



Sexual Behaviors as a Mediator Between Pornography Use and Heterosexual Relationship Outcomes

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Abstract

This study seeks to build on previous research about how pornography use is associated with relationship outcomes. Using the 3AM model (Wright, 2011) as a theoretical guide, sexual behaviors were tested as a possible mediator of the association between pornography use and relationship well-being. Using a national data set of individuals in heterosexual relationships ($n = 2519$), associations between different types of pornography use (alone use vs. joint use), sexual behaviors, and relationship outcomes were analyzed. Results showed that pornography use with a partner is a distinct activity when compared to pornography use alone. Additionally, significant indirect relationships between pornography use and relationship outcomes were found through sexual behaviors. Both vaginal sex and oral sex had positive effects, while anal sex had a unique, negative effect (use of sex toys was not significantly related). Future research should continue to examine the context of pornography use and how it is related to behaviors and outcomes in relationships.

Keywords Pornography use · Sexual behaviors · Sexual satisfaction · Relationship stability · Heterosexual relationships

Introduction

Pornography use has become a normal part of many lives in recent years, and thus, scholars have been interested in patterns of use (Carroll et al., 2008; Regnerus et al., 2016). Although there exist some differences in pornography use based on demographic characteristics such as age and biological sex (Poulsen et al., 2013; Price et al., 2016), research tends to show that using pornography is not limited to any one group of people. Because of how widespread pornography use has become, scholars have sought to understand more about how it affects individuals (Patterson & Price, 2012; Perry, 2018; Willoughby et al., 2019) and how it affects relationships (Leonhardt & Willoughby, 2019; Maas et al., 2018; Poulsen et al., 2013; Willoughby et al., 2016). Patterns of pornography use among couples (use alone vs. joint use) have also been studied (Bridges & Morokoff, 2011; Grov et al., 2011; Rodrigues, 2021; Willoughby & Leonhardt, 2020; Yucel & Gassanov, 2010). Generally, joint pornography use tended to have positive or null associations, whereas

pornography use alone tended to have negative associations with relationship outcomes.

In addition to these important aspects of pornography use research, scholars have also become interested in understanding how pornography use is related to the frequency of sexual experiences and behaviors. Research has revealed that pornography use is associated with increases in specific sexual experiences such as casual (Vandenbosch & Van Oosten, 2018) and extramarital sex (Wright & Randall, 2012). Additionally, pornography use has been shown to be associated with specific sexual behaviors such as oral sex, anal sex, and even submissive sexual behaviors (Herbenick et al., 2020; Mahapatra & Saggurti, 2014). Using the 3AM model (Wright, 2011) has allowed scholars to conceptualize why pornography use may be associated with engaging in a variety of sexual behaviors (Brem et al., 2021; Bridges et al., 2016; Sun et al., 2017). Although pornography use has been linked to both relationship outcomes and sexual behaviors in previous research, no study has explored mediated associations between all three simultaneously or explored how individual and joint pornography use may have different impacts on sexual behaviors in committed relationships. The possible relationships that exist are important to study because pornography use might not be as directly related to relationship outcomes as previously assumed. Sexual behaviors could be

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a salient mediator because they have been shown to be associated with relationship outcomes in other studies (see Brody & Costa, 2009; De Santis et al., 2019; Frederick et al., 2017). The purpose of this study was to use the 3 AM model as a conceptual framework to further understand how pornography use is associated with relationship outcomes through the mediating effects of sexual behaviors.

Pornography Use and Relationships

Pornography use has been shown to be associated with relationship outcomes in both positive and negative ways (Leonhardt & Willoughby, 2019; Maas et al., 2018; Willoughby & Leonhardt, 2020). Willoughby and Leonhardt (2020) found, for example, that male pornography use was negatively associated with both male and female relationship satisfaction, as well as male sexual satisfaction. These scholars also found, however, that pornography use had a positive relationship with sexual desire. In their study, Maas et al. (2018) showed a negative association between relationship satisfaction and pornography use. Further, Leonhardt and Willoughby (2019) found that using sexual media was related to lower satisfaction with the love and affection in the sexual relationship. Much of the research surrounding pornography use and its effects on relationships has found mixed results. This means that in the context of relationships, pornography use is nuanced and complex, not totally positive or negative. Additionally and importantly, much of this research examines direct relationships between pornography use and outcomes, but often fails to examine possible mediators.

How pornography is used in the relationship (either alone or jointly with a partner) is a key determining factor that has important considerations for the present study. For example, one study showed that when individuals used adult websites with a partner, they were more likely to have an openness to doing new things sexually (Groves et al., 2011). Other scholars have observed that solitary pornography use had negative associations with relationship outcomes, but pornography use together either had a less-negative impact, or no impact whatsoever (Bridges & Morokoff, 2011; Yucel & Gassanov, 2010). Finally, couple pornography use appears to be consistently related to higher sexual satisfaction in men and women, and that those who use pornography jointly with their partner perceive increases in the quality of their sex life (Rodrigues, 2021; Willoughby & Leonhardt, 2020). Pornography use alone and pornography use together as a couple seem to be distinct activities, and this complexity is a gap in research that needs further exploration. The 3AM model is an important theoretical framework through which this gap can be addressed.

3 AM Model

Beyond empirical suggestions that sexual behaviors may mediate relationships between pornography use and relationship well-being, recent theoretical arguments also suggest such a relationship may be likely. Wright's (2011) 3 AM Model was employed in the current study to explain the potential relationships between pornography use, sexual behaviors, and relationship outcomes. This theory is frequently used to understand how sexual behaviors are influenced through media use (including, and specifically for this study, pornography). In the model, Wright proposes that individuals learn and enact sexual scripts that have been taught to them by media. This happens through the three-step process of acquisition, activation, and application. Wright describes how individuals acquire sexual scripts in mass media because those which are more arousing may be more salient. The second step (activation) explores how the sexual knowledge gained during media use primes expectations for sexual experiences. Finally, applying the sexual script is where behaviors are enacted. Wright is explicit in saying that the script is not always going to be enacted, but the probability of it being used increases. Overall, the 3 AM model informs scholars about how sexual scripts from the media are acquired, activated, and applied in real sexual situations and suggests that pornography use (media) is likely to influence and change sexual behavioral patterns.

Scholars frequently use the 3 AM model as a theoretical lens through which to understand how sexual media influences behavior. For example, Sun et al. (2017) used the 3AM model as a theoretical framework in order to understand more thoroughly how sexual media provides scripts for specific sexual behaviors. Braithwaite et al. (2015) also used the 3AM model in their study to show how pornography use influences sexual scripts and behaviors for emerging adults in college. Similar to these previous studies, the present study seeks to use the 3AM model as a way to theoretically frame how pornography use is related to sexual behaviors as a mechanism through which shifts in relationship well-being may occur. More specifically, the current study uses the 3AM model by exploring how pornography use (acquisition of sexual scripts) is related to the frequency of sexual behaviors (application of sexual scripts). Although our study does not specifically measure the activation concept, it can be assumed that pornography scripts would of necessity be activated before they are applied in behavior. The 3AM Model provided an important framework which guided the current study because it has frequently been used by previous scholars to associations between pornography use and sexual behaviors (Brem et al., 2021; Bridges et al., 2016; Sun et al., 2017), and other research has clearly demonstrated that pornography use is connected with relationship outcomes

(Leonhardt & Willoughby, 2019; Maas et al., 2018; Poulsen et al., 2013). The 3AM Model allows us to explore a model in which pornography use may be associated with relationship outcomes through various kinds of sexual behaviors that couples may engage in.

Sexual Experiences

Recent research has hinted that a relationship exists between pornography use and a variety of sexual behaviors. Vandenberg and Van Oosten (2018) found longitudinally that frequent viewers of sexually explicit materials were more likely to engage in casual sex over time. Other scholars have found reported associations between movie sexual exposure and casual sex, including casual sex without a condom (O'Hara et al., 2012). Extradyadic sexual behaviors have also been shown to be associated with pornography use by scholars, including having ever engaged in paid sex (sex with a sex worker) and cyber infidelity (Ferron et al., 2016; Gwinn et al., 2013; Mahapatra & Saggurti, 2014; Wright & Randall, 2012). In addition to basic sexual experiences being related to pornography use, risky sex is a specific experience that has been notably researched by scholars.

Risky and unsafe sex (such as early sexual debut, having multiple sexual partners) have been shown to be associated with pornography use across studies (Harkness et al., 2015; Lin et al., 2020). Early exposure to sexually explicit materials has been shown to be associated with unsafe sexual behaviors in emerging adulthood (Lin et al., 2020). This association also happens in adulthood generally, as demonstrated by Harkness et al. (2015) in their review of associations between pornography use and sexual risk behaviors. Beyond risky sexual behaviors in general, a higher number of sexual partners is a specific kind of risky sex that has been frequently found to be associated across multiple studies (Braithwaite et al., 2015; O'Hara et al., 2012; Willoughby et al., 2014; Wright & Arroyo, 2013; Wright & Randall, 2012). Finally, sexual aggression (especially verbal sexual aggression) may be related to pornography use (Brem et al., 2021; Wright et al., 2016). In addition to these more general experiences, specific sexual behaviors have been identified by scholars as being related to using pornography.

Specific sexual behaviors that have been linked to pornography use by scholars include submissive sexual behaviors, oral sex, and anal sex (Braithwaite et al., 2015; Herbenick et al., 2020; Mahapatra & Saggurti, 2014; Sun et al., 2017). Braithwaite et al. (2015), for example, found that among emerging adults engaging in casual sexual encounters, the association between pornography use and behaviors existed for kissing, intimate touching, and oral sex. Mahapatra and Saggurti (2014) also found an association between pornography use and oral sex, but also showed a relationship with anal sex. More diverse sexual behaviors have also been shown to

be associated with pornography use. Among German women, both personal and partnered use of pornography was associated with their desire for, and engagement in, submissive sexual behaviors such as having their hair pulled, having their face ejaculated on, being spanked, choked, called names, slapped, and gagged (Sun et al., 2017). Interestingly, pornography use was only associated with submissive behaviors, not dominant behaviors. Although these scholars examined both personal and partnered use of pornography, the current study is unique as it looks at different sexual behaviors and analyzes relationship outcomes. Other scholars found similarly that pornography use was related to women and men who have sex with men being more likely to report having been choked, having one's face ejaculated on, and aggressive fellatio (Herbenick et al., 2020). As these studies show, beyond just broader sexual experiences, a key relationship exists between pornography use and sexual behaviors.

The association commonly shown between pornography use and behaviors is not the end of the story, however. Specific sexual behaviors have been associated with relationship outcomes in previous studies, but these studies are few and far between (Brody & Costa, 2009; De Santis et al., 2019; Frederick et al., 2017). Vaginal intercourse has been found to be strongly positively associated with sexual satisfaction (Brody & Costa, 2009). However, these scholars also found that other partnered sexual activities (anal sex and oral sex) were inversely related or unrelated to satisfaction measures. Conversely, Frederick et al. (2017) did discover a relationship between oral sex and sexual satisfaction, but only for men. They theorized that orgasm frequency was highly overlapping for women, which is why it might not have been as salient. Using a sexual intervention study to examine the effect of sex toy use on both sexual and relationship satisfaction, De Santis et al. (2019) did not find any significant differences pretest and posttest. Perhaps the most clearly studied pattern of sexual behavior and relationship outcomes is that of anal sex. Although the research is typically highly gendered among heterosexual couples (i.e., mainly focused on women's experiences), studies frequently show that anal sex for women is not typically pleasant. For example, women are frequently hesitant to try anal sex, but are often coerced into the behavior by their partners and are likely to experience pain during the encounter (Faus & Gonzalez, 2014; Faustino & Gavey, 2021; McBride, 2019). Clearly, there is a mixed bag of results when examining how sexual behaviors are associated with relationship outcomes, and further exploration is called for. Research demonstrates that pornography use is associated with various sexual behaviors in relationships. Additionally, sexual behaviors have been shown to be associated with relationship outcomes. Therefore, the links between pornography use and relationship outcomes may be mediated by sexual behaviors. The current study uniquely seeks to use the 3AM model to understand in more depth the

connection between pornography use (use alone vs. joint use) and relationship outcomes through the mediating effects of sexual behavior frequency.

Present Study

The present study seeks to add to a growing body of research on associations between pornography use, sexual behaviors, and relationship outcomes. Previous research has linked pornography use to relationship outcomes with mixed results (Maas et al., 2018; Willoughby & Leonhardt, 2020). While research has focused on contextual moderators that may change the relationships between these variables, such as gender and religion (Carroll et al., 2017; Short et al., 2015; Willoughby & Dover, 2022), less research has focused on mediating factors. Given the association found in previous research between pornography use and sexual behaviors (Braithwaite et al., 2015; Sun et al., 2017) and the association between sexual behaviors and relationship outcomes (Brody & Costa, 2009; De Santis et al., 2019; Frederick et al., 2017), variation in behaviors tied to pornography use is likely a mediator of this relationship that has been largely unexplored. Given these previous findings, the current study sought to expand this research by exploring associations between pornography use, sexual behaviors (as measured by vaginal sex, oral sex, use of sex toys, and anal sex), and relationship well-being (as measured by sexual satisfaction and relationship stability) for the first time. Sexual satisfaction and relationship stability were selected as they have been linked to pornography use in previous research (see Willoughby et al., 2016; Willoughby & Leonhardt, 2020). We tested these relationships with sexual behaviors being conceptualized as a mediator given previous empirical and theoretical work, with a specific focus on the 3AM model (Wright, 2011). While we utilized cross-sectional data in the current study and causal pathways could not be established, this cross-sectional analysis is an important first step to see if associations potentially exist and if future longitudinal work is warranted. Specifically, we explored the research questions and hypothesis below.

The 3AM Model has frequently been used to examine the relationship between pornography use and sexual behaviors (Brem et al., 2021; Bridges et al., 2016; Sun et al., 2017). This model provides a useful framework in which to understand how using pornography may lead to engagement with varying sexual behavior patterns. Further, pornography use has frequently been shown to be associated relationship outcomes (Leonhardt & Willoughby, 2019; Maas et al., 2018; Poulsen et al., 2013). Therefore, we proposed the following hypotheses to expand the current literature about how the 3AM Model can be used in mediation models:

H1 Pornography use will be positively associated with all of the sexual behaviors, with more consistent associations between joint pornography use and the frequency of sexual behaviors.

H2 The associations between pornography use and relationship outcomes will be mediated by the frequency of sexual behaviors.

Because of the scarce literature on how specific sexual behaviors are associated with relationship outcomes (Brody & Costa, 2009; De Santis et al., 2019; Frederick et al., 2017), we seek to help fill this gap with the following research question:

RQ1 How are each of the sexual behaviors (vaginal sex, oral sex, use of sex toys, anal sex) associated with relationship outcomes (relationship stability and sexual satisfaction)?

Method

Participants

Participants for this study were administered an online survey by the online data collection company, Qualtrics. The current sample was recruited from the USA using an opt-in panel design where Qualtrics panelists were given an option to opt into this study. No weights were used in the study. Inclusion criteria included a minimum age of 18 and currently self-identifying as being in a committed relationship. All participants for this study completed an informed consent form prior to being asked any questions in the survey. As part of that informed consent, participants were given an overview of the study, assured of the confidentiality of their data, and explained their rights as a research participant. Following completion of the survey participants was compensated directly by Qualtrics, at the standard rates they utilize for online panels. In order to ensure data quality, attention check questions were placed throughout the survey. Examples of these were “If you are reading this question, please select ‘Somewhat important’” and “If you are reading this question, please move the slider to ‘65’.” Participants who did not pass all of the attention checks were removed from the final sample. A total of 21 individuals were removed from the data due to failing attention checks or completing the survey in an unreasonably fast amount of time (< than 5 min). Those who were removed were not significantly different on biological sex, relationship length, education, or income. Removed participants were significantly older, more religious, and had more children. Missing data were very low on all reported variables (2% or less). The mean time for survey completion was 37.3 min (SD = 104.32).

The final sample consisted of 2519 individuals who identified themselves as being mostly or completely heterosexual. The reason for dropping participants who self-identified as being part of the LGBTQ+ community (i.e., self-identifying as not mostly or completely heterosexual) is that sexual behaviors among heterosexuals are different in ways that are not accounted for in the questions. For example, when asked about the frequency of vaginal sex in a relationship, a heterosexual individual may interpret and answer this question differently than an individual who self-identifies as being part of the LGBTQ+ community. Additionally, those who self-identified as transgender or “other” gender were also dropped from the sample because of small sample size ($n=2$). The final sample consisted of 1710 (66.9%) females and 846 (33.1%) males. About 75.5% of the individuals in the sample were White, 9.1% were African American (Black), 4.7% were Latino, 3.8% were Asian, and 6.9% were in another category (Native American, Other, Biracial/Multiracial). The sample was diverse in terms of relationship status with 58.5% being in their first marriage, 20.2% cohabiting with their intimate partner, 12.3% in a remarriage, 7.0% exclusively dating, 1.1% in an open relationship, and 0.9% married but separated. The median relationship length was 72 months. The sample was also diverse in terms of religion. Thirty-three percent (33.1%) of individuals were Protestant Christian, 22.8% had no religious affiliation, 20.0% were Roman Catholic, 4.6% were Agnostic, with 21.1% identifying another way (Greek Orthodox, Latter-day Saint, Jewish, Muslim, Unitarian, Atheist, Wiccan, Other). For the highest completed level of education, 78.7% of participants completed at least some college education, while 21.3% completed a high school degree or less. About 14.4% of individuals completing an associate degree, 25.7% completing a bachelor’s degree, 10.3% completed a master’s degree, and 3.4% completed an advanced degree (JD, PhD, MD, etc.).

Measures

Pornography Use Frequency

To measure the frequency of pornography use for this study, the short form of the Pornography Usage Measure was utilized, which assesses the frequency of use for using specific types of sexually explicit material (Busby et al., 2020). The following prompt was given to participants: “Please indicate how often in the last 12 months you have viewed or used the following sexual content alone.” The possible response categories given for each of the content questions ranged from “Never” (1) “Every day or almost every day” (6). Participants were then given 7 specific content questions and responded with the frequency of how often they use it. Examples of the content questions include: “An image of a woman alone posing in a suggestive way without any clothes on,”

“A short video depicting a couple having consensual sex. The woman’s breasts are shown but neither partner’s genitals are shown,” “An image of a heterosexual couple having sex which shows the man’s penis penetrating the woman,” “A video showing two naked women or men manually stimulating each other.” After the participants answered questions about the frequency of their pornography use alone, they were given the same content questions and the same prompt, but instead answered about how often they used the sexual content jointly with their partner. Both of the pornography use variables were latent variables in the final model, while being averaged for the correlation analysis. Cronbach’s alphas for the 7 pornography use alone and 7 joint pornography use items were 0.94 and 0.96, respectively. Pornography use alone had a slightly higher mean than joint pornography use (Use alone: $M=1.88$, $SD=1.14$; Joint use: $M=1.59$, $SD=1.02$).

Sexual Behavior Frequency

In order to measure the frequency of specific sexual behaviors, participants were given the following prompt: “How often do you engage in the following sexual behaviors with your partner?” The scale for these questions ranged from “Never” (0) “More than once a day” (7). Participants recorded the frequency of how often they engage in vaginal intercourse, using sex toys, anal sex, performing oral sex, and receiving oral sex. The two oral sex frequency variables were combined into one latent variable in the structural equation model, while the rest of the frequency variables were manifest variables.¹

Relationship Stability

Relationship stability was one of two relational outcomes that was used to assess relational quality for this study. Relationship stability was measured using items from the RELATE survey (Busby et al., 2001). Participants were asked the following three questions: “How often have you thought your relationship (or marriage) might be in trouble?”, “How often have you and your partner discussed ending your relationship (or marriage)?”, and “How often have you broken up or separated and then gotten back together?”. Participants then responded on a scale from 1 to 5 (“Never” to “Very Often”). Items were reverse coded so that higher numbers

¹ The oral sex variables were combined because of their very high correlation ($r=.77$). Further, the model had worse fit when the two oral sex variables were left separate, which is why they were combined into one latent variable. Model fit without combining the variables: ($\chi^2(414)=6693.159$, $p<.001$; RMSEA=.078 [90% CI .076, .079]; CFI=.893; TLI=.866; SRMR=.094). See Results for model fit with the variables combined.

meant higher relationship stability. This variable was averaged for the correlation analysis, while being a latent variable in the final model. The three items in the relationship stability scale had good reliability ($\alpha = 0.84$).

Sexual Satisfaction

Sexual satisfaction was the second relational outcome variable that was used to assess relational quality. The Golombok-Rust Inventory of Sexual Satisfaction (GRISS) asked participants questions about their sexual relationship, with possible responses on a scale from “Never” (1) to “Very Often” (5) (Rust & Golombok, 1985). The six questions that the participants were asked included: “Are you dissatisfied with the amount of variety in your sex life with your partner?”, “Do you find the sexual relationship with your partner satisfactory?”, “Are you satisfied with the amount of time you and your partner spend on foreplay?”, among others. The negatively worded questions were recorded so that higher scores on the scale represent higher levels of sexual satisfaction. This was also a latent variable in the final model, with items being averaged for correlation analysis. Reliability for the six items in the sexual satisfaction scale was good ($\alpha = 0.84$).

Control Variables

For the final model, a variety of control variables were used including biological sex, relationship length, religiosity, life satisfaction, and education.

Biological Sex Biological sex was used as a dummy variable in the final analysis with 0 = male and 1 = female. Biological sex was controlled for in the final model because of research which has shown differences between males and females in terms of both pornography use and its association with relationship outcomes (Carroll et al., 2017; Willoughby & Leonhardt, 2020).

Relationship Length Relationship length was measured as a continuous variable and was controlled for in the present study because the length of a relationship is likely to affect the sexual processes in the relationship (Grøntvedt et al., 2020). In addition, it has been controlled for in previous studies (Daspe et al., 2018; Willoughby et al., 2016). Because the oldest participant in the sample was 99, relationships lengths over 1188 months were coded as missing data to get rid of any lengths that were impossible for the sample.

Religiosity Religiosity was controlled for in anticipation that religion often plays a key role in the variation of defining pornography in general (Willoughby & Busby, 2016), rates at which pornography is used (Short et al., 2015), and the effects of pornography use (Leonhardt et al., 2018; Willoughby &

Dover, 2022). The religiosity scale was created using three items that measured both intrinsic religiosity and religious behavior. The first item was: “Spirituality is an important part of my life” and was measured on a scale from 1 (“Never”) to 5 (“Very Often”). The second item asked participants to report how often they prayed or communed with a higher power and was measured on the same scale as the previous item. The third and final item “How important is your religious faith to you?” was measured on a scale from 1 (“Not important”) to 5 (“Very important”). Z scores for each variable were calculated before the final variable was created because the possible responses were on different scales. Cronbach’s alpha for the 3 items was high ($\alpha = 0.92$).

Life Satisfaction Life satisfaction was another control variable used because past research has shown that life satisfaction varies between pornography users and abstainers and that life satisfaction is associated with relationship well-being (Gustavson et al., 2016; Harper & Hodgins, 2016; Willoughby et al., 2018) and to ensure that differences in associations were not due to underlying differences in individual well-being. Life satisfaction was measured by asking participants how they would rate their overall life satisfaction on a scale from 1 (Very Dissatisfied) to 7 (Very Satisfied).

Education The final control variable included in the models was education, which was used as a stand-in for SES. Previous research has shown that pornography use varies by level of education (Buzzell, 2005; Træen et al., 2004). Education was measured by participants reporting their highest completed level in school.

Results

Table 1 summarizes the bivariate correlations between variables in the study. In support of H1 at the bivariate level, pornography use was positively correlated with each of the sexual behaviors. Additionally, joint pornography use had a more consistent relationship than pornography use alone across the board (correlations reported for alone use first, followed by joint use) with vaginal sex ($r = 0.15$, $p < 0.001$; $r = 0.24$, $p < 0.001$), sex toys ($r = 0.35$, $p < 0.001$; $r = 0.42$, $p < 0.001$), performing oral sex ($r = 0.27$, $p < 0.001$; $r = 0.33$, $p < 0.001$), receiving oral sex ($r = 0.30$, $p < 0.001$; $r = 0.35$, $p < 0.001$), and anal sex ($r = 0.40$, $p < 0.001$; $r = 0.45$, $p < 0.001$). Examining the bivariate associations between relationship outcomes and sexual behaviors help to answer RQ1. We found that relationship stability was weakly positively associated with vaginal sex ($r = 0.10$, $p < 0.001$), weakly negatively associated with both sex toys ($r = -0.09$, $p < 0.001$) and anal sex ($r = -0.17$, $p < 0.001$), and not significantly related to performing ($p = 0.633$) or receiving

Table 1 Means, standard deviations, and correlations of study variables

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Pornography use alone	1.88	1.14	1												
2. Joint pornography use	1.59	1.02	.73*	1											
3. Vaginal sex	3.96	1.74	.15*	.24*	1										
4. Sex toys	1.79	1.92	.35*	.42*	.39*	1									
5. Anal sex	1.18	1.70	.40*	.45*	.34*	.53*	1								
6. Performing oral sex	3.22	1.95	.27*	.33*	.64*	.46*	.44*	1							
7. Receiving oral sex	2.91	2.00	.30*	.35*	.59*	.47*	.43*	.77*	1						
8. Relationship stability	3.97	0.97	-.29*	-.29*	.10*	-.09*	-.17*	.01	.02	1					
9. Sexual satisfaction	3.57	0.97	-.08*	.03	.51*	.19*	.13*	.38*	.41*	.43*	1				
10. Biological sex (1 = female)	0.67	0.47	-.46*	-.29*	-.05*	-.14*	-.26*	-.13*	-.19*	.06*	-.05*	1			
11. Relationship length	114.96	128.43	-.16*	-.15*	-.19*	-.13*	-.16*	-.19*	-.17*	.09*	-.07*	.08*	1		
12. Religiosity	0.00	0.93	.03	.12*	.06*	.03	.04*	.04*	.05*	-.09*	.03	-.00	.01	1	
13. Life satisfaction	5.32	1.40	.04*	.10*	.21*	.13*	.13*	.14*	.18*	.27*	.36*	-.15*	.04	.21*	1
14. Education	3.87	1.47	.17*	.12*	.02	.08*	.12*	.04*	.09*	-.01	.03	-.21*	-.02	.08*	.23*

M and SD are used to represent mean and standard deviation, respectively

*Indicates $p < .05$

($p = 0.354$) oral sex. Further, we found that sexual satisfaction was strongly positively related to vaginal sex ($r = 0.51$, $p < 0.001$), performing oral sex ($r = 0.38$, $p < 0.001$), receiving oral sex ($r = 0.41$, $p < 0.001$), and weakly positively associated with sex toys ($r = 0.19$, $p < 0.001$) and anal sex ($r = 0.13$, $p < 0.001$). Finally, bivariate associations showed that both kinds of pornography use were moderately negatively associated with relationship stability ($r = -0.30$, $p < 0.001$, $r = -0.29$, $p < 0.001$; alone and joint use, respectively), and pornography use alone was weakly negatively correlated with sexual satisfaction ($r = -0.08$, $p < 0.001$). Joint pornography use was not significantly correlated with sexual satisfaction ($p = 0.104$).

Figure 1 shows the structural equation model results exploring associations between pornography use, sexual behaviors, and relationship outcomes. Model fit was determined based on parameters suggested by previous scholars (Hu & Bentler, 1999; Steiger, 2007; Wang & Wang, 2019) in that good fit for models should have comparative fit index (CFI) > 0.90 , Tucker–Lewis index (TLI) > 0.90 , root mean square error of approximation (RMSEA) ≤ 0.07 , and standardized root mean square residual (SRMR) ≤ 0.08 . Based on the suggestions by previous scholars, the model in the current study had adequate overall fit ($\chi^2(424) = 4868.036$, $p < 0.001$; RMSEA = 0.065 [90% CI 0.063, 0.066]; CFI = 0.924; TLI = 0.907; SRMR = 0.087). Overall, the model accounted for 30% of the variance in relationship stability and 52% of the variance in sexual satisfaction. All factor loadings for the latent variables in the model were ≥ 0.798 . Importantly, we also modeled the covariance between joint use and use alone in order to parse out the unique effects of each type of pornography use. This allowed us to look at the effect of one kind of pornography use net of any effect from the other kind. In other words, the results for pornography use alone can be interpreted as the effect independent of joint pornography use (and vice versa).

Examining the standardized path coefficients from Fig. 1 highlight important patterns to consider in how pornography use impacts the frequency of sexual behaviors in relationships. The unique effect of pornography use alone was only significantly and positively associated with the frequency of sex toy use ($\beta = 0.10$, $p = 0.003$) and anal sex ($\beta = 0.07$, $p = 0.043$), but not with the other sexual behaviors. The unique effect of joint pornography use, on the other hand, was significantly and positively associated with all of the sexual behaviors including vaginal sex ($\beta = 0.24$, $p < 0.001$), sex toys ($\beta = 0.34$, $p < 0.001$), oral sex ($\beta = 0.32$, $p < 0.001$), and anal sex ($\beta = 0.37$, $p < 0.001$). How the sexual behaviors are associated with relationship outcomes also illuminates key patterns. Vaginal sex was positively associated with both relationship stability ($\beta = 0.12$, $p < 0.001$) and sexual satisfaction ($\beta = 0.38$, $p < 0.001$), as was oral sex ($\beta = 0.10$, $p = 0.003$; $\beta = 0.31$, $p < 0.001$; relationship stability and

Model predicting relationship outcomes

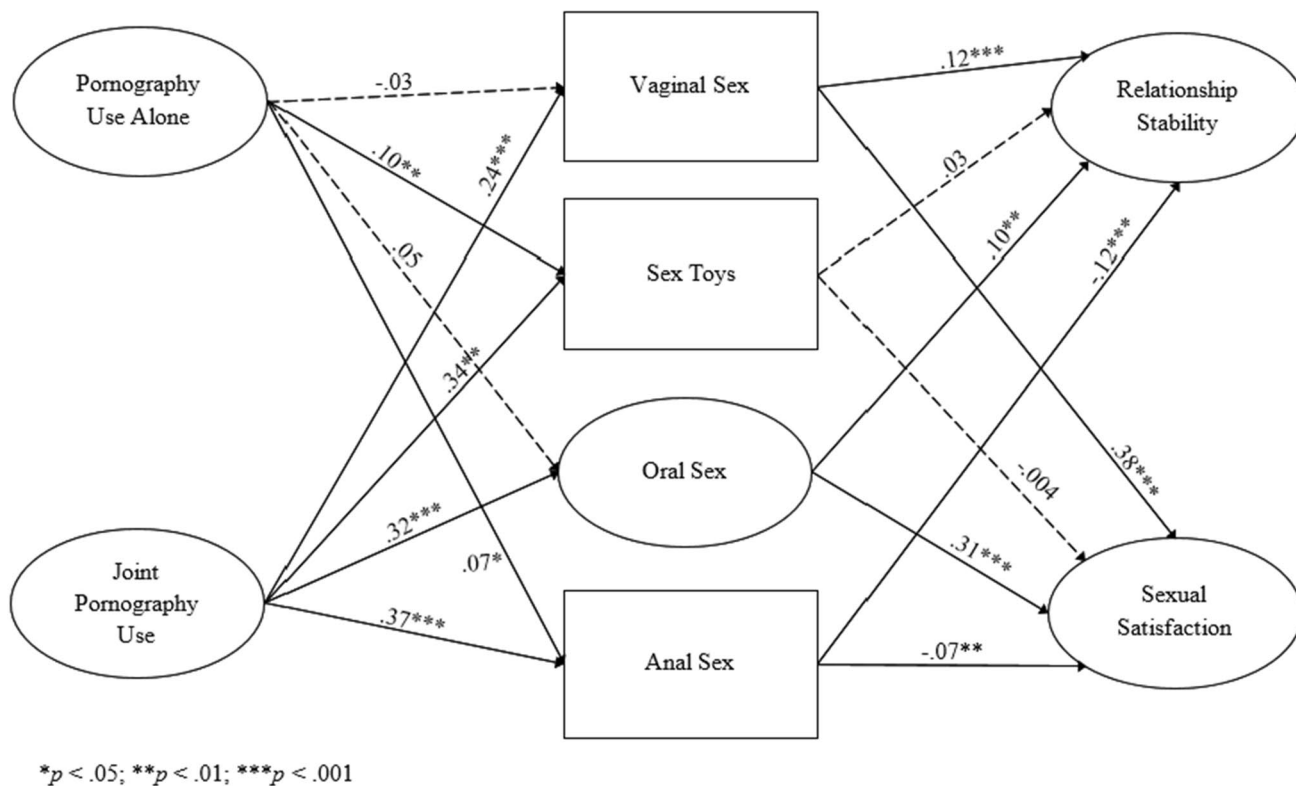


Fig. 1 Model predicting relationship outcomes

sexual satisfaction, respectively). Anal sex was negatively associated with both relationship stability ($\beta = -0.12$, $p < 0.001$) and sexual satisfaction ($\beta = -0.07$, $p = 0.001$). The use of sex toys was not significantly related to either outcome.

Table 2 shows the standardized indirect effects on sexual satisfaction. A similar pattern emerges which demonstrates the varying effects of pornography use alone and joint pornography use. The total indirect effect of pornography use alone on sexual satisfaction was not significant ($p = 0.880$), but the effect of joint pornography use was ($\beta = 0.160$, $p < 0.001$). The significant pathways vary between positive and negative effects through different sexual behaviors. While total indirect effect and the specific indirect effects through vaginal sex ($\beta = 0.089$, $p < 0.001$) and oral sex ($\beta = 0.099$, $p < 0.001$) were positive, the pathway through anal sex was negative ($\beta = -0.026$, $p = 0.002$).

Table 3 reveals the same pattern of the indirect effects on relationship stability. The total indirect effect of pornography use alone on relationship stability was not significant ($p = 0.550$). For joint pornography use however, the sum was significantly positive ($\beta = 0.026$, $p = 0.024$). Similar to the indirect effects on sexual satisfaction, vaginal ($\beta = 0.029$, $p < 0.001$) and oral sex ($\beta = 0.032$, $p = 0.005$) were positive, while anal sex was negative ($\beta = -0.044$, $p < 0.001$).

Discussion

The purpose of this study was to use the 3AM model to uniquely show how sexual behaviors act as a mediator between pornographies use and relationship outcomes. Partial support for H1 was found in that joint pornography use did indeed have more consistent associations with all of the sexual behaviors than pornography use alone. Interestingly, pornography use alone was only significantly associated with the use of sex toys and anal sex. Although previous scholarship has noted differences in alone use vs. joint use (Bridges & Morokoff, 2011; Grov et al., 2011; Yucel & Gassanov, 2010), this study provides clear evidence of how the context of pornography use is associated with patterns in sexual behaviors. Using pornography with a partner is a markedly different behavior than using pornography alone while in a relationship. Indeed, our results are robust with these findings considering that the covariance between joint use and use alone was controlled for in the model. This means that the effect of one type of use is independent of the other kind. Future research should treat these behaviors as distinct and different within heterosexual relationships. Perhaps couples who use pornography together are able to navigate challenges surrounding sex more easily, or they may have clearer

boundaries around sex. More work in the future is required in this area to understand this better.

These findings are important to understand in the broader context of research as well. With joint pornography use being significantly associated with sexual behaviors, support for the 3AM model (Wright, 2011) was shown, as is the case with previous studies (Braithwaite et al., 2015; Sun et al., 2017). We found that the effect of pornography use on sexual behavior may be more salient when pornography is jointly used with a partner. This perhaps suggests that the acquisition of sexual scripts through pornography is more likely to occur when pornography is viewed with a partner. There seems to be a compounding effect of pornography use when it is used with a partner rather than alone. It is possible that sexual scripts are more salient and easily activated and applied when they are acquired with a partner. Perhaps when sexual behaviors are seen by both partners in pornography they are more willing to try it together because they have been aroused by that behavior together previously. Past research has shown that when viewing pornography together, couples may use it as a tool to learn new behaviors that they want to incorporate into their sex lives (Groves et al., 2011; Olmstead et al., 2013). Also, it may be possible that they are more open in their communication and feel less embarrassment about the behavior when they have viewed it in pornography with their partner. Further research needs to be done in this area to understand why joint pornography use has more consistent associations with sexual behaviors.

It is also important to note that although pornography use was positively associated with all of the behaviors, the behaviors are not all positively associated with outcomes. Pornography use does seem to be connected to behaviors that promote positive outcomes (vaginal sex and oral sex), but it also is connected to anal sex, which was negatively related to relationship outcomes. When taken in the context of past research that pornography is related to other behaviors that have a negative impact on relationships such as extradyadic experiences, infidelity, and psychological aggression (Feron et al., 2016; Gwinn et al., 2013; Huntington et al., 2021; Mahapatra & Saggurti, 2014; Wright & Randall, 2012), pornography cannot be thought of as a totally positive or negative behavior. Rather, there is a lot of complexity and nuance that exists.

These complex findings may be helpful for clinicians who work with clients about pornography use. Scholars have noted that pornography use is becoming a growing clinical concern, with disclosure of pornography use presenting unique challenges to clinicians (Twohig & Crosby, 2010; Walters & Spengler, 2016). Using the 3AM model and examining the complexity that comes with how pornography use is related to sexual can allow clinicians to explore relationship behaviors in more depth. For example, they can understand how clients' pornography use may be influencing aspects

Table 2 Standardized indirect effects on sexual satisfaction

	Sum of indirect β	p value	Vaginal β	p value	Toys β	p value	Oral β	p value	Anal β	p value
Pornography use alone	-.003 (.023)	.880	-.012 (.014)	.376	.000 (.002)	.846	.014 (.012)	.239	-.005 (.003)	.080
Joint pornography use	.160 (.022)	.000	.089 (.014)	.000	-.001 (.007)	.846	.099 (.015)	.000	-.026 (.008)	.002

Standard errors in parentheses

Table 3 Standardized indirect effects on relationship stability

	Sum of indirect β	p value	Vaginal β	p value	Toys β	p value	Oral β	p value	Anal β	p value
Pornography use alone	-.005 (.008)	.550	-.004 (.005)	.550	.003 (.003)	.286	.005 (.004)	.271	-.008 (.004)	.059
Joint pornography use	.026 (.012)	.024	.029 (.008)	.000	.009 (.008)	.252	.032 (.011)	.005	-.044 (.009)	.000

Standard errors in parentheses

of their relationship such as the sexual behaviors that they engage in. This again may be evidence that pornography use is indeed an important factor to consider for clinicians in terms of acquiring and applying sexual scripts. What is more, the frequency of sexual behaviors has implications for relationship outcomes as well, which may also be of key interest to clinicians.

In answer to RQ1, all of the sexual behaviors except for use of sex toys were significantly associated with both relationship stability and sexual satisfaction. Both vaginal sex and oral sex had positive relationships with both outcomes, but had more consistent relationships with sexual satisfaction. Anal sex frequency, on the other hand, had a negative association with both outcomes, but a more consistent association with relationship stability. This finding lends support to a growing body of research that the experience of anal sex in heterosexual relationships is frequently negative and may undermine relationship well-being, especially for women (Faus & Gonzalez, 2014; Faustino & Gavey, 2021; Marston & Lewis, 2014; McBride, 2019). These studies on women's experience with anal sex also link their negative experiences to the pressure that their male partners may put on them to try it out. Expanding on this within the present study, it is possible that male partners are learning sexual scripts from pornography and then, expect their partners to perform the acts with them.

Anal sex had significant and negative indirect effects between joint pornography use and both relationship outcomes (sexual satisfaction and relationship stability). This finding provides evidence that when heterosexual partners watch pornography with each other, and enact possible sexual scripts, it is not always a positive experience. Combined with other research that has suggested a negative relationship environment (e.g., higher partner negativity, lower partner support) is predictive of engaging in anal sex (Hensel et al., 2010), the findings from this study continue to support the need for more work regarding pornography use in relationships. More research is especially warranted in terms of possible group comparisons of pornography users, and how these groups differ in relationship outcomes. Some research has found trends in which people expect pornography to be used together in their relationship (Olmstead et al., 2013), but caution should be used when interpreting the findings of this paper in prescribing pornography use to be used together as a couple as a way to enhance relationship outcomes. Although

causation cannot be claimed for this study, there still remains significant, negative associations between pornography use and relationship outcomes that should be considered. Future research should continue to examine anal sex as a unique behavior that has negative associations with relationship outcomes.

In answer to H2, and in support of the 3AM model, sexual behaviors did act as a potential mediator (based on indirect effects) between pornography use and relationship outcomes, but only through specific pathways. Indirect effects between joint pornography use and both relationship outcomes were significant and positive for vaginal sex and oral sex, but the pattern flips for anal sex in that the indirect effects between joint pornography use and relationship outcomes were significant and negative. Sexual behaviors have not been used as a potential mediator in pornography and relationship research previously. This is relevant for future scholars because pornography use as a behavior does influence relationship outcomes (Leonhardt & Willoughby, 2019; Maas et al., 2018; Willoughby & Leonhardt, 2020), but it also influences other behaviors in the relationship. Specifically, within the scope of this study, pornography use, sexual behavior patterns, and relationship outcomes are interrelated. The 3AM model was found to be a salient theoretical framework through which to understand how these concepts may be connected. However, this study falls short of establishing causation and more research will be needed to determine causal order.

Limitations and Future Directions

There are a few important limitations to remember when interpreting the findings of this study. The first limitation of this study is that findings can only be interpreted within the scope of the heterosexuals in the sample. The sample was not nationally representative and consisted exclusively of individuals who self-identified as heterosexual. Further, the sample consisted of mainly White participants. Thus, findings should be interpreted with hesitation to extrapolating beyond the sample. A final limitation about the sample was that participants self-identified as being in a committed relationship, which means the sample consists of people with varying views on what a committed relationship is.

Additionally, the data were cross-sectional in nature meaning that causation cannot be implied in this study. Although the results suggest that pornography use, frequency of sexual

behaviors, and relationship outcomes are interrelated with each other, the order at which those are occurring cannot be established with cross-sectional data.² Evidence from this study does suggest that sexual behaviors are a salient mediator (based on indirect effects) between pornography use and relationship outcomes, but it is not the only possible option. There are numerous other analytical approaches that can expand the scope of future studies to understand these relationships with more clarity and depth. For example, using a longitudinal design that is able to capture pornography use and changes in sexual behavior frequency over time would be especially crucial.

Finally, we could only find broad support for the 3AM model, but we were not able to specifically examine whether the specific content of pornography being watched was associated with engaging in that specific behavior. For example, the pornography measure used in this study did not specifically ask participants whether the pornography they were watching involved anal sex. Thus, we cannot conclude that watching pornography that includes anal sex is directly associated with the frequency of actually engaging in anal sex. Instead, we found preliminary evidence that pornography use does seem to be associated with learning new possible sexual scripts and the frequency of sexual behaviors. More specific analyses that include specific content viewed are an important direction for future research. Further, another critical next step for researchers to take is to further parse out how pornography use may influence relationship outcomes by narrowing in on groups of pornography users. For example, analyzing how the effects of pornography use may be different for individuals who only use pornography alone in their relationship as opposed to only together, or some mixture of both. A final direction for future research could be focused on the activation concept from the 3AM model. Although it could be implied that pornography scripts would of necessity be activated before they are applied in behavior, future research could examine the processes behind activation in relation to pornography use and sexual behaviors.

The current study examined the associations between different types of pornography use, sexual behaviors, and relationship outcomes. Evidence suggests that joint pornography use is distinct from pornography use alone and that sexual behaviors are an important potential mediator between pornography and relationship outcomes because of the various impacts (with anal sex having a unique, negative association).

² An alternate model was tested in order to examine other possible configurations of a mediation model with relationship outcomes predicting pornography use, which then predicted sexual behaviors. The model showed similar fit to the one presented in the current study, as well as similar results (available via the 1st author). However, the model presented in the current study seemed to fit the theoretical question best, which is why it was chosen.

Evidence also supported the 3AM model of sexual scripts (Wright, 2011). These findings should be taken into consideration for future scholars to understand the complexities surrounding pornography use and its associations with relationship outcomes.

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Declarations

Conflict of Interest Not applicable.

Ethical Approval All procedures performed were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all participants included in this study, and ethics approval was received from the University Research Ethics Board of the first author.

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