



Learning About Sex from Different Sources: Implications for Sexual Attitudes, Sexual Knowledge, and Risky Sexual Behavior Among U.S. College Students

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Abstract

This exploratory cross-sectional study, guided by primary socialization theory, examined relations between four primary socialization agents of sexual learning (i.e., mothers, fathers, friends/peers, and online media) and sexual attitudes, sexual knowledge, and risky sexual behavior. Latent-variable structural equation models were tested using self-report data obtained from 515 emerging adults who had spent at least 6 months attending in-person college classes. Results showed that learning about sex from mothers was associated with more conservative sexual attitudes and lower risky sexual behavior. Sexual learning from friends/peers was linked to liberal sexual attitudes and greater sexual knowledge. Learning from online media was associated with increased sexual knowledge. To account for a shift in sexual learning patterns from before to after entry to college, we created algebraic difference scores for each source of sexual information. Greater reliance on sexual learning from friends/peers in the past 6 months of college relative to before college was associated with liberal sexual attitudes and greater sexual knowledge. Additional analyses revealed different effects of learning about sex from mothers more during college than before college between those living on campus vs. commuters living at home. The discussion emphasizes the different role that each of the primary socialization agents plays for emerging adults' sexual development, including the protective role of mothers against risky sexual behavior, the impact of friends and peers on sexual attitudes and knowledge, and the shifting dynamics of socialization processes during college.

Keywords Sexual learning · Emerging adulthood · Primary socialization theory · Sexual attitudes · Sexual knowledge · Risky sexual behavior

Introduction

Sexuality is a natural part of human behavior, and there is a general expectation that sexual activity is something positive and enjoyable. However, many emerging adults (i.e., those ages 18–25; Arnett, 2000) often come to college unprepared to navigate through a complex landscape of

sexual relations that occur on college campuses. Heightened vulnerability to sexually transmitted infections (STIs) and sexual victimization is one of the most notable challenges facing young adults (Basile et al., 2022; Centers for Disease Control & Prevention, 2021). Past research has attributed this heightened vulnerability to various factors, including the lack of comprehensive and skill-based sex education in secondary schools (Goldfarb & Lieberman, 2021; Guttmacher Institute, 2023; Lindberg et al., 2016) and the absence of in-depth sexual communication at home (Astle et al., 2022; Lindberg et al., 2016). However, limited formal sex education or parental sex communication prior to college does not necessarily mean that the same applies to young adults attending college. In other words, college students may still be learning about various aspects of sexuality by talking to their parents and friends as well as using online sources to learn more about sex. Despite a tacit awareness that most college students learn about sex

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somewhere and somehow, very little attention has been paid to the sources from which college students acquire sexual information, as opposed to before they enter college. In addition, there is scant knowledge regarding the relative influence these sources have on different aspects of sexuality among emerging adults compared to adolescents. Guided by primary socialization theory (Oetting & Beauvais, 1987; Oetting & Donnermeyer, 1998), the current study specifically addresses questions regarding sources of learning about sex by examining the relative influence of mothers, fathers, friends/peers, and online media on sexual attitudes, sexual knowledge, and risky sexual behavior.

Emerging Adulthood and Sexual Socialization

Nearly 40% of 18- to 24-year-olds in the United States (US) go to college (Institute of Education Sciences & National Center for Education Statistics, 2023) with high expectations for not only academic and career opportunities and pursuits but also social, relational, and sexual experiences (Anders et al., 2020; Nadelson et al., 2013). Many college students identify themselves no longer as adolescents but not yet adults, which positions them as “emerging adults” – young adults from ages 18 to 25 (Arnett, 2000), which has now been extended to age 29 (Arnett, 2015). Emerging adults perceive college as a time and place to prepare them for adult role socialization including achieving financial independence, independent decision making, and accepting responsibility for their actions (Arnett, 2000, 2015).

Given the unique developmental tasks and challenges faced by emerging adults, college marks an important place and time for socialization in various domains, including sexuality (Halpern & Kaestle, 2014). There is indeed empirical evidence suggesting that this age group is still learning about various aspects of sexuality and how to independently make healthy sexual decisions while attending college (e.g., Astle et al., 2023a; Stinson, 2010). In other words, sexual learning and socialization is expected to be an ongoing dynamic process for emerging adults (Halpern & Kaestle, 2014). Research with adolescents has documented various sources of sexual information that have implications for sexual development, including mothers, fathers, friends/peers, and online media (Bleakley et al., 2018; Simon & Daneback, 2013; Widman et al., 2014). However, less research has been conducted with respect to where emerging adults acquire sexual knowledge while attending college and its implications for their sexual development. Given emerging adults’ desire and need for emotional and instrumental support in their sexual decision-making (Astle et al., 2023a), the same informal sources of sexual information as those deemed influential in adolescence (i.e., mothers, fathers, friends/peers, online media) are likely to retain their influence for college students.

Primary Socialization Theory and Sexual Learning

Primary socialization theory (PST; Oetting & Beauvais, 1987; Oetting & Donnermeyer, 1998) integrates psychosocial and social learning theories (Bandura, 1986) to suggest that adolescents learn values, norms, and behaviors through social interactions with the main people in their lives, including parents and friends/peers. According to PST, parents convey an influence through punishment, modeling, and other parenting practices (e.g., monitoring, boundary setting), whereas friends and peers influence each other through direct and vicarious learning. It is through these immediate influences of parents and friends/peers that an individual learns to formulate certain attitudes, values, and beliefs that shape their behavior. In more recent years, online media (e.g., the internet, social media) has gained popularity and been recognized as a primary socialization agent (Endendijk et al., 2022; Nikkelen et al., 2019). PST was originally developed to explain substance use and delinquency among adolescents (Higgins et al., 2010; Oetting & Donnermeyer, 1998; Pettigrew et al., 2017) and has been extended to other areas of research in more recent years, including health behaviors (Rew et al., 2013) and sexuality (Francis & Thorpe, 2010; Moussa Rogers & McKinney, 2019).

Unlike research with emerging adults, extensive research has been conducted with adolescents and has consistently demonstrated that informal sources of sexual information, such as parents, friends/peers, and online media are the main conduits through which individuals acquire sexual information (Bleakley et al., 2009, 2018; Guse et al., 2012; Widman et al., 2016). Although formal socialization agents, such as teachers (or schools through educational curriculum), doctors, and religious leaders may provide sexual information or health guidance (Bleakley et al., 2009), several studies show that adolescents do not rely on these sources as much, find them as useful, or feel as comfortable seeking information from them as informal sources (Bleakley et al., 2009; Whitfield et al., 2013). This lesser reliance on formal sources of sexual information among adolescents is coupled with a decline in formal sexual health education in recent years (Lindberg et al., 2016).

Compared to research on sexual learning among adolescents, considerably less research has examined how emerging adults learn about sex while they are in college. There is empirical evidence for an increase in sexual knowledge during the college years (Franklin & Dotger, 2011), highlighting sexual learning that occurs in college. However, sources of sexual learning among college students are still not well understood. Instead, research with emerging adult college students often focused on sexual behavior such as hooking up (Owen et al., 2010), condom use (Fehr et al., 2015), and alcohol consumption before and during sex (Cooper, 2002). This noted gap in the literature stands in contrast to popular

theoretical frameworks of health behavior that highlight the importance of attitudes and knowledge as a precursor of behavior, such as social cognitive theory (Bandura, 1986), theory of planned behavior (Ajzen, 1991), and the health belief model (Becker, 1974). In addition, collegiate sex education programs that are designed to promote sexual health and safe sex (e.g., testing for HIV/sexually transmitted infections or STIs, condom use) and/or prevent sexual violence often focus not on the behaviors themselves but rather on their precursors, such as attitudes, beliefs, and knowledge (Vladutiu et al., 2011; Wong et al., 2019). Therefore, examining not only sexual behavior but also its origin, that is, where emerging adults' understanding of sex comes from, will provide better insight into the underlying mechanisms of their sexual learning and socialization processes.

The timing of sexual socialization may also play an important role in behavior. For example, many studies often asked college students to recall sexual information they had learned prior to college (e.g., Astle et al., 2022; Epstein & Ward, 2008; Hutchinson & Cederbaum, 2011; Trinh & Ward, 2016). Recognizing adolescence and emerging adulthood as distinct developmental stages (Arnett, 2000), conclusions drawn from studies on adolescents may not necessarily generalize to emerging adults. Among limited research with emerging adults, however, there is sufficient empirical evidence supporting that sexual socialization continues to take place in college with continuing (and possibly changing) influences of the same primary socialization agents. Lefkowitz and Espinosa-Hernandez (2007) asked college students to recall their sexual communication with close friends and mothers in the past 3 months and found that sexual communication with friends was more open and comfortable and less embarrassing than with mothers and that communication quality with friends (but not with mothers) was associated with more liberal sexual attitudes. A qualitative study using diaries completed by college women also supported the idea that college students talk about sex with their friends considerably more than with parents, accounting for 88% of total sexual communication that occurred in a week (Pariera & Abraham, 2020).

Given the heavy reliance on friends and peers for sexual information during emerging adulthood, it is not surprising that their influence as a source of sexual values increases during earlier years in college, whereas parents' influence decreases (Morgan & Zurbruggen, 2012). However, there is some evidence that college students want more emotional support from mothers (but not fathers) in sexual decision-making (Astle et al., 2023a; Friedman & Morgan, 2009) and feel increasingly more comfortable and open when talking about sex with both mothers and fathers during their college years (Morgan et al., 2010). In other words, a majority of college students may not learn about sex from parents as much as from friends and peers, but when they do, parents may

continue to serve as an important role for sexual socialization during emerging adulthood.

Emerging adults also use the internet as a source of sexual information, even more often than friends for many sex-related topics including HIV/STIs (Buhi et al., 2009). This is largely attributed to smartphones and laptops that are both ubiquitous and accessible to a majority of college students (Smith et al., 2011). Lim et al. (2014) found that emerging adults feel very comfortable obtaining sexual information from websites, but less so with social media due to privacy concerns and stigma surrounding sexual health, especially STIs. However, an increasing number of studies have demonstrated the efficacy of sexual health promotion programs implemented using social media (Sinnenberg et al., 2017; Veale et al., 2015). For example, Stevens et al. (2017) found that adolescents and emerging adults who received sexual health messages on social media were more likely to have used contraception or a condom at last sexual intercourse. Therefore, when emerging adults *do* use online media, whether it be the internet and/or social media, for sexual information, they may obtain some benefits that other primary socialization agents may not be able to provide given greater ease (and perhaps privacy) accessing information.

The Current Study

The current study examined the relative influence of learning about sex from four primary socialization agents (i.e., mothers, fathers, friends/peers, and online media) on three important components of sexuality: sexual attitudes, sexual knowledge, and risky sexual behavior. These three components were posited as endogenous constructs given our theoretical assumption that they are dependent on sources of sexual information, such as how, when, and where sexual learning occurs. Although prior research has extensively explored each component within sexual socialization (Coyne et al., 2019; Nurgitz et al., 2021; van de Bongardt et al., 2015), this study remains largely exploratory, given the historical focus on adolescent sexual learning. Recognizing the distinct developmental stages of adolescence and emerging adulthood (Arnett, 2000), it is inappropriate to generalize findings from adolescent studies to emerging adult populations. Thus, our study sought to capture sexual learning not only predating college but also within the past 6 months in college. To ensure data relevance, participants were required to have completed at least 6 months of on-campus coursework, excluding those solely engaged in online education.

We also took advantage of the fact that many college-bound emerging adults make a transition from living at home to life on campus, although there are a good number of college students who still live with their parents for a variety of reasons. Thus, it is conceivable that those who live on campus, compared to commuters, experience less influence

from their parents as primary socializing agents and shift to friends and peers while attending college. As a result, different patterns of sexual learning are likely to occur during this transition, giving us the opportunity to explore whether learning about sex more while attending college compared to before college (from each source) contributes uniquely to sexual attitudes, knowledge, and behavior. We addressed this question by modeling difference scores (i.e., subtracting sexual learning before college from sexual learning while attending college) for each source of sexual information. A positive difference score represents obtaining more sexual learning in college than prior to college, whereas a negative score represents the opposite. In addition, to explore whether changes in the reliance on different socialization agents for sexual information are dependent on changes in the physical environment from high school to college, we conducted a multiple group analysis in the difference score models to compare those who live on campus vs. at home.

Taken all together, the current study addressed two questions.

RQ1: What is the relative influence of sexual learning from the four primary socialization agents (i.e., mothers, fathers, friends/peers, and online media) while attending college on the three components of sexuality: sexual attitudes, sexual knowledge, and risky sexual behavior?

RQ2: Do changes in the reliance on the same four primary socialization agents for sexual learning during the transition to college contribute uniquely to each of the same three components of sexuality?

Method

Participants

Study participants were recruited from the first author's departmental subject pool where a majority of potential participants were undergraduate students enrolled in an introduction to psychology course. In order to be eligible for the current study, participants needed to meet the following criteria: (1) ages 18–25 and (2) having spent at least 6 months on any college campus, which did not have to be the one where this study was being conducted. The former inclusion criterion was to ensure that all participants would meet Arnett's (2000) definition of emerging adulthood. The latter criterion ensured that all participants would be able to answer questions regarding learning about sex from parents, friends/peers, and online media while enrolled in college.

The sample consisted of 515 college-attending emerging adults ages 18 to 25 ($M = 19.33$ years, $SD = 1.49$) including 236 first-year students (45.83%). More than three quarters of the sample were women ($n = 395$, 76.70%), and four participants identified as gender non-conforming. The sample was racially and ethnically diverse: 32.82% of participants

identified as White/European American, 25.63% Latino/Hispanic, 14.56% Asian, 14.37% Black/African American, 6.80% multiple races/ethnicities, 2.52% Native Hawaiian and Pacific Islander, 1.75% American Indian or Alaska Native, 0.78% Middle Eastern or Northern African, and 0.78% other. A majority of participants (83.11%) indicated that they were heterosexual/straight, while the remainder identified as bisexual (7.18%), questioning (2.91%), lesbian (2.33%), gay (0.28%), or other (3.50%; e.g., asexual, pansexual). Nearly three quarters of the participants ($n = 373$, 72.43%) reported having experienced penetrative sex (i.e., anal, oral, vaginal) in the past prior to the study.

Procedure

Data collection for this study started in Fall 2019, which was placed on hold during the COVID-19 pandemic lockdown that started in March 2020. In the 2019–2020 academic year, data were collected from 245 (49 men, 192 women, 4 gender non-conforming). From Fall 2020 to Winter 2021, data were collected from 97 participants; however, a majority of students were still remotely attending classes, and the campus was rather deserted. Therefore, we did not include data collected during this period. Students who were enrolled in in-person classes were required to come to campus in Fall 2021, and additional data were collected from 270 individuals (67 men, 203 women) in the 2021–2022 academic year.

Subject pool participants received an email 1 h prior to their appointment time. The email contained a Zoom link for their online study session and an IRB-approved participant letter describing the purpose of the study and outlining their rights as a research participant. If there were multiple participants per session, each one of them was placed in a separate break-out room to maintain their anonymity. Each session was run by an undergraduate research assistant who explained the study individually to each participant. Once the participant gave a verbal consent, the research assistant provided them with the link to the online survey through chat on Zoom. The research assistant stayed online to answer any questions or address any concerns or problems throughout the session.

Measures

Learning About Sex. Participants reported the amount of information they learned about 23 sex-related topics (e.g., menstruation, orgasm, methods of protection) from all four sources (i.e., mothers/mother figures, fathers/father figures, friends/peers, and online media). All the 23 topics were rated on a 5-point scale (1 = None; 5 = A lot) for two timelines: Prior to college and in the past 6 months of college. The stem provided was: "Please indicate below how much you have learned from [each of the four sources] [before college/in

the past 6 months of college].” These 23 topics were adapted and extended from the 9-item measure called the Weighted Topics Measures of Family Sexual Communication (Fisher, 2011). The complete list of 23 topics along with sample means and standard deviations are shown in Supplemental Table 1 for prior to college and Supplemental Table 2 for the period while attending college.

Sexual Attitudes. Sexual attitudes were measured by the Attitudes Toward Sexuality Scale (Fisher & Hall, 1988) with 13 items rated on a 5-point scale (1 = Strongly Disagree; 5 = Strongly Agree). The response scales on the items representing more sexually liberal or permissive attitudes (e.g., “Abortion should be made available whenever a woman feels it would be the best decision,” “Homosexual behavior is an acceptable variation in sexual orientation”) were left unchanged. The items that represented more conservative sexual attitudes (e.g., “Premarital sexual intercourse for young people is unacceptable to me,” “Parents should be informed if their children under the age of eighteen have visited a clinic to obtain contraception”) were reverse-scored. A higher score represents a higher level of sexual permissiveness or liberalness.

Sexual Knowledge. Sexual knowledge was measured by the Sex Knowledge and Attitude Test for Adolescents (SKAT-A; Fullard & Scheier, 2011) based on 41 sexuality-related statements, such as “During sex, using a condom is the best way of avoiding sexually transmitted diseases” (true) and “Drinking alcohol increases a person’s ability to have sex” (false). Participants judged each statement and selected “True,” “False,” or “Not Sure.” Correct judgement was given a 1, while incorrect judgement and “Not Sure” were assigned zero. A 2-parameter logistic Item Response Theory (IRT) model identified five items with extreme difficulty and discrimination parameters, and these were eliminated from further analyses (Hambelton et al., 1991). A higher score represents greater general sexual knowledge.

Risky Sexual Behavior. Risky sexual behavior was assessed by a 24-item questionnaire developed by Dilorio et al. (1992). The questionnaire was completed only by those who had experienced penetrative (oral, anal, vaginal) sex in the past 6 months prior to the study ($n = 373$; 72.43%). The response scales for the items pertaining to risky sexual behavior (e.g., “I engage in anal intercourse without using a condom,” “I drink alcoholic beverages prior to or during sexual intercourse”) were kept intact, whereas the items pertaining to safe sexual practices (e.g., “I insist on condom use when I have sexual intercourse,” “I initiate the topic of safer sex with my potential sexual partner”) were reverse-scored so that a higher score would represent greater engagement in risky sexual behavior. All items were rated on a 5-point frequency scale (1 = Never; 2 = Sometimes; 3 = About half the time; 4 = Most of the time; 5 = Always).

Demographics. Demographic measures included time of study participation (0 = 2019–2020 [$n = 245$ for sexual attitudes and sexual knowledge/190 for risky sexual behavior]; 1 = 2021–2022 [$n = 270/183$]), gender (0 = male [$n = 116/84$], 1 = female [$n = 395/287$]), sexual orientation (0 = LGBTQ+ [$n = 87/58$]; 1 = heterosexual [$n = 428/315$]), race/ethnicity (0 = people of color [$n = 346/230$], 1 = White/European American [$n = 169/143$]), living situation (0 = living on campus [$n = 279/220$], 1 = living at home with at least one parent [$n = 236/153$]), chronological age (continuous), and sexual debut age (i.e., age for the first penetrative sexual intercourse; continuous).

Analytic Plan

We subjected each multi-item measure to data summarization using exploratory structural equation modeling (ESEM) using the Mplus V8.6 statistical software (Muthén & Muthén, 2008–2017). The model settings included anywhere from one to three factors using geomin (oblique) rotation with epsilon set a 0.5 (Asparouhov & Muthén, 2009; Marsh et al., 2009). In every case, the measures provided evidence of unidimensionality with large amounts of variance being accounted for by a single underlying dimension. If multiple factors were extracted, they were highly correlated (r 's > .60). Inferential model fit indices for confirmatory factor analysis (CFA) models all exceeded the benchmark values (Hu & Bentler, 1999). Evidence of high communality from the factor analyses supported constructing latent factors using random parcels for each measure (i.e., each of the four socialization agents, sexual attitudes, sexual knowledge, risky sexual behavior). There are both advantages (Coffman & MacCallum, 2005; Little et al., 2013) and disadvantages to the use of random parcels (e.g., Bandalos, 2002; Marsh et al., 2013). In general, random parcels find utility when the measures used to infer latent factors are unidimensional. When this occurs, the formation of independent clusters as “indicators” (i.e., mean composites) of latent factors is feasible as each independent cluster takes on no special characteristic or meaning that could confirm test or item-specific variation. In other words, each cluster contributes to the true score variation underlying the latent factor in a non-discerning manner (Kishton & Widaman, 1994), and the focus rests with empirically confirming construct-to-construct relations. The use of parcels also provides parsimony (given the use of a reduced set of parcels as opposed to individual items as indicators) with fewer and more stable parameter estimates and improves reliability with increased power. The detail about what items were placed in each random parcel is provided in Supplemental Table 3.

In the current study, we used a distributed parceling strategy by randomly assigning items to different parcels (Little et al., 2002). The latent factors of sexual information sources and sexual attitudes consisted of three random parcel

indicators, whereas the latent factors of sexual knowledge and risky sexual behavior had four random parcel indicators. We evaluated CFA model fit using the comparative fit index (CFI; Bentler, 1990), Tucker-Lewis index (TLI; Tucker & Lewis, 1973), root-mean-square-error of approximation (RMSEA; Steiger & Lind, 1980), and standardized root mean square residual (SRMR; Hu & Bentler, 1999).

Following the derivation of the individual latent factors, we tested them simultaneously in a confirmatory factor analysis (CFA) model. This model provides the opportunity to generate factor loadings for the random parcels, estimate error-free correlations between the factors, and generate inferential fit indices to statistically gauge whether the hypothesized model fits the sample data. We then tested structural equation models in three steps. First, each endogenous construct (i.e., sexual attitudes, sexual knowledge, risky sexual behavior) was regressed individually on the four latent factors of sexual information sources, both individually (i.e., a univariate model with one sexual information source at a time to derive their unique contributions) and as a block (i.e., a multivariate model with all four sexual information sources together). Second, the same endogenous constructs were regressed on the covariates, both individually (i.e., a univariate model with one covariate at a time to detect any suppressor effects) and as a block (i.e., a multivariate model with all covariates modeled together). Third, a fully adjusted multivariate model regressed the three endogenous latent constructs separately on the four latent factors of sexual information sources and the full set of covariates simultaneously. For all models involving gender as a covariate, four gender non-conforming individuals were excluded. Any model containing sexual debut age was tested with only participants who reported having had sexual intercourse ($n = 373$), resulting in a loss of 142 cases who reported they had not experienced sexual debut yet.

All the latent variable models used full information maximum likelihood model (FIML) imputation to address missing data (which was $\leq 5\%$). Cases that had no covariate information (e.g., four gender non-conforming individuals when gender was included in the model) were completely removed in those models. The difference score models, which relied on observed variables, were run using path analysis. As a result, cases with no data on some sources of sexual information (e.g., 26 individuals who did not have a father or father figure to report on) were not included in the analyses.

In order to examine the unique influence of changes in sexual learning patterns during the transition to college on the three endogenous constructs, we computed difference scores by subtracting sexual information learned from each source prior to college from sexual information learned from the same source in the past 6 months of college, producing four sets of difference scores, corresponding to each source of sexual information. While retrospective reporting may

introduce some recall bias, the use of a six-month timeframe has been established in previous studies and is considered appropriate for phenomena like sexual learning, which often occurs gradually rather than rapidly (Byers et al., 2018; Sales et al., 2008). A positive value for the difference score represents more sexual information learned in college than before college (from the source), while a negative score is the exact opposite. There is a considerable discussion regarding regression artifacts that can arise from using difference scores, including the potential for floor and ceiling effects (Cronbach & Furby, 1970; Woody & Costanzo, 1990). Notwithstanding, this approach is consistent with our focus in the current study on assessing changes in patterns of sexual learning at a critical transition point when students become more independent and can more autonomously engage in information gathering from the four primary socialization agents.

A Monte Carlo simulation indicates adequate power (> 0.85) for the CFA model with all four sexual information sources and the three endogenous constructs. There is 94.8% confidence that parameter estimates (λ) lie within the 95% confidence interval (94.7% for all CFA correlations). Power for the regression analyses is good for sexual attitudes (94.8% confidence), sexual knowledge (94.9% confidence), and risky sexual behavior (94.8% confidence) with moderately large effect sizes ($\sim \beta > 0.11$) and covariate adjustment. However, power is lower for smaller effect sizes in the fully adjusted model.

Results

Table 1 shows means and SDs of observed composites for the four sources of sexual information (i.e., mothers, fathers, friends/peers, and online media) both before and after enrolling in college, difference scores (i.e., sexual learning in college relative to prior to college) for the same sources of sexual information, and three observed measures of sexuality (i.e., sexual attitudes, sexual knowledge, and risky sexual behavior). Two sets of preliminary analyses were performed to (1) compare means of sexual learning from each source before vs. in college and (2) examine associations between covariates and the three components of sexuality. Among the four mean-level comparisons between learning about sex before vs. in college, only learning about sex from mothers was significant: participants learned significantly less about sex from mothers in college than before college, $t(511) = 8.22$, $p < .0001$. A total of 15 t-tests were conducted for five categorical covariates (i.e., time of study participation, gender, sexual orientation, race/ethnicity, and living situation) using the Holm-Bonferroni adjustment, which controls the family-wise error rate and preserves the protections against Type I errors (false positives) and a lower increase of Type II error risk offered by the classical Bonferroni adjustment. Eight of

Table 1 Descriptive statistics on all model variables

| Variables | <i>n</i> | <i>M</i> | <i>SD</i> |
|--|----------|----------|-----------|
| <i>Sources of sexual info prior to college</i> | | | |
| Mothers | 512 | 2.08 | .89 |
| Fathers | 489 | 1.36 | .62 |
| Friends/peers | 515 | 2.83 | 1.11 |
| Online media | 515 | 2.85 | 1.21 |
| <i>Sources of sexual info in college</i> | | | |
| Mothers | 512 | 1.81 | .94 |
| Fathers | 489 | 1.33 | .71 |
| Friends/peers | 515 | 2.82 | 1.30 |
| Online media | 515 | 2.79 | 1.31 |
| <i>Difference scores^a</i> | | | |
| Mothers | 512 | -.27 | .73 |
| Fathers | 489 | -.04 | .61 |
| Friends/peers | 515 | -.02 | .92 |
| Online media | 515 | -.06 | 1.03 |
| <i>Endogenous constructs</i> | | | |
| Sexual attitudes ^b | 515 | 3.83 | .61 |
| Sexual knowledge ^b | 515 | 21.33 | 5.06 |
| Risky sexual behavior ^c | 373 | 2.65 | .61 |

Notes. All variables were based on mean scores (on a 5-point scale), except for sexual knowledge, which was based on a sum across 35 items (6 items were excluded from the 41-item set per IRT results).

^aDifference scores were calculated by subtracting learning from a source prior to college from learning from the same source while attending college with positive values representing more learning from the source in college than prior to college. ^bAll models including gender were run with $n=511$ (without four gender non-conforming individuals). ^cAll models including gender were run with $n=373$ (without two individuals who were gender non-conforming and had never experienced sexual debut)

these comparisons revealed significant group differences in the endogenous constructs and involved all five covariates (see Supplemental Table 4 for detail). For the two continuous covariates, chronological age was not significantly associated with any sexuality measure, but early sexual debut age was significantly associated with greater risky sexual behavior ($r = -.13, p < .05$). These results confirm the importance of including the covariates in the subsequent analyses.

Confirmatory Factor Analysis

The results of confirmatory factor analyses indicated moderate to large and significant loadings for the random parcel indicators on their respective latent factors. When each set of random parcels was run individually as indicators of their respective latent factors, all of the models fit well (model fit information can be obtained from the first author). Figure 1 shows standardized factor loadings of the four latent factors reflecting different sources of sexual information (i.e., mothers, fathers, friends/peers, online media). Figure 2

shows the same results for the three latent factors assessing sexual attitudes, sexual knowledge, and risky sexual behavior. A model including all seven latent factors with freely estimated interfactor correlations fit well: $\chi^2(209) = 585.08$, CFI = 0.97, TLI = 0.96, RMSEA = 0.06 (90% CI [0.05, 0.07]), SRMR = 0.03, $\chi^2/df = 2.80$. Table 2 shows the associations among the seven latent factors.

Latent Variable Models

Structural equation models were individually tested positing the sources of sexual information as predictors of the three endogenous constructs: sexual attitudes, sexual knowledge, and risky sexual behavior. A majority of these latent variable models fit well, with the CFI > 0.95, TLI > 0.95, RMSEA < 0.06, and SRMR < 0.08 (Hu & Bentler, 1999). Model fit indices for all of the latent variable models are found in Supplemental Table 5.

Sexual Attitudes

Table 3 shows the results of the latent variable model with sexual attitudes as the endogenous construct. Sexual information learned from mothers was associated with less liberal (or more conservative) sexual attitudes in the multivariate model ($\beta = -0.17, p < .05$), and this association remained significant in the fully adjusted model with covariates ($\beta = -0.15, p < .05$). On the other hand, sexual learning from friends/peers was associated with more liberal sexual attitudes in the univariate ($\beta = 0.23, p < .001$), multivariate ($\beta = 0.37, p < .001$), and fully adjusted models ($\beta = 0.33, p < .001$). Sexual learning from online media was significantly associated with more liberal sexual attitudes in the univariate model ($\beta = 0.12, p < .05$); however, when specifying all four sources of sexual information and the covariates in the model, this association diminished in magnitude and became non-significant. The fully adjusted model accounted for 18.0% (without sexual debut age) of the variance in sexual attitudes, which did not appreciably change with sexual debut age in the model (16.8%).

Sexual Knowledge

Table 4 shows the results for the model specifying sexual knowledge as the endogenous construct. Interestingly, learning about sex from fathers was significantly associated with less sexual knowledge in the multivariate model ($\beta = -0.14, p < .05$), but this effect diminished and was not significant in the fully adjusted model with covariates ($\beta = -0.10, ns$). On the other hand, sexual information learned from friends/peers was significantly associated with greater sexual knowledge in all three models ($\beta = 0.25, p < .001$; $\beta = 0.24, p < .01$; and $\beta = 0.17, p < .05$,

Fig. 1 Standardized loadings on latent factors for four sources of sexual information. *Note:* The first set of numbers is the standardized factor loading for mothers, the second fathers, the third friends/peers, and the fourth online media. e = error net of prediction from the factor. A large circle is the latent factor, and rectangular boxes are the observed measures of communication

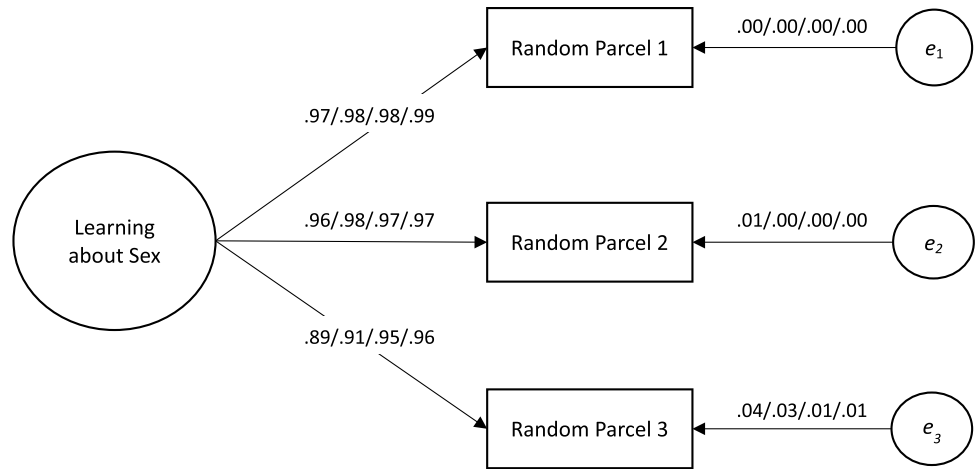


Fig. 2 Standardized loadings on latent factors for three endogenous constructs. *Note:* The first set of numbers is the standardized factor loading for sexual attitudes, the second sexual knowledge, and the third risky sexual behavior. “NA” means not applicable (as there were only three random parcels for this factor)

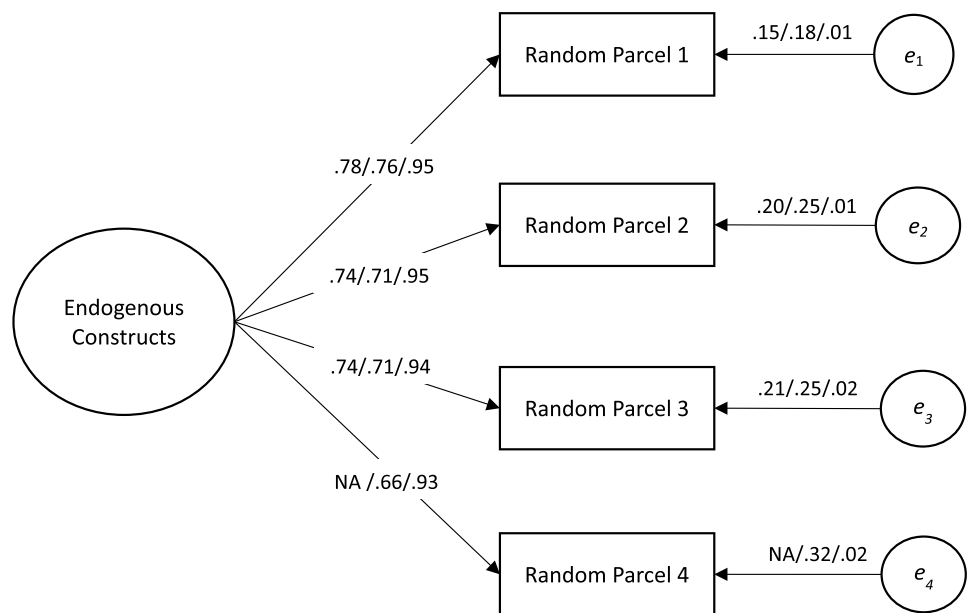


Table 2 Correlations among the latent factors

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---------------------------------------|--------|--------|--------|--------|--------|-------|-----|
| 1. Mothers ^a | – | | | | | | |
| 2. Fathers ^a | .65*** | – | | | | | |
| 3. Friends/peers ^a | .46*** | .28*** | – | | | | |
| 4. Online media ^a | .33*** | .19*** | .68*** | – | | | |
| 5. Sexual attitudes | –.05 | –.07 | .23*** | .12* | – | | |
| 6. Sexual knowledge | .01 | –.08 | .25*** | .22*** | .56*** | – | |
| 7. Risky sexual behavior ^b | –.19** | –.06 | –.11* | –.10† | –.07 | –.13* | – |
| Omega ^c | .96 | .97 | .98 | .98 | .79 | .76 | .94 |

Notes: ^aA source of sexual information. ^bAnalyses were done with 373 participants who had experienced sexual debut. ^cEstimates of internal consistency were computed with McDonald’s (1970) Omega statistic
 † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 3 Structural path coefficients from the latent variable model predicting sexual attitudes

| | Univariate | | Multivariate ^{a,b} | | Fully adjusted ^{a,b} | |
|-------------------------------|------------|------------|-----------------------------|------------|-------------------------------|------------|
| | β | 95% CI | β | 95% CI | β | 95% CI |
| <i>Sources of sexual info</i> | | | | | | |
| Mothers | -.05 | -.15, .05 | -.17* | -.31, -.03 | -.15* | -.27, -.03 |
| Fathers | -.08 | -.18, .02 | -.06 | -.19, .07 | -.04 | -.15, .07 |
| Friends/peers | .23*** | .14, .33 | .37*** | .23, .50 | .33*** | .22, .45 |
| Online media | .12* | .03, .22 | -.06 | -.19, .07 | -.08 | -.19, .03 |
| <i>Covariates</i> | | | | | | |
| 2021–2022 ^c | -.05 | -.15, .04 | -.05 | -.13, .03 | -.05 | -.13, .03 |
| Female ^d | .06 | -.02, .14 | .02 | -.06, .10 | .01 | -.07, .09 |
| Heterosexual ^e | -.34*** | -.41, -.26 | -.32*** | -.40, -.25 | -.30*** | -.38, -.23 |
| White ^f | .07 | -.03, .16 | .07 | -.01, .15 | .07 | -.01, .14 |
| Living at home ^g | -.16** | -.25, -.06 | -.13** | -.21, -.06 | -.11* | -.18, -.03 |
| Age | -.03 | -.13, .07 | -.06 | -.14, .02 | -.06 | -.15, .00 |
| Sexual debut age ^h | -.12* | -.23, -.00 | -.10 [†] | -.20, -.00 | -.09 | -.19, .01 |

Notes: ^aModel parameters for the multivariate and fully adjusted models are not trimmed of nonsignificant effects. ^bThe multivariate covariate-only and fully adjusted models (without four gender non-conforming individuals in the data) were run without and with sexual debut age with $n=511$ and $n=373$, respectively. ^c0=Data collected in 2019–2022; 1=2021–2022. ^d0=Male; 1=Female. ^e0=LGBTQ+; 1=Heterosexual. ^f0=People of color; 1=White/European American. ^g0=Living on campus; 1=Living at home with at least one parent. ^hThe absolute average difference in parameter estimates with and without sexual debut age in the model was .047 (Pearson $r=.96$) for the multivariate (covariates only) model and .045 (Pearson $r=.95$) for the fully adjusted model. CI=confidence interval

[†] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 4 Structural path coefficients from the latent variable model predicting sexual knowledge

| | Univariate | | Multivariate ^{a,b} | | Fully adjusted ^{a,b} | |
|-------------------------------|-------------------|------------|-----------------------------|------------|-------------------------------|------------|
| | β | 95% CI | β | 95% CI | β | 95% CI |
| <i>Sources of sexual info</i> | | | | | | |
| Mothers | .02 | -.09, .11 | -.04 | -.18, .10 | -.07 | -.19, .05 |
| Fathers | -.09 [†] | -.19, .01 | -.14* | -.27, -.01 | -.10 | -.21, .01 |
| Friends/peers | .25*** | .15, .34 | .24** | .10, .38 | .17* | .06, .29 |
| Online media | .22*** | .12, .31 | .09 | -.04, .23 | .12 [†] | .01, .22 |
| <i>Covariates</i> | | | | | | |
| 2021–2022 ^c | -.19*** | -.28, -.09 | -.18*** | -.26, -.10 | -.19*** | -.27, -.11 |
| Female ^d | .15** | .07, .23 | .11* | .04, .19 | .08 [†] | .00, .16 |
| Heterosexual ^e | -.24*** | -.32, -.16 | -.22*** | -.29, -.14 | -.19*** | -.27, -.11 |
| White ^f | .13* | .03, .23 | .13** | .05, .21 | .13** | .06, .21 |
| Living at home ^g | -.17** | -.27, -.08 | -.14** | -.21, -.06 | -.11* | -.19, -.04 |
| Age | .05 | -.05, .15 | .02 | -.06, .09 | .00 | -.08, .08 |
| Sexual debut age ^h | -.07 | -.17, .04 | -.08 | -.18, .02 | -.08 | -.18, .02 |

Notes: ^{a–g}The same as Table 3. ^hThe absolute average difference in parameter estimates with and without sexual debut age in the model was .057 (Pearson $r=.90$) for the multivariate (covariates only) model and .051 (Pearson $r=.90$) for the fully adjusted model

[†] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

respectively for the univariate, multivariate, and fully adjusted models). Sexual learning from online media was also significantly associated with greater sexual knowledge in the univariate model ($\beta = 0.22, p < .001$), but it was only marginally significant in the fully adjusted model.

The fully adjusted model accounted for 18.0% (without sexual debut age) of the variation in sexual knowledge as the endogenous construct, which reduced slightly to 15.8% with sexual debut age in the model based on participants who reported having experienced sexual intercourse.

Table 5 Structural path coefficients from the latent variable model predicting risky sexual behavior

| | Univariate | | Multivariate ^{a,b} | | Fully adjusted ^{a,b} | |
|-------------------------------|-------------------|------------|-----------------------------|------------|-------------------------------|------------|
| | β | 95% CI | β | 95% CI | β | 95% CI |
| <i>Sources of sexual info</i> | | | | | | |
| Mothers | -.20** | -.31, -.09 | -.25** | -.41, -.09 | -.19* | -.33, -.05 |
| Fathers | -.07 | -.19, .05 | .08 | -.07, .23 | .07 | -.06, .20 |
| Friends/peers | -.10 [†] | -.21, .01 | .05 | -.11, .21 | .03 | -.10, .17 |
| Online media | -.12* | -.23, -.00 | -.09 | -.23, .06 | -.09 | -.21, .03 |
| <i>Covariates</i> | | | | | | |
| 2021–2022 ^c | .14* | .03, .25 | .11 [†] | .02, .20 | .11 [†] | .02, .20 |
| Female ^d | -.16** | -.26, -.07 | -.19** | -.28, -.10 | -.15** | -.25, -.06 |
| Heterosexual ^e | -.08 | -.18, .01 | -.11 [†] | -.20, -.02 | -.12* | -.21, -.03 |
| White ^f | .15** | .04, .26 | .15* | .05, .24 | .14* | .04, .23 |
| Living at home ^g | -.05 | -.16, .06 | -.01 | -.10, .08 | .00 | -.09, .09 |
| Age | .02 | -.09, .14 | .06 | -.04, .15 | .06 | -.04, .15 |
| Sexual debut age | -.15** | -.26, -.04 | -.16** | -.26, -.07 | -.16** | -.25, -.07 |

Notes: ^{a–g}The same as Table 3. ^bThe multivariate covariate-only and fully adjusted models were always run with sexual debut age ($n=373$)

[†] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Risky Sexual Behavior

Table 5 shows the results of the latent variable model for risky sexual behavior. In all models predicting risky sexual behavior, the sample was reduced from 515 to 371, excluding 144 participants who had not experienced sexual intercourse and could not answer the questions pertaining to risky sexual behavior. Learning about sex from mothers was associated with less risky sexual behavior in all three models: $\beta = -0.20$, $p < .01$; $\beta = -0.25$, $p < .01$; $\beta = -0.19$, $p < .05$, respectively in the univariate, multivariate, and fully adjusted model. None of the remaining sources of sexual information were significant in the multivariate or fully adjusted models. The fully adjusted model accounted for 12.1% (with sexual debut age) of the variance in risky sexual behavior.

Difference Score Models

Table 6 contains the results of the models for the sexual learning difference scores predicting the same three endogenous constructs. The table presents only standardized coefficients for the difference scores of sexual learning given that the analyses with covariates replicate what is reported for the latent variable models (Tables 3–5). Model fit indices for all of the difference score models are presented in Supplemental Table 6, and regression coefficients for the covariates in the fully adjusted models are presented in Supplemental Table 7.

Sexual Attitudes

Learning sexual information from friends/peers more while attending college than before college was associated with more liberal sexual attitudes in the univariate, multivariate, and fully adjusted models ($\beta = 0.10$, $p < .05$; $\beta = 0.17$, $p < .01$; $\beta = 0.14$, $p < .05$, respectively). On the other hand, learning more about sex from online media while in college relative to before college was associated with *less* liberal (or more conservative) sexual attitudes in both the multivariate and fully adjusted models ($\beta = -0.15$, $p < .05$; $\beta = -0.14$, $p < .05$, respectively). The fully adjusted model without sexual debut age accounted for 15.8% of the variance in sexual attitudes, which did not diminish greatly with the inclusion of sexual debut age (15.6%).

Sexual Knowledge

When the same model was tested with sexual knowledge as the endogenous construct, greater sexual learning from friends/peers while in college relative to before college was associated with greater sexual knowledge across all three models ($\beta = 0.15$, $p < .01$; $\beta = 0.19$, $p < .01$; and $\beta = 0.16$, $p < .01$ for the univariate, multivariate, and fully adjusted models, respectively). In the fully adjusted model, 15.8% of the variance in sexual knowledge was accounted for without sexual debut age, and this reduced slightly to 14.5% with sexual debut age.

Table 6 Coefficients from the difference score model predicting endogenous constructs

| Sources of sexual info | Univariate | | Multivariate ^a | | Fully adjusted ^a | |
|--|-------------------|------------|---------------------------|------------|-----------------------------|------------|
| | β | 95% CI | β | 95% CI | β | 95% CI |
| <i>Difference score model: Sexual attitudes</i> | | | | | | |
| Mothers | .02 | -.07, .12 | -.01 | -.13, .12 | -.01 | -.10, .09 |
| Fathers | .03 | -.07, .12 | .01 | -.11, .13 | .01 | -.09, .10 |
| Friends/peers | .10* | .01, .20 | .17** | .05, .29 | .14* | .05, .24 |
| Online media | -.06 | -.16, .03 | -.15* | -.26, -.03 | -.14* | -.24, -.05 |
| <i>Difference score model: Sexual knowledge</i> | | | | | | |
| Mothers | -.03 | -.13, .07 | -.11 [†] | -.23, .01 | -.08 | -.18, .02 |
| Fathers | .04 | -.06, .14 | .06 | -.06, .18 | .05 | -.05, .14 |
| Friends/peers | .15** | .05, .25 | .19** | .08, .31 | .16** | .07, .26 |
| Online media | .01 | -.09, .11 | -.08 | -.19, .04 | -.08 | -.17, .01 |
| <i>Difference score model: Risky sexual behavior</i> | | | | | | |
| Mothers | -.00 | -.11, .11 | .03 | -.12, .17 | .04 | -.08, .16 |
| Fathers | -.02 | -.13, .10 | -.01 | -.15, .13 | .01 | -.11, .12 |
| Friends/peers | -.11 [†] | -.22, .00 | -.08 | -.22, .05 | -.11 [†] | -.22, -.00 |
| Online media | -.12* | -.23, -.01 | -.10 | -.23, .03 | -.05 | -.15, .06 |

Notes. ^aThe same as Table 3

[†] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Risky Sexual Behavior

In the model with risky sexual behavior as the endogenous construct, the only significant association was with differences in sexual learning from online media in the univariate model ($\beta = -0.12$, $p < .05$), suggesting that greater sexual learning from online media in college compared to before college was associated with less risky sexual behavior. The fully adjusted model (with sexual debut age) accounted for 13.2% of the variance in risky sexual behavior.

Living on Campus vs. at Home

To explore whether a transition in the living situation could explain a shift in how emerging adults learn about sex during the transition from high school to college, we conducted a multiple group analysis, comparing the multivariate difference score models between those who lived on campus vs. those who lived at home. The rationale for this additional analysis was that newfound freedoms associated with independent living and newly acquired friends at school (including social acquaintances) might prompt a shift in the sources of sexual learning. Among 12 comparisons of parameter estimates between the two models, only one showed a significant group difference ($z = 0.26$, $SE = 0.12$, $p < .05$). Specifically, in the model predicting risky sexual behavior, greater sexual learning from mothers in the past 6 months of college compared to before college was associated with lower risky sexual behavior among those who lived on campus ($\beta = -0.11$, n.s.), whereas it was associated with higher risky sexual behavior among those who lived at home ($\beta = 0.19$, $p < .10$). The

model fit was good, $\chi^2(34) = 48.45$, CFI = 0.98, TLI = 0.97, RMSEA = 0.05 (90% CI [0.00, 0.08]), SRMR = 0.06 and accounted for 2.5% of the variance in risky sexual behavior for those living on campus and 5.5% of the variance for those living at home. Despite lack of significant differences in the other comparisons, regression coefficients for the two groups were noticeably different in some cases, suggesting that the shift in the living situation (i.e., whether they lived with parents or not) has some implications for emerging adults' sexual attitudes, sexual knowledge, and risky sexual behavior. Supplemental Table 8 shows more detailed results.¹

Discussion

Guided by PST, we first tested latent variable models to examine the relations between four sources of sexual learning (i.e., mothers, fathers, friends/peers, and online media) and three components of sexuality including sexual attitudes, sexual knowledge, and risky sexual behavior. In addition, using difference score models, we examined shifts in the patterns of learning from the four different sources during and prior

¹ To test the possibility that being new to college life (regardless of the living situation) contributes to any changes in sexual learning during the transition from high school to college, we ran a multiple group analysis, comparing the multivariate difference score models between first-year students and older students. There was no significant group difference for all three endogenous constructs. Model fit indices did not change appreciably from the other multiple group analysis testing the living situation. This finding suggests that physical proximity to par-

to college and their relations to the same three components of sexuality. These four sources of sexual learning serve as primary channels for emerging adults to gather information on various sexuality-related topics. They play crucial roles in assisting emerging adults in shaping attitudes, values, and knowledge that contribute significantly to the socialization into adult roles including responsible and healthy sexual decision-making.

Overall, the current study demonstrated that where emerging adults learn about sex can have important implications for their sexual attitudes, knowledge, and behavior, all of which are mainstays of psychological theories of motivation and human agency (Ajzen, 1991; Bandura, 1986; Becker, 1974). With regard to the first research question, our findings comport with a growing literature that addresses sexual learning among college students and continuing roles that parents, friends, and online media play in sexual socialization during emerging adulthood (e.g., Buih et al., 2009; Lefkowitz & Espinosa-Hernandez, 2007; Morgan & Zurbriggen, 2012; Stevens et al., 2017). Results revealed three consistent patterns of the associations: (1) mothers' role in promoting conservative sexual attitudes and lowering risky sexual behavior, (2) the importance of friends/peers for developing sexual attitudes and acquiring sexual knowledge, and (3) the overall absence of fathers' influence.

First, the finding that learning about sex from mothers as college students was associated with conservative sexual attitudes and lower risky sexual behavior is consistent with research on parent-adolescent sex communication. Dilorio et al. (1999), for example, reported that a greater variety of sexual topics discussed with mothers was linked to adolescents' conservative sexual values. Additionally, in their meta-analysis, Widman et al. (2016) found a robust pattern across studies that mother-adolescent communication was associated with safe sexual practices (e.g., condom use). One of the possible mechanisms to explain these findings is the nature of sexual topics mothers talk about with their daughters and sons as emerging adults. Mothers, compared to friends/peers, are more likely to communicate about risk- and avoidance-based messages, such as abstinence until marriage and use of condoms and contraception (Boone, 2015). Even though the current study did not unpack the specific topics each source is likely to discuss or offer information on, it is possible that mothers conveyed their sexual attitudes and beliefs while focusing on what not to do rather than what is acceptable behavior. In their systematic review, Bangpan and Operario (2012) found that the link between sexual communication with parents and young women's sexual-risk decisions (e.g.,

HIV/STI prevention strategies, condom use, abstinence) was largely attributed to parents communicating their attitudes toward gender- and sex-related issues and young women internalizing them. Mothers' moralistic sexual messages, or messages of "do the right thing," may encourage emerging adults to develop more conservative sexual attitudes and protect them from engaging in risky sexual behavior, such as unprotected sex and alcohol consumption before and during sex. This type of view comports with the basic tenets of PST and reinforces the "channels of communication" that reify conservative norms and behavior not only for drug use but also for sexuality.

When the degree of sexual learning in college relative to prior to college was examined in the difference score models, maternal effects on the outcomes were no longer significant. However, the participants' living situation did make a difference in the implications of sexual learning from mothers while in college more than before college. Specifically, when emerging adults lived away from home, increased sexual learning from mothers during college (compared to before college) was protective against risky sexual behavior. However, for those still living with parents, it was associated with more risky sexual behavior. This suggests that not only the developmental but also environmental shift from high school to college affects how adolescents vs. emerging adults make different interpretations of sexual learning from their mothers. During emerging adulthood, individuals seek greater autonomy in decision-making (Arnett, 2000, 2015). If this need for autonomy is not met due to excessive parental control and overprotection (e.g., helicopter parenting), it can negatively impact mental health, academic performance, and decision-making skills (Luebbe et al., 2018; Schiffrin et al., 2014). Maternal control, which can be "well-intentioned albeit misdirected" (Padilla-Walker & Nelson, 2012, p. 1178), was likely greater for those living at home, and greater sexual learning from mothers in college than prior to college may indicate developmentally inappropriate control, fostering resentment and risky behavior as a reaction to a perceived lack of autonomy (Cook, 2020; Kwon et al., 2017; Moussa Rogers & McKinney, 2019). On the other hand, when emerging adults live on campus, they are subject to less parental (maternal) control, making it easier for them to make responsible decisions without harboring negative feelings toward their mother. Studies have shown that emerging adults who report less helicopter parenting and/or greater autonomy supportive parenting indeed demonstrate greater self-efficacy (Reed et al., 2016) and self-control (Hong & Cui, 2020), suggesting that a sense of autonomy and independence is critical for healthy decision making among emerging adults. More research is needed to better understand the subtle intricacies of these relations and the possibility that living situation may be a proxy for other factors including communication, parental control, boundary setting, and parent-child relationships

Footnote 1 (continued)

ents and their "voice" carries a more potent force in sexual learning and socialization during emerging adulthood than the fact that students are new to college.

that may moderate the associations between sexual learning and sexual behavior.

The second pattern evident in the results worth noting is the magnitude of the associations between sexual learning from friends/peers and both sexual attitudes and knowledge, which were by far the largest effects overall. This highlights the importance of friends and peers in formulating two important features of sexual development in emerging adults. In both cases, friends/peers were associated with more liberal sexual attitudes and greater sexual knowledge compared to parental influences. This is not surprising as studies have noted that emerging adults find friends and peers more influential than parents for their sexual values in college (e.g., Morgan & Zurbriggen, 2012). It is also consistent with Lefkowitz and Espinosa-Hernandez's (2007) finding that college students who reported having higher quality conversations about sex with friends also reported more liberal sexual attitudes. In the current study, liberal sexual attitudes came from greater endorsement of the statements on the questionnaire that support individuals' autonomy in reproductive and sexual decision-making. Therefore, this association is likely a reflection of sexual topics that emerging adults talk about with each other, which often involves a "discourse of erotics" (Allen, 2001). Such communication among friends and peers focuses on their own sexual experiences and sex-positive messages that promote various expressions of sexuality (Astle et al., 2023b; Boone, 2015; Lefkowitz et al., 2004) in manners that are less embarrassing and more open and comfortable (Lefkowitz & Espinosa-Hernandez, 2007). Emerging adults can obtain sexual information from online media and build their sexual knowledge from it, but sexual learning from online media is not quite the same as social interactions with another trusted individual. Given that learning from online media is likely more of a fact-finding mission (Buhi et al., 2009), the use of the internet and social media may not contribute to values and beliefs as much, whereas sexual learning from friends and peers is a socioemotional process that is instrumental in formulating one's attitudes toward sex, obtaining knowledge and learning about what is considered risky sexual behavior.

Greater sexual learning from friends/peers during college than prior to college also exhibited the same associations, indicating the ongoing influence of friends/peers for sexual socialization during the transition from adolescence to emerging adulthood. Surprisingly, peer influence was even stronger for those living at home than those on campus, despite presumably spending less time with friends/peers. Similar to those living at home who rebelled against increased communication about sex from mothers during college, emerging adults living at home may have exhibited a stronger, emotional, and cognitive shift in their reliance on and value of sexual information from peers in college compared to high school. This shift may be due to compensating

for less time spent with friends/peers compared to time and influence at home with parents.

The third notable pattern of the findings is that learning about sex from fathers demonstrated predominantly non-significant associations with sexual attitudes, sexual knowledge, and risky sexual behavior. There are two possible reasons for the lack of significant findings with fathers. First, it can be a statistical artifact of the high correlation between learning about sex from mothers and fathers. Emerging adults learn about sex from both mothers and fathers (hence the high correlation between the two), but the larger share of sexual learning may involve mothers, masking any influence that fathers may have. Second, more than three-quarters of the sample were women in the current study, and emerging adult women may feel more comfortable discussing sex with mothers than with fathers. Although there is evidence that college students feel increasingly comfortable and open to talking to both parents about sex (Morgan et al., 2010), college women report that fathers had often provided sexual messages that were based less on facts but more on their own beliefs and attitudes, which did not prepare them "well" for sexuality in college (Hutchinson & Cederbaum, 2011). Many college women do not even desire any type of support from fathers in their sexual decision-making (Astle et al., 2023a). On the other hand, college men report more comfort and openness talking to fathers about sex (Astle et al., 2022; Dilorio et al., 1999; Morgan et al., 2010). Future research should continue to examine sexual learning from fathers both during and before college and utilize a more balanced representation of male college students.

Although demographic factors were not the main focus of the study, all the covariates except for chronological age were significantly associated with the endogenous constructs in various models. The nature of their effects varied depending on the endogenous construct being examined. For example, gender and race/ethnicity mattered for sexual knowledge and risky sexual behavior, while sexual orientation and living situation mattered for sexual attitudes and knowledge. Even with these significant findings, it is important to note that the magnitude of coefficients for the main primary socialization agents (in both latent factor and difference score models) did not change appreciably with the inclusion of the covariates. In other words, the way in which sexual learning was associated with sexual attitudes, sexual knowledge, and risky sexual behavior was not altered by the inclusion of covariates. This suggests that the *process* whereby sexual learning contributes to emerging adults' sexual attitudes, knowledge, and behavior may be relatively independent of contextual and demographic factors. The fact that most of the covariates were significant in the multivariate and fully adjusted models does reinforce, however, the need for additional research modeling these contextual influences and more closely examining their direct and indirect influences on the outcomes. It also suggests that

sexual health promotion programs focusing on optimal sexual learning can become even more effective if they consider the demographic composition of their target audience.

Limitations and Future Directions

The current study has several limitations that are worth noting. First, the sample composition in the current study over-represented women, and this may have affected the obtained statistical relations. A larger male representation including men who discussed sexuality with their fathers may contribute to different findings or, at the very least, add significant variations to the models. It would also provide a means to test for invariance in the latent construct composition (i.e., whether the construct means the same for men and women) and also in the structural effects (i.e., whether the construct exhibits the same relations to outcomes for men and women). In addition, there were four gender non-conforming individuals in the current study, but they were not included in the analyses testing gender as a covariate. Having an overall larger sample size can provide more power to detect meaningful associations that would otherwise be hard to detect for under-represented individuals. However, it still cannot address the question of whether the constructs have the same meaning and influence for different groups. Future studies with larger samples and that contain a more balanced representation of different subgroups based on gender and sexual orientation can explore group differences or similarities. This line of work is critical to avoid heteronormativity and gender binarism as we build a more complete understanding of emerging adults' sexuality.

Second, in the current study, race/ethnicity was only examined using a White or non-White distinction. This type of distinction can result in "ethnic gloss" especially when very diverse individuals from different racial or ethnic groups are treated as a homogeneous group (Trimble, 1990). Although the decision to examine race/ethnicity dichotomously was necessitated by the smaller number of individuals who identify as people of color in the current study, the resultant illusion of homogeneity across different ethnic and cultural groups could have been avoided with a more purposeful sampling strategy, such as quota sampling. This is especially important given evidence of ethnic and cultural differences in sexual behavior and attitudes (e.g., Okazaki, 2002; Randolph et al., 2009). Future studies should strive to have larger representations of ethnic and cultural minority groups to avoid masking important effects specific to race, ethnicity, or culture.

Third, given that the current study utilized cross-sectional data as opposed to longitudinal data, certain memory biases and inaccuracy in reporting cannot completely be disregarded, suggesting that the findings should be interpreted with caution. Even with this caveat in mind, it is important

to emphasize that the current study was primarily exploratory given a paucity of research with emerging adults' sexual learning as college students. The current study represents a significant stride toward gaining a deeper understanding of sexual socialization among emerging adult college students. Previous studies have shown increases in sexual risk (Fromme et al., 2008) and alcohol-related sexual consequences (e.g., STIs, sexual coercion, regret after sex; Orchowski & Barnett, 2012) during the transition from high school to college. Accordingly, longitudinal studies tracking adolescents from late high school to early college could shed light on potential shifts in sexual learning during this transition and its impact on sexuality development.

Finally, the way in which "online media" was operationalized in the current study did not allow us to distinguish whether participants used reliable sources for sexual health information, sexually explicit media, or social media. Emerging adults often use the internet for sexual information (Buhi et al., 2009), and they are fully aware of misinformation (i.e., inaccurate information) or disinformation (i.e., deliberately misleading information) yet still struggle to discern fact from opinion or experience (Fraser et al., 2021). Although CDC, Planned Parenthood, and WebMD websites are considered as reliable sources of sexual health information (Diez et al., 2022), they are not the only sources of sexual information available on the internet. Emerging adults (especially men) are frequent consumers of sexually explicit media (Bhuptani et al., 2023; Morgan, 2011), and exposure to sexually explicit material in adolescence is linked to higher risky sexual behavior in emerging adulthood (Lin et al., 2020). Future research should examine different types of online media together within the same study so that we can better understand how each one of them could make relative contributions to emerging adults' sexual attitude, knowledge, and behavior.

Conclusion

The current study contributes to the growing body of literature on emerging adults' sexual learning while they are in college, a topic that has been relatively limited but is steadily expanding. Emerging adulthood is a transformative phase, characterized by meeting new people in new environments, sharing and learning diverse ideas and facts, embracing freedom and autonomy, and exploring endless possibilities that arise from new academic, social, and sexual encounters. Given that sexuality plays a central role in this developmental period, understanding where emerging adults acquire sexual information while attending college and how it relates to their sexual attitudes, knowledge, and behavior becomes crucial in developing effective sexual health promotion programs on college campuses. Targeting the early stages of the collegiate years as part of health programs may be particularly important as younger emerging adult college students are faced with considerable changes due to a

different living situation as well as an expanding social network that can increase their exposure to intimate relationships. In addition, given the unique role of mothers, colleges and universities may consider offering parent and family orientations before the student matriculates into college. These orientations could address a range of topics relevant to the lives of college students, encompassing not only academic success and mental health but also sexual health and violence. The efforts to help emerging adults to have a fulfilling and healthy college life can only become fruitful with further research to gain a deeper understanding of the multi-faceted and dynamic nature of sexual development during emerging adulthood. Such research can pave the way for fostering healthy sexual decision-making during this critically important transitional phase.

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Data Availability The datasets and codes generated for this study are available upon request from the corresponding author.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethics Approval This study was approved by the IRB at the first author's affiliated institution, and the study was performed in line with the principles of the 1964 Declaration of Helsinki.

Informed Consent Informed consent was collected from all participants prior to their participation.

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