time 1 was associated with increased sexual activity at Time 2. Thus, the simultaneous relationship modeled with the data from Time 1 was replicated prospectively with this model. According to the regression results, adolescents who engage in sexual activity seek out media with sexual content ($\beta = 0.33, p < .01$), and those who are exposed to more sexual content are more likely to engage in sexual behaviors ($\beta = 0.46, p < .01$). The standardized coefficients in Figure 3 indicate that the effect of sexual activity on sexual content exposure carries somewhat more weight than the effect of sexual content exposure on sexual activity cross-sectionally, but longitudinally the standardized coefficient for exposure predicting behavior is slightly higher.

DISCUSSION

Our simultaneous predictions of sexual behavior and exposure to sexual content in television, music, magazines, and video games provide evidence for a nonrecursive relationship; that is, there is a feedback loop in that the more sexual activity in which adolescents engaged, the more likely they are to be exposed to sex in media, and the more they are exposed to sex in media, the more likely they are to have progressed in their sexual activity. These findings are consistent with others in the literature that demonstrate a causal effect of sexual content exposure on sexual behavior (Brown et al., 2006; Collins et al., 2004; Martino et al., 2006).

However, the results presented here elaborate on this relationship in two ways. First, in the cross-sectional component we specify a nonrecursive relationship between exposure and behavior. Other models treat media exposure and sexual behavior as *either* causes *or* effects, but not as both. This is an important distinction in models of exposure to sexual content and sexual behavior. Second, in both the cross-sectional and longitudinal equations, we were able to predict more variance in sexual activity than in exposure to sexual content. This is not especially surprising given the lack of research on individual and social characteristics that may influence the seeking of sexual content among adolescents.

Slater (2007) discussed the theoretical implications of analyses that treat media use variables as endogenous rather than as background variables. Analyses such as those presented here support the notion of a complex dynamic between media selectivity and media effects that is rarely explored within the same analysis. The relationship between adolescent sexual behavior and exposure to media sexual content is a particularly appropriate application for this approach. The focus shifts from the effects of exposure on behavior to also treating exposure *as a behavior*. As outlined earlier, there are social and behavioral theories that offer plausible explanations for how each component of a nonrecursive model may operate (i.e., sexual content exposure predicting sexual behavior and sexual behavior predicting sexual content exposure). However, implicit in such a nonrecursive model is a reconceptualization of a larger media effects framework to include models of mutual influence.

The effects of our exogenous predictors are consistent with past research. As expected, overall time spent with media (i.e., television, music, magazines, and video games) and having a television in the bedroom positively predict exposure to sexual content. But the positive association between parental disapproval and adolescents' exposure to sexual content is of note. This implies that adolescents who perceive that their parents disapprove of their having sexual intercourse tend to seek out sex in media, so parental disapproval of sexual behavior appears to increase exposure to sex in media—exposure that not only predicts sexual behavior in the

future but may also be associated with stereotypical and casual attitudes about sex (Ward, 2003). When we look at the sexual behavior outcome, we see that parental disapproval has the expected (but nonsignificant) effect: it is negatively associated with sexual behavior. However, friends' approval of sex, self-reported physical development, having a romantic partner, and older age were also associated with increased sexual activity. Parents face difficult problems in determining the best way to communicate with their children about both sex in general and in media given the complex pattern between parental disapproval of sex, the positive effect of peer norms, exposure to sexual media, and the adolescent's sexual behavior. It is clear that peers and parents tend to exert contrary effects on both self-reported sexual behavior and exposure to sexual media content. Clearly, the dynamic between these four variables calls for additional research.

This study is not without its limitations. Convenience sampling limits generalizability of our findings to other populations, although our findings are similar to those reported using national samples. The relatively small sample size limits subgroup analysis by race/ethnicity and gender because TSLS is only a consistent estimator in that bias declines only as the sample size gets large (Kennedy, 2003). Brown et al. (2006) show differences in media effects on sexual behavior between White and African-American adolescents. It is possible that the nonrecursive relationship exists only within one group, but why this would be the case is uncertain. This type of research needs to be replicated within subgroups of adolescents. Additionally, the sample size limits our ability to detect smaller effects. For example, the effect of parental monitoring in our sample is not significant for either sexual content exposure or sexual behavior even though the literature suggests otherwise (Collins et al., 2004, Kim et al., 2006).

In summary, nonrecursive models are theoretically and empirically useful to investigate the relationship between exposure to sexual content and engaging in sexual behavior. Theoretical models and empirical analyses on the effects of media on adolescent behavior (not just sexual behavior) need to consider the simultaneous nature of media exposure and behavior. In particular, this specific research domain would benefit from studies that aim to explain how and why adolescents "seek out" media sexual content and how parental and peer norms fit into the larger system of behavioral explanation and prediction.

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