



Published in final edited form as:

Media Psychol. 2008 October 1; 11(4): 443–461. doi:10.1080/15213260802491986.

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

Amy Bleakley, Michael Hennessy, Martin Fishbein, and Amy Jordan

Annenberg Public Policy Center, Annenberg School for Communication, University of Pennsylvania, 202 S. 36th Street, Philadelphia, PA, 19104. Fax: (215) 573-2667.

Abstract

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 non-recursive 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, videogames, 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.

Introduction

The nature of the relationship between exposure to sexual content in the media and adolescent sexual development has not been clearly established. The amount of time in that Youth use media almost 6.5 hours an average day (Roberts et al., 2005). Thus the media are clearly a considerable presence in their lives and sexual content in television is well documented (Kunkel et al., 2005) although there are conflicting views about change over time (Hetsroni, 2007). Thus media have the potential to shape or reinforce adolescents' notions of sex and sexuality during an 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 *non-recursive* (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 non-recursive 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) while another way of describing this relationship is as a “reinforcing spiral.”(Slater, 2007) Throughout this paper we refer to the nature of the hypothesized relationship between sexual content exposure and sexual activity as non-recursive, but the terms simultaneous (Kennedy, 2003: Chapter 10), non-recursive (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 argues that while 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 (Bandura, 1997; Bandura et al., 1963). 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 acts as a “super peer” and is a source of information about sex when or if adolescents are unable to learn from their peer group (Brown et al., 2005). Another study shows that using friends and/or media as sources of information about sex is associated with increased self efficacy for having sexual (Bleakley et al., 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” about overcoming barriers associated with sexual activity (e.g., “how-to” articles in magazines).

Research provides some empirical support for a causal effect of exposure to sex content on sexual initiation. Narrative summaries on media effects” literature pertaining to adolescent sexual attitudes and behavior are provided by Ward (2003), Escobar-Chaves (2005), and {Annenberg Media Exposure Research, 2008 #73}. Here we summarize a few of the more important recent papers. 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. The authors found that among White adolescents high exposure to sexual content in music, movies, television, and magazines predicted precoital sexual activity and sexual intercourse 2 years after the adolescents were first interviewed. Additionally, Martino et al. (2006) showed that listening to music with degrading sexual lyrics (when compared to non-degrading 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 provided initial evidence for a non-recursive 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 non-recursive 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 et al., 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: that 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 due to other social or environmental factors such as communication about sex, or about sex in the media, with friends or family members. 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 belief about sex that ultimately lead to adolescent sexual activity, and that sexual activity in turn shapes media use. Slater has more recently (2007) outlined the theoretical justification for non-recursive 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.” We know of no studies that examine whether such a non-recursive relationship exists between exposure to sexual content and adolescent sexual activity. In this study, we estimate a structural model that assumes a non-recursive 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 non-recursive relationship between sex 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 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 & Goodson (2007). For predicting exposure to sexual media we relied primarily on Kim et al. (2006) and other research cited below although 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 e_1 through e_4 are assumed to be mutually correlated within and across the two time periods because correlated errors are a necessary feature of non-recursive 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 initiation, 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. We also include predictors based on prior research in this area. 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 pre-coital sexual activity. These relationships were statistically significant after controlling for several demographic variables (e.g., age, race, and gender) which were associated with increased exposure to sex 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 cited 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 is 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 spent with four media (i.e., watching television, reading magazines, listening to music, and playing videogames). 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 (1) media use, (2) subjective judgments of the amount and quality of sexual content in television, movies, music, magazines, and video games, (3) potential moderator variables, (4) prior sexual behavior; and (5) 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 artists, magazines, movies, and videogame 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 1 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 IRB.

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 off-site 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 off-site 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, and their age breakdown was: 33.1% 15 years, 34.7% 16 years, and 32.1% 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 7 behaviors (Hennessy et al., 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 procedures (1971). 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, page 27) summarize, "... H is interpreted as an index for the degree to which subjects can be accurately ordered by means of k items" and a value of 0.5 or more is considered a strong scale (Mokken, 1971; Ringdal et al., 1999). The fit of our sexual behavior index is excellent: Loevinger's H is .70 or above for both genders. These dichotomous sex behaviors were also scaled using a correlational definition of unidimensionality: the KR20 coefficients are .84 and .85 for male and female respondents respectively. KR20 is similar to Cronbach's alpha but is appropriate for dichotomous items (Streiner, 2003). The scaling results for Year 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 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 7 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 re-test reliability.

Dependent Variable: Exposure to Sexual Content in Multiple Media—A measure of exposure to sexual content in multiple media was calculated based on 2 types of variables: respondents' exposure to selected media titles in 4 media (i.e., television, music, magazines, and videogames) 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 videogame. The lists of media titles were constructed to reflect popular titles for teenagers and/or the general public at the time of the survey. Popular titles were provided by website 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, listen to, 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 3 randomly selected television episodes (from the 2004-2005 season for year 1 and from the 2005-2006 season for year 2), 3 randomly selected magazine issues from the 12 months prior to the survey (September 2004-August 2005 for year 1, September 2005 – 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), the DVD version of the movie, and the 90 minutes of game play for the video game). The unit of analysis was the television episode, the movie, 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 videogames, and 15 magazines. In year 2, the coded titles included 52 television shows, 31 music artists, 26 videogames, and 14 magazines.

A team of undergraduates was trained over the course of an academic year to recognize and code the variables. Inter-rater agreement was calculated and only variables achieving a minimum of 75% agreement were used in analysis. For the present study, only 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). Inter-rater 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 sex content exposure measures specific to television, music, magazines, and videogames. The total (multiple media) sexual content exposure measure was created by summing the 4 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 et al., 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 4 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 2 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 4 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 bed category time 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 employment,” 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 videogames. 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 videogames 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 ½ 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 4 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 non-recursive relationships are included in a statistical model, OLS regression produces biased estimates of all regression coefficients because the endogenous variables involved in the non-recursive 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 non-recursive relationship based on the all 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 non-recursive 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 underestimate the true value because they only include exogenous variables which 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

Results of the regression analyses are presented in Figures 2 and 3. Figure 2 includes the lagged endogenous predictors and Figure 3 are the results without these predictors. (The coefficients in the cross-sectional equations are identical for both). In the cross-sectional equations (Time 1 variables only), we found support for a non-recursive, 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, videogames, 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 was a strong predictor of sex 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 videogames provide evidence for a non-recursive relationship. That is, there is a feedback loop in that the more sexual activity adolescents engaged in, 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 non-recursive 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 non-recursive model may operate (i.e., sexual content exposure predicting sexual behavior and sexual behavior predicting sexual content exposure). However, implicit in such a non-recursive model is a re-conceptualization 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 videogames) and having a television in the bedroom positively predicts 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 which 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 non-significant) 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 media sex 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 non-recursive 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 both sexual content exposure and sexual behavior even though the literature suggests otherwise (Collins et al., 2004, Kim et al., 2006).

In summary, non-recursive 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.

References

- Ajzen I. The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 1991;50(2):179–211.
- Bandura, A. *Social Learning Theory*. Prentice-Hall; Englewood Cliffs, NJ: 1977.
- Bandura, A. *Self efficacy: The exercise of control*. W.H. Freeman & Co; New York: 1997.
- Bandura A, Ross D, Ross S. Imitation of film-mediated aggressive models. *Journal of Abnormal and Social Psychology* 1963;66:3–11. [PubMed: 13966304]
- Bentler P, Raykov T. On measures of explained variance in nonrecursive structural equation models. *Journal of Applied Psychology* 2000;85:125–131. [PubMed: 10740963]
- Bleakley A, Hennessy M, Fishbein M, Jordan A. How source of sexual information relates to adolescents' belief about sex. *American Journal of Health Behavior*, Forthcoming. 2009
- Bollen, K. *Structural Equations with Latent Variables*. Wiley; New York: 1989.
- Brown J, Halpern C, L'Engle K. Mass media as a sexual super peer for early maturing girls. *Journal of Adolescent Health* 2005;36(5):420–427. [PubMed: 15837346]
- Brown J, L'Engle K, Pardun C, Guo G, Kenneavy K, Jackson C. Sexy media matter: Exposure to sexual content in music, movies, television, and magazines predicts back and white adolescents' sexual behavior. *Pediatrics* 2006;117(4):1018–1027. [PubMed: 16585295]
- Buhi E, Goodson P. Predictors of adolescent sexual behavior and intention: a theory-guided systematic review. *Journal of Adolescent Health* 2007;40:4–21. [PubMed: 17185201]
- Collins R, Elliot M, Berry S, Kanouse D, Kunkel D, Hunter S, Miu A. Watching sex on television predicts adolescent initiation of sexual behavior. *Pediatrics* 2004;114(3):e280–e289. [PubMed: 15342887]
- Duncan, OD. *Introduction to Structural Equation Models*. Academic Press; NY: 1975.
- Eggermont S. Television viewing, perceived similarity, and adolescents' expectations of a romantic partner. *Journal of Broadcasting and Electronic Media* 2004;48:244–265.
- Eggermont S, Van den Bulck J. Nodding off or switching off? The use of popular media as a sleep aid in secondary-school children. *Journal of Paediatrics and Child Health* 2006;42(7-8):428–433. [PubMed: 16898880]
- Escobar-Chaves S, Tortolero S, Markham C, Low B, Eitel P, Thickett P. Impact of media on sexual attitudes and behaviors. *Pediatrics* 2005;116(1):303–326. [PubMed: 16001458]

- Fishbein, M.; Ajzen, I. *Belief, attitude, intention, and behavior: An introduction to theory and research*. Addison-Wesley; Reading, MA: 1975.
- Greene, W. *Econometric Analysis*. Prentice Hall; Englewood Cliffs: 1993.
- Hansen C, Krygowski W. Arousal-augmented priming effects: rock music videos and sex object schemas. *Communication Research* 1994;21:24–47.
- Hennessy M, Bleakley A, Fishbein M, Jordan A. Validating an index of adolescent sexual behavior using psychosocial theory and social trait correlates. *AIDS and Behavior* 2008;12:321–331. [PubMed: 17636374]
- Hetsroni A. Three decades of sexual content on prime-time network programming: a longitudinal meta-analytic review. *Journal of Communication* 2007;57:318–348.
- Katz, E.; Blumler, J.; Gurevitch, M. Utilization of mass communication by the individual. In: Blumler, J.; Katz, E., editors. *The uses of mass communication: current perspectives on gratifications research*. Sage; Beverly Hills: 1974. p. 19-32.
- Kennedy, P. *A Guide to Econometrics*. Fifth ed.. MIT Press; Cambridge, MA: 2003.
- Kim J, Collins R, Kanouse D, Elliott M, Berry S, Hunter S, Miu A. Sexual readiness, household policies, and other predictors of adolescents' exposure to sexual content in mainstream entertainment television. *Media Psychology* 2006;8:449–471.
- Kirby, D.; Lepore, G.; Ryan, J. *Sexual and risk protective factors: Factors affecting teen sexual behavior, pregnancy, childbearing and sexually transmitted disease: Which are important? Which can you change?*. National Campaign to Prevent Teen Pregnancy. ETR Associates; 2005.
- Kline, R. *Principles and Practice of Structural Equation Modeling*. Guilford; New York: 2005.
- Kunkel, D.; Eyal, K.; Finnerty, K.; Biely, E.; Donnerstein, E. *Sex on TV 2005*. A Kaiser Family Foundation Report; 2005.
- Loehlin, JC. *Latent Variable Models: An Introduction to Factor, Path, and Structural Analysis*. LEA; Marwah: 1998.
- Martino S, Collins R, Elliott M, Strachman A, Kanouse D, Berry S. Exposure to degrading versus nondegrading music lyrics and sexual behavior among youth. *Pediatrics* 2006;118(2):e430–441. [PubMed: 16882784]
- Mokken, R. *A Theory and Procedure of Scale Analysis*. Mouton; The Hague: 1971.
- Ringdal K, Ringdal G, Kaasa S, Bjordal K, Wisløff, Sundstrøm, Hjermsstad M. Assessing the consistency of psychometric properties of the HRQoL scales within the EORTC QLQ-C30 across populations by means of the Mokken scaling model. *Quality of Life Research* 1999;8:25–43. [PubMed: 10457736]
- Roberts, D.; Foehr, U.; Rideout, V. *Generation M: Media in the lives of 8-18 year olds*. Kaiser Family Foundation; Menlo Park, CA: 2005.
- Rubin, A. The uses-and-gratifications perspective of media effects. In: Bryant, J.; Zillman, D., editors. *Media effects: Advances in Theory and Research*. Lawrence Erlbaum; Mahwah: 2002. p. 525-548.
- Slater M. Reinforcing spirals: The mutual influence of media selectivity and media effects and their impact on individual behavior and social identity. *Communication Theory* 2007;17:281–303.
- Streiner D. Starting at the beginning: an introduction to coefficient alpha and internal consistency. *Journal of Personality Assessment* 2003;80:99–103. [PubMed: 12584072]
- Van den Bulck J. Television viewing, computer game playing, and Internet use and self-reported time to bed and time out of bed in secondary-school children. *Sleep* 2004;27(1):101–104. [PubMed: 14998244]
- Ward L. Understanding the role of entertainment media in the sexual socialization of American youth: A review of empirical research. *Developmental Review* 2003;23:347–388.
- Ward L, Friedman K. Using TV as a guide: Associations between television viewing and adolescents' sexual attitudes and behavior. *Journal of Research on Adolescence* 2006;16(1):133–156.
- Wonnacott, T.; Wonnacott, R. *Regression: A Second Course in Statistics*. Krieger; Malabar: 1987.

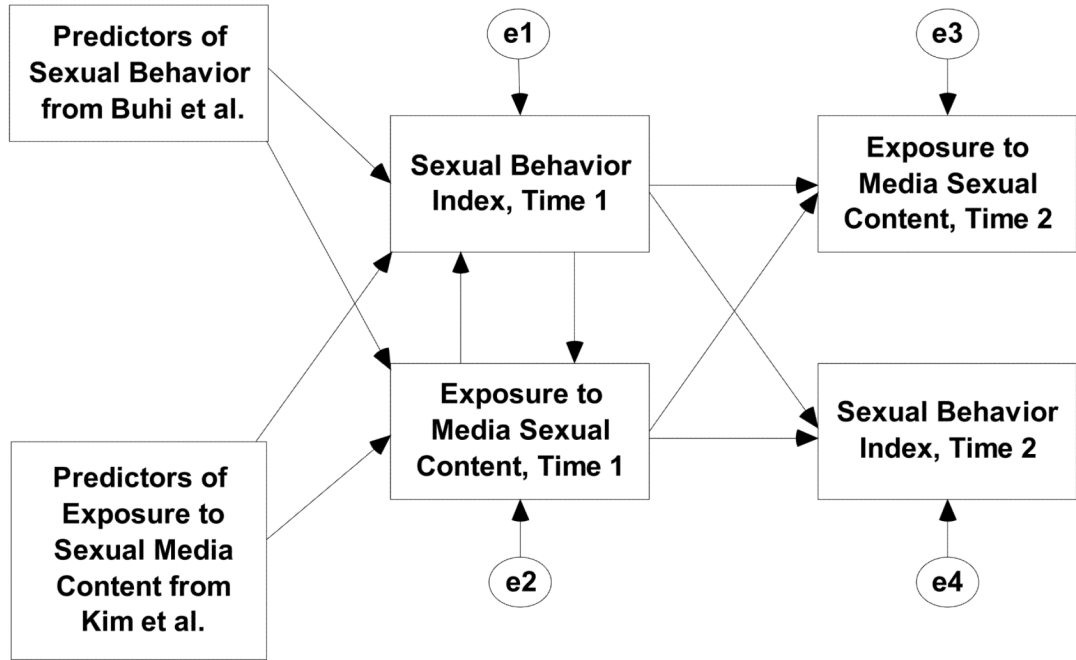


Figure 1.

Generic two stage least squares model of sexual behavior and exposure to media sexual content

Notes: Correlations between exogenous variables and between endogenous error terms not shown for clarity.

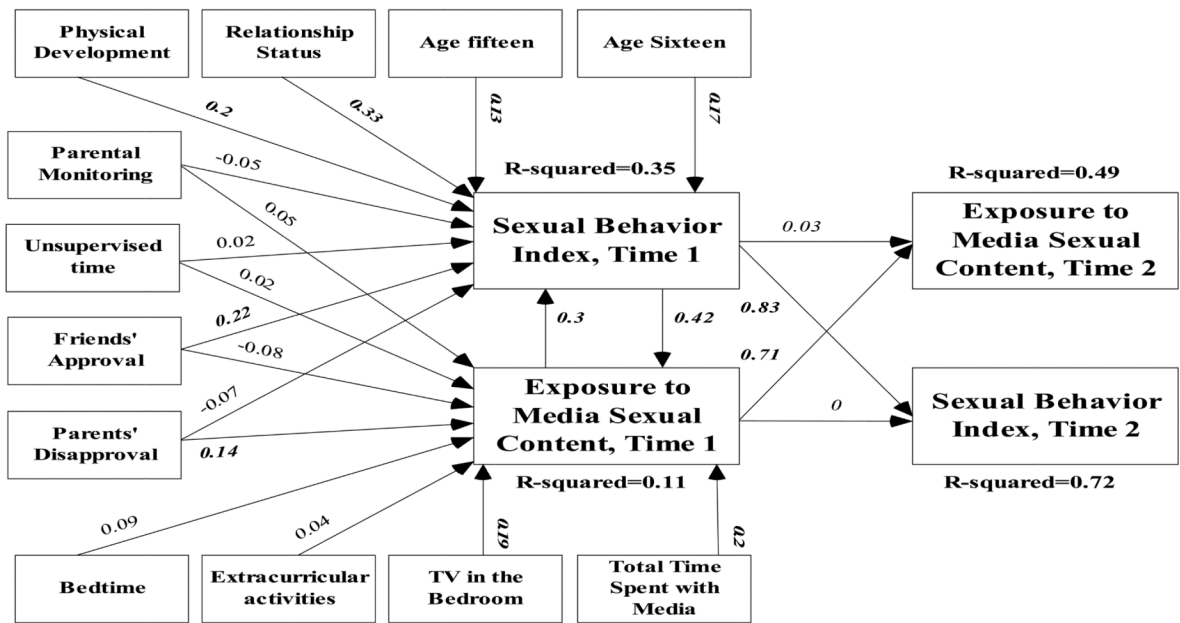


Figure 2. Two stage least squares standardized regression results for nonrecursive and longitudinal prediction of sexual behavior index and sexual content exposure with lagged endogenous predictors (N = 441)

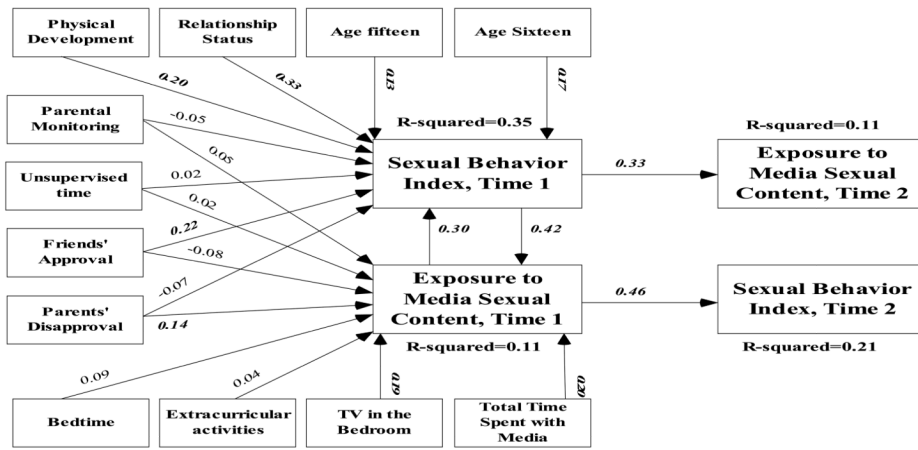


Figure 3. Two stage least squares standardized regression results for nonrecursive and longitudinal prediction of sexual behavior index and sexual content exposure without lagged endogenous predictors (N = 441)

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.

Table 1

Mokken 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 <i>H</i> KR20	0.70 0.84	.83 .85	0.71 0.83	0.85 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 the percent of males or females at Times 1 and 2 that reported having engaged in the above sexual behaviors at any point in their lifetime.

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