A Latent Class Analysis of Online Sexual Experiences and Offline Sexual Behaviors among Female Adolescents

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Abstract

This study used latent class analysis (LCA) to identify patterns (i.e. classes) across a broad range of online sexual experiences among female adolescents ($n = 312$) and to explore offline sexual behavior and substance use correlates of as well as maltreatment differences in class membership. The following four classes were identified: *Online Abstinent, Online Inclusive, Attractors*, and *Seekers*. Maltreated female adolescents were more likely to be members of the *Online Inclusive* class and less likely to be members of the *Online Abstinent* class than non-maltreated female adolescents. Offline sexual behaviors and substance use differentially predicted class membership. These results suggest online sexual experiences vary greatly and should not be aggregated together as a global risk factor for all female adolescents.

The proliferation of the internet has provided adolescents with unprecedented access to pornography and constant social interaction in ways never before observed prior to the digital era (Ward, Seabrook, Manago, & Reed, 2016; Ybarra & Mitchell, 2008). One-half to two-thirds of adolescents in the US have reported exposure to internet pornography, suggesting that exposure may be more normative than previously thought (Owens, Behun, Manning, & Reid, 2012; Sabina, Wolak, & Finkelhor, 2008). Additionally, 73% of American adolescents use social networking websites, over 50% use a social networking website daily, and 22% use them more than ten times per day (Refuel Agency, 2015). Although there is a growing body of research that examines the effects of media on adolescents' health and well-being, findings are inconsistent across studies. Study samples are often of US adolescents in higher socioeconomic contexts and/or adolescents from Northern European countries (Brown & Bobkowski, 2011; Peter & Valkenburg, 2016). Furthermore, although gender differences are frequently tested in studies of online sexual experiences, studies that focus on female adolescents from both theoretical and applicable perspectives are sparse. Consequently, the current body of work that examines online sexual experiences among adolescents is not necessarily generalizable to female adolescents, particularly those in more vulnerable socioeconomic contexts. The dearth of knowledge about how online sexual experiences may differ for adolescents across varying contexts may also signal a deficiency

in prevention programming that can respond to these differences to ensure healthy sexual development in the new digital era.

As adolescents develop an interest in sexuality, they begin to assume culturally constructed norms around sexuality known as 'sexual scripts' (Simon & Gagnon, 1984). Sexual Scripting Theory posits that these culturally constructed sexual scripts are transmitted through parents, peers, and media (Simon & Gagnon, 1984). Ultimately, it is theoreized that these sexual scripts guide individuals' behaviors and expectations about sexual scenarios. Objectification Theory further postulates that the predominant sexual script targeted toward female adolescents is that 'physical beauty translates to power', which may influence a girl or woman to take an observer's perspective of her physical self as the predominant view of her whole self (Fredrickson & Roberts, 1997). Thus, many female adolescents may feel pressure from this sexual script to prove sexual worthiness through physical displays of sexuality (Tolman, 2002).

The online context is a space where female adolescents can learn sexual scripts as well as practice them. Indeed, the Sexual Media Practice Model posits that individuals are both influenced by media they consume and they also choose media which align with their self-concept (Shafer, Bobkowski, & Brown, 2013). For example, a female adolescent may see sexually explicit pictures of women online and decide to display herself provocatively on social media (Crimmins & Seigfried-Spellar, 2014; Strassberg et al., 2013) or decide to engage in 'sexting' (i.e., sending nude images via an internet-connected device), suggesting a media effect on behavior. However, female adolescents with a sexualized self-concept will be more likely to seek out images of sexualized women in various media platforms, suggesting a media selection effect. Thus, research that examines the complexity of individual differences in patterns of online sexual experiences (i.e., experiences that occur online and are sexual in nature) and for whom those online experience patterns are linked with offline behaviors is vital for our overall knowledge of the multidimensional nature of female sexual development today.

Internet Pornography and Sexual Scripts

A predominant online sexual experience where adolescents can learn sexual scripts is through internet pornography use. A well-agreed upon definition for internet pornography that will be used here is "professionally produced or user-generated pictures or videos intended to sexually arouse the viewer" (Peter & Valkenburg, 2011, pp. 1015-1016). The internet changed the way adolescents are exposed to and use pornography because the internet provides an unprecedented level of access to pornography (Cooper, Delmonico, & Burg, 2000). This accessibility could explain why American high-school students are exposed to pornography online a few times per month, compared with exposure to pornography in movies or magazines a few times per year (Chang et al., 2016). Overall, reports from US and Northern European samples indicate that 40-70% of adolescents are first (and sometimes subsequently) exposed to internet pornography unintentionally (Peter & Valkenburg, 2016), suggesting that exposure to internet pornography is typical for adolescents regardless of their intentions. Among female adolescents in the US, prevalence of intentional pornography use ranges from 23-48% (Peter & Valkenburg, 2016). However,

US prevalence studies of adolescent internet pornography use rarely include racial and ethnic minority or low-income participants, making it difficult to determine how accurate the frequencies are beyond middle-income white adolescents.

Although sexual interest is developmentally normative in adolescence, pornography exposure is concerning because analyses of the most frequented pornographic websites and most purchased pornographic videos reveal that the majority of scenes portray sex with verbal and physical aggression toward women and without the use of condoms (Barron & Kimmel, 2000; Bridges, Wosnitzer, Scharrer, Sun, & Liberman, 2010; Klaassen & Peter, 2015). Internet pornography use has been found to be associated with riskier sexual attitudes and behaviors among many adolescents in both cross-sectional and longitudinal research (Peter & Valkenburg, 2016), suggesting that internet pornography may indeed shape sexual scripts. For example, more traditional forms of media (e.g. TV and magazines) have been shown to be indirectly associated with sexual objectification for boys through the internalization of appearance ideals, whereas internet pornography was directly related to self-objectification (Vandenbosch & Eggermont, 2013a). In terms of sexual behavior, exposure to internet pornography is associated with more frequent and an earlier onset of sexual activity among US and Dutch female adolescents (Peter & Valkenberg, 2016) and less frequent use of contraceptives among sexually active female adolescents in the US (Wingood et al., 2001). Internet pornography use has also been found to be associated with higher rates of nicotine and alcohol use among female adolescents (Mattebo, Tydén, Häggström-Nordin, Nilsson, & Larsson, 2016). These studies suggest that internet pornography use is a consistent correlate of female adolescent health behaviors.

Social Media, Sexting, and Sexual Scripts Among Female Adolescents

Social media also provide adolescents with the opportunity to learn and practice sexual scripts through observing and interacting with others. For example, some adolescents use social media to chat about sex with peers and strangers, as a context to present themselves sexually, and/or to distribute sexually suggestive images of themselves (Doornwaard, Moreno, van den Eijnden, Vanwesenbeeck, & Ter Bog, 2014; Perloff, 2014; Van Oosten, Peter, & Boot, 2015). Several studies have shown that female adolescents (compared to male adolescents) more commonly present themselves in a sexually provocative way on social media sites (Kapidzic & Herring, 2015; Manago, Graham, Greenfield, & Salimkhan, 2008; Thiel-Stern, 2009). These findings suggest that female adolescents may use social media as a source of sexual expression in ways that are distinct from male adolescents.

Consistent with Objectification Theory, girls and women report pressure to present themselves in a sexualized way online that is consistent with the way they witness girls and women presented in media (Aubrey, 2006; Peluchette & Karl, 2009; Ringrose, Harvey, Gill, & Livingstone, 2013; Thiel-Stern, 2009; Ward et al., 2016). In experimental research, young girls (5-8 years old) have been shown to internalize and apply appearance ideals portrayed in media to their own bodies (Dohnt & Tiggemann, 2006). In middle school, female adolescents are more likely than male adolescents to internalize appearance ideals, and in turn, are more likely to demonstrate a positive association between their media consumption and body dissatisfaction than male adolescents (Jones, Vigfusdottir, & Lee, 2004). Thus, it is

unsurprising that some female adolescents report feeling pressure to have a sexy or at least a pretty Facebook® profile picture (Peluchette & Karl, 2009). For instance, 20%-50% of female adolescents display a sexually provocative image on their social media profiles (Crescenzi, Arauna, & Tortajada, 2013; Kapidzic & Herring, 2015). In a recent longitudinal study of Dutch adolescents, female participants who presented themselves in a sexualized way online had an increase in their willingness to engage in sexting two months later, whereas male adolescents did not (van Oosten & Vandenbosch, 2017). Therefore, more research is needed to understand how female adolescents engage in social media and sexting as a form of sexual expression.

Sexting through internet-connected devices also serves as an online sexual experience for adolescents to practice sexual scripts. However, female adolescents who engage in sexting seem to be at higher risk for negative psychosocial outcomes compared to male adolescents who engage in sexting (Lippman & Campbell, 2014; Ringrose, Harvey, Gill, & Livingstone, 2013; Walker, Sanci, & Temple-Smith, 2012). Sexting is perceived among many youth to be a modern form of flirting or expressing romantic interest in someone (Strassberg et al., 2013). However, scholars have found sexting to be associated with having an earlier onset of sexual behavior, more penetrative and oral sex partners, a lower likelihood of using a condom during penetrative sex, and a greater likelihood of engaging in sex under the influence of drugs or alcohol (Crimmins & Seigfried-Spellar, 2014; Henderson & Morgan, 2011). Female adolescents in particular, report feeling pressured to send sexts and face more consequences after doing so, whereas male adolescents report feeling pressured to collect sexts and gain social power by doing so (Ringrose et al., 2013; Walker et al., 2012). Indeed, more male (49.7%) than female (30.9%) adolescents report receiving sexts, and approximately 25% of male receivers (compared with 2% of female receivers) report forwarding them to other people (Strassberg et al., 2013). Thus, female adolescents may be at higher risk for negative psychosocial outcomes from sexting, as their nude photos are more likely to circulate widely.

The speed and ease of forwarding sexts to peers and strangers through various forms of social media make it more likely for public humiliation to occur for the female senders than the male receivers (Walker et al., 2012). Even within the context of a committed relationship, the majority of girls are judged as 'sluts' for sexting or 'prudes' for refusing to sext, whereas boys remain immune from criticism regardless of sexting behaviors (Lippman & Campbell, 2014). Thus, sexting could be considered a self-objectifying behavior for female adolescents whereby seeking approval for sexual appeal is prioritized over preventing negative outcomes (such as mass distribution of a nude photo). Understanding potentially self-objectifying behaviors as part of the Sexual Media Practice Model (Shafer et al., 2013) is important because self-objectification has been linked with negative health outcomes such as depression, anxiety, disordered eating, substance use, and less condom use (Carr & Szymanski, 2010; Grabe & Hyde, 2009; López-Guimerà, Levine, Sánchez-Carracedo, & Fauquet, 2010). Thus, social media and sexting behaviors may have important implications for female adolescents' health.

The Role of Maltreatment

Understanding which female adolescents are prone to engage in which kinds of online sexual experiences will help to illuminate who needs targeted intervention when it comes to internet safety and sex education. A growing body of research points to childhood maltreatment (i.e., sexual abuse, physical abuse, and neglect) as a risk factor for a multitude of negative adolescent outcomes, especially in the context of sexual risk-taking (both offline and online). For instance, research has shown women who were maltreated in their youth are more likely to abuse substances and pair substance use with sexual behavior than non-maltreated youth (Norman, Byambaa, De, Butchart, & Scott, 2012; Trickett, Noll, Reiffman, & Putnam, 2001). Furthermore, sexual assault and sexual behavior without the use of contraceptives is more likely to occur among female adolescents and adults who were maltreated in their youth than those who were not maltreated in their youth (Noll, Trickett, & Putnam, 2003; Norman et al., 2012; Trickett et al., 2001). Importantly, maltreated female adolescents are also more likely to present themselves provocatively online, as well as more likely to agree to an offline meeting with someone whose identity was never confirmed online compared to non-maltreated female adolescents (Mitchell, Finkelhor, & Wolak, 2007; Noll et al., 2013; Noll et al., 2009). Given this heightened risk for anomalous online and offline behavior, it is crucial to ascertain the risk that maltreatment confers for the development of aberrant sexual scripts among female adolescents.

All types of maltreatment may result in distorted sexual script formation and self-objectification. However, the pathways to these outcomes may be different depending on the type(s) of maltreatment experienced. For example, children who have experienced sexual abuse may have distorted perceptions of their sexual selves and may be drawn to sexual experiences that are more likely to result in negative outcomes (Noll et al., 2003). In contrast, children who have experienced physical abuse may have low self-esteem and self-efficacy which may propel a trajectory of general self-destruction and risk-taking, including sexual risk-taking (Kim & Cicchetti, 2006; Milner, 2000; Miniati et al., 2010; Norman et al., 2012). Finally, children who have experienced neglect may have weak parent-child relationships and household environments with low parental warmth and monitoring (Erickson & Egeland, 2002). However, maltreatment types co-occur in more than 50% of individuals who experience any type of maltreatment (Adams et al., 2016; Vachon, Krueger, Rogosch, & Cicchetti, 2015). This co-occurrence makes it difficult to disentangle which types of maltreatment are associated with which online and offline sexual experiences. Given the global vulnerability of maltreated youth [as they are less likely to have a strong parental presence (Erickson & Egeland, 2002) and more likely to be in the child protection system], research that examines the online sexual experiences of maltreated youth is needed to improve case management of female adolescents in child protective services.

The Value of a Person-Centered Approach to Online Sexual Behavior

A person-centered approach focuses on particular *patterns* of behaviors that occur concurrently, as opposed to a variable-centered approach that emphasizes single behaviors (Bergman & Trost, 2006; Magnusson, 2003). Examining adolescent sexual behavior using a person-centered approach is important insofar as single behaviors may not be risky on their

own but rather in combination with other behaviors. Consequently, a person-centered approach will build upon prior variable-centered work by describing adolescent online sexual behavior holistically and emphasizing key patterns of behaviors that occur among female adolescents. Latent class analysis (LCA; Collins & Lanza, 2010) is a person-centered approach that can be used to identify classes of adolescents based on combinations of online sexual experiences to explore the multifaceted nature of these experiences. LCA has been used in previous studies to identify adolescents' different patterns of sexual and romantic relationships and the perceived consequences of those patterns (Vasilenko, Kuglar, & Lanza, 2015; Wesche, Lefkowitz, & Vasilenko, 2016), as well as to investigate violence exposure among women (Nurius & Macy, 2008). However, less is known about different patterns of adolescent online sexual experiences due to the lack of person-centered approaches applied to the study of online sexual experiences.

To our knowledge, the only person-centered study of online sexual experiences among adolescents identified group-based trajectories of online and offline sexual risk behaviors in a sample of Dutch adolescents (49% female) from two-parent households (80%) (Baumgartner, Sumter, Peter, & Valkenburg, 2012). The results of this study show that online sexual risk behaviors peak in mid-adolescence, similar to offline risk behaviors. However, online sexual risk behavior is initiated earlier, particularly among adolescents who later engage in offline sexual risk behavior. Adolescents from less cohesive families were more likely to be members of the high-risk trajectory compared to adolescents from more cohesive families. Although this was an important study with developmental implications for online sexual risk behaviors, (1) the measure only contained four items of online sexual behaviors, leaving out a nuance of experiences that may be important for female sexual development; and (2) results from a Dutch sample of higher-SES adolescents from two-parent households cannot necessarily be generalized to female adolescents in the US in more vulnerable economic and familial contexts. Therefore, LCA can uncover which female adolescents engage in a variety of online sexual experiences and for whom those experiences are linked with offline behaviors. Such research could reveal vital information for targeted prevention strategies in both internet safety and sex education programming for maltreated and non-maltreated female adolescents.

The Current Study

The current study used LCA to (1) uncover latent classes of female adolescents characterized by different patterns of online sexual experiences, (2) investigate how class structure and distribution differed by maltreatment status, and (3) examine how offline sexual and romantic behavior, as well as substance use histories were associated with class membership. Given the unique nature and dynamics of online sexual experiences for female adolescents compared to male adolescents (Ringrose et al., 2013; van Oosten & Vandenbosch, 2017; Ward et al., 2016), the current study focuses solely on female adolescents.

Consistent with the Sexual Media Practice Model (Shafer et al., 2013) and prior research which found online sexual behaviors to cluster into trajectories of low, moderate, and high risk (Baumgartner et al., 2012), it was expected that at least three classes with the following

characteristics would emerge: (a) high probabilities of online sexual self-presentation behaviors (e.g., sexualized social media presentation and sexting), (b) high probabilities of seeking internet pornography and cybersex/role-play experiences, but low probabilities of sexual self-presentation behaviors, and (c) low probabilities of all online sexual experiences. Due to prior findings that maltreated youth as well as youth from less cohesive families engage in more online sexual behaviors (Baumgartner et al., 2012; Noll et al., 2009; 2013), it was also expected that female adolescents who had been maltreated would be less likely to be members of a class with little to no online sexual experiences. Finally, consistent with Objectification Theory and prior work showing that self-objectification is positively correlated with alcohol, nicotine, and other substance use (Carr & Szymanski, 2010), it was expected that participants who had engaged in more offline sexual behaviors and substance use would be more likely to be members of classes with more online sexual self-presentation behaviors.

Method

Participants

Female adolescents (N = 312) were recruited from a large, Midwestern city. Maltreated participants (n = 154) were intentionally recruited from local Child Protective Services (CPS) agencies for having experienced substantiated instances of physical abuse, physical neglect, or sexual abuse via state and local standards. Fifty-one percent of the maltreated sub-sample experienced multiple types of maltreatment. Given the high percentage of comorbid maltreatment types, analyses will not be carried out by abuse type. Non-maltreated (n = 158) participants were recruited through a hospital-based adolescent health center and were matched with maltreated participants on neighborhood, age, race/ethnicity, family income, and family constellation (e.g., one vs. two-parent household). Non-maltreated participants were screened via phone interviews with caregivers for not having any prior history of involvement with protective services or experiences of maltreatment. The total sample had a mean age of 15.21 years (SD = 1.23). Participants had a median family income level of $20,000–$29,000 and 53% came from single-parent households. The total sample had a racial/ethnic make-up of 46% Caucasian, 45% African-American, 8% Bi- or Multi-racial, 0.5% Hispanic, and 0.5% Native American.

Procedures

This study was approved by the Institutional Review Board at a large Children's Hospital Medical Center. Adolescents provided assent and caregivers provided consent for adolescents. Adolescents completed confidential questionnaires via private computers in a laboratory setting to maximize anonymity. Families received approximately $20 per hour as monetary compensation for their time and participation. Consent to access CPS records for the entire sample was obtained to confirm any substantiated maltreatment in each group.

Measures

Online sexual experience indicators

Online sexual experiences: Eight self-report items were derived to assess online sexual experiences (see Table 1), with possible responses ranging from 0 = "never" to 4 = "very often." These indicators where part of the Online Experiences Scale (OES) and the Internet and Media Consumption Inventory. Both of these measures were reliable [(α = .89) and (α = .92), respectively] for this sample. Examples of items include: "I have started sexual discussions with other people online", "I choose sexy photos of myself for my social media profile picture", "I have had sexual advances from people I do not know online", "People have asked me to "cyber" or "role-play" (having sex online)". We were interested in deciphering differences in having had certain online sexual experiences or having not had certain online sexual experiences. All eight items had zero-inflated responses, thus we were able to dichotomize responses into 1 = "never" to 2 = "rarely-very often" in order to conduct the LCA. The eight indicators were chosen because of their high response rates from participants, zero-inflated responses (suggesting little issue with dichotomization), and diverse representation of online sexual experiences (e.g. not all passive experiences such as viewing content or receiving comments, nor all active experiences such as pursuing pornography websites or sending nude photos).

Offline behavioral covariates—Sexual and romantic history (See Table 1) variables were assessed with individual items from *The Sexual Attitudes and Activities Questionnaire* (SAAQ; Noll et al., 2003):

Number of lifetime romantic partners: Number of lifetime romantic partners was assessed using one item. Participants were asked, "How many boyfriends/partners have you had in your lifetime?" Participants could respond with any number representing the number of partners. Participant answers ranged from 0-8 romantic partners.

Number of lifetime sexual intercourse partners: Participants who answered "yes" to ever having had voluntary sexual intercourse were asked, "How many different partners have you had sexual intercourse with in your lifetime?" Participants could respond with any number greater than 0 representing the number of partners. Answers were coded as '0' for those who have never had sexual intercourse. Participant answers ranged from 0-5 sexual partners.

Age at first voluntary sexual intercourse: Participants who answered "yes" to ever having had voluntary sexual intercourse were asked, "As best you can recall, how old were you the first time you had consensual intercourse?" Answers were scored according to risk level such that lower ages received high scores and those who had never had intercourse were given the lowest score. Specifically, answers were coded as 1-19 representing different ages in 6-month increments from (1) older than 21 to (19) younger than 12. For example, (5) represents 14 years old and (8) represents 15 ½ years old. Participants were coded as '0' if they never had voluntary sexual intercourse. This variable includes all participants and responses ranged from 0-19.

Ever had oral sex: Participants who indicated 1 or more lifetime partners for "given oral sex (mouth on private parts)" or "received oral sex" were coded as '1'. Participants who indicated 0 lifetime partners for "given oral sex (mouth on private parts)" and "received oral sex" were coded as '0'.

Number of Sexually Transmitted Infections (STIs): Participants were asked a series of separate questions for 6 different STIs (Chlamydia, Gonorrhea, Syphilis, Pelvic Inflammatory Disease [PID], Genital Herpes, and HIV) to determine STI history. Participants were scored 0-6 based on answering "yes" to the question, "Have you ever been diagnosed with _____?", as a sum across the 6 different STIs.

Ever pregnant: Participants who answered "yes" to having ever been pregnant were asked, "How did you know you were pregnant or how was this pregnancy confirmed?" Participants could indicate the following: (1) "I missed my period"; (2) "I felt ill"; (3) "I had a positive over-the-counter pregnancy test"; (4) "The pregnancy was confirmed by a doctor"; or (5) "The pregnancy was never formally confirmed". Answers were coded as '0' for answering 'no' to having ever been pregnant, having missed a period, felt ill, or never formally confirmed a pregnancy and '1' for having had a positive over-the-counter pregnancy test or a pregnancy that was confirmed by a doctor.

Lifetime substance use history: Variables were assessed using the *Monitoring the Future* (MTF) national survey questionnaires (Johnston, O'Malley, Bachman, & Schulenberg, 2005). *Cigarette use* was defined as the number of cigarette smoking occasions (from 0 = ''none'' to 4 = ''four times or more''). Participant responses ranged from 0-4. *Alcohol use* was defined by two items reflecting the number of lifetime occasions adolescents had ''more than just a few sips of alcohol'' and were ''drunk or very high from drinking'' (from 0 = ''none'' to 6 = "40 or more''). Participant responses ranged from 0-6. *Marijuana use* was defined as the number of occasions the participant used marijuana. Participant responses ranged from 0 = ''none'' to 6 = "40 or more''.

Analysis Plan

To examine patterns of online sexual experiences among female adolescents, we used latent class analysis (LCA), a technique that identifies unique classes of individuals within a population based on their patterns across characteristics or behaviors (Collins & Lanza, 2010). Using eight observed, binary variables as manifest indicators (see Table 1) of the latent variable 'online sexual experiences', mutually exclusive and exhaustive subgroups were identified, referred to as classes.

The optimally fitting model was determined through an examination of model fit statistics and selection criteria, as well as parsimony and theoretical interpretability (e.g., item-response probabilities clearly separated one class from another). Model selection criteria included the Akaike information criterion (AIC; Akaike, 1974), Bayesian information criterion (BIC; Schwarz, 1978), the adjusted Bayesian information criterion (aBIC; Sclove, 1987), Bozdogan's consistent AIC (CAIC; Bozdogan, 1987), and bootstrap likelihood ratio test (BLRT; McLachlan, 1987; McLachlan & Peel, 2000). More optimal models were

indicated by lower values for the AIC and BIC and by a model with the last significant BLRT. LCAs with two, three, four, and five latent classes were compared to select the optimally fitting model; 1000 sets of random starting values were used to ensure maximum likelihood estimate identification for all models. Latent Gold 5.0 (Vermunt & Magidson, 2013) was used to estimate all models.

After model selection, two sets of parameters were examined and used to describe the classes of online sexual experiences: class membership probabilities and item-response probabilities (Collins & Lanza, 2010). Class membership probabilities are the expected prevalence rates of the identified classes in the population. Item-response probabilities are the probabilities of providing particular responses to particular items conditional on class membership; they are used to label the classes.

Next, in order to determine whether there were differences in the prevalence of latent class membership by maltreatment status, we added a grouping variable for maltreatment status to our selected model. We tested for measurement invariance of the latent class structure between those who had and had not been maltreated using a likelihood ratio test (Collins & Lanza, 2010). This test allowed us to determine whether item-response probabilities that defined the latent classes differed between the two groups (Lanza, Bray, & Collins, 2013). Then we directly compared the latent class prevalence between these groups using an overall Wald omnibus test. Finally, a baseline-category, multinomial logistic regression model was specified in Latent Gold to predict latent class membership from nine offline behavioral covariates, including number of lifetime romantic partners, number of lifetime sex partners, age at first sex, number of STI diagnoses, ever had oral sex, ever been pregnant, and lifetime number of cigarette, alcohol, and marijuana use occasions. For this model, we used the BCH adjusted 3-step approach in which all covariates are entered simultaneously into a logistic regression model for the latent classes in order to prevent the covariates from changing the structure of the classes (Block, Croon, & Hagenaars, 2004; Vermunt, 2010).

Results

In Table 1, we present the means, standard deviations, and differences by maltreatment group from matched-pairs t-tests (for continuous variables) or chi-square tests (for binary or dichotomous variables). Maltreated female adolescents were more likely to have visited at least one pornographic website, engaged in cybersex or role-play online, posted a sexy profile picture, and been solicited online for offline sexual behavior. Similarly, maltreated participants were significantly more likely to have engaged in all sexual behaviors (except for oral sex), engaged in all substance use behaviors, and been pregnant; they also had more STIs than non-maltreated female adolescents.

How do online sexual experiences cluster together within individuals?

LCA was used in an exploratory fashion to compare models with different numbers of latent classes and select the optimal solution describing multidimensional patterns of online sexual experiences among female adolescents (see Table 2). The BIC and CAIC indicated a 2-class model, but the AIC and aBIC indicated a 4-class model. The BLRT was significant for each additional class (up to 4) added to the model. The addition of a fifth class did not

substantially improve model fit, as evidenced by all fit indices. It is common for information criteria to fail to unambiguously select an optimal solution in LCA (Collins & Lanza, 2010). Therefore, parsimony and theoretical interpretability of the solutions must also be considered. Based on a combination of statistical criteria and the addition of meaningful patterns of experiences in the 4-class model (compared to the 2- and 3-class models), we selected the 4-class model as optimal (see Table 3).

The first class, labeled *Online Abstinent* (52% of the total sample), was comprised of participants who had low probabilities of having engaged in any of the eight online sexual experiences. For example, participants in the Online Abstinent class had a probability of .05 of having visited a pornographic website, indicating a rare occurrence. The second class, labeled *Online Inclusive* (19%), was comprised of participants who had high probabilities of having engaged in all eight online sexual experiences. For example, participants in the Online Inclusive class had a probability of .55 of having visited a pornographic website, indicating a more than likely occurrence. The third class, labeled *Attractors* (16%), was comprised of participants who had low probabilities of having visited a porn site, engaged in cybersex, chatted with someone online about sex, or engaged in sexting, but high probabilities of posting a sexy profile picture on a social media site, someone writing comments about how sexy the participant was on her social media profile(s), someone requesting that the participant send them sexy photos, and someone soliciting the participant online for offline sex. Finally, the fourth class, labeled *Seekers* (13%), was comprised of participants who had low probabilities of having engaged in cybersex, engaged in sexting, a sexy profile picture on a social media site, and someone soliciting the participant online for offline sex, but high probabilities of having visited a pornographic website, chatted with someone online about sex, someone writing comments about how sexy the participant was on her social media profile(s), and someone requesting that the participant send them sexy photos.

How does maltreatment status differentially predict class membership?

We used LCA with a grouping variable to examine measurement invariance in the latent class structure by maltreatment status. Examining $2* LL$ in Latent Gold between the freely estimated and constrained models showed that the latent class structure did not differ significantly by maltreatment status ($\chi^2 (36) = 46.83$, $p > .10$). Therefore, the same four classes were observed among maltreated and non-maltreated participants, allowing us to impose measurement invariance by constraining the ρ parameters to be equal across maltreatment status (Lanza et al., 2013). An overall Wald test ($W = 19.09$, $p < .01$) was used to determine that the distribution of class memberships significantly differed by maltreatment status (see Table 3). Although the effect sizes are small ($\varphi < .30$), post-hoc pairwise comparisons showed that maltreated participants were more likely to be members of the Online Inclusive class ($\chi^2 (1) = 10.33$, $p < .01$, $\varphi = .18$) and less likely to be members of the Online Abstinent class ($\chi^2 (1) = 10.31$, $p < .01$, $\varphi = .18$) compared to non-maltreated participants.

How are offline sexual and substance use behavior histories associated with online sexual experience class membership?

Table 4 shows associations between offline sexual and substance use history variables and online class membership. The multinomial logistic regression model was specified to predict latent class membership from offline sexual and substance use behaviors simultaneously. To facilitate interpretation, all covariates were standardized to a mean of 0 and a standard deviation of 1. The Attractors class was specified as the reference class in order to determine differences in attracting and seeking class membership. Results indicated whether the probability of being a member of another class compared to being a member of the Attractors class differed based on the level of a covariate, controlling for the other covariates. Compared to the Attractors class, class membership in the three other classes significantly differed based on whether or not a participant had ever been pregnant ($W = 9.02$, $p < .05$), number of lifetime penetrative sex partners ($W = 10.22$, $p < .05$), number of STIs ($W = 10.39$, $p < .05$), and frequency of cigarette ($W = 12.49$, $p < .01$) and alcohol use ($W = 7.69$, $p < .05$).

The odds of membership in the Seekers class compared to the Attractors class is 3.75 times higher for adolescents who had ever been pregnant compared to adolescents who had never been pregnant. For every 1-unit decrease in the number of sexual partners, the odds of membership in the Online Abstinent class is .81 times higher and odds of membership in the Seekers class is .84 times higher relative to the Attractors class. For every 1-unit decrease in STI diagnoses, the odds of membership in the Online Abstinent class is .72 times higher relative to the Attractors class. Whereas, for every 1-unit increase in STI diagnoses, the odds of membership in the Online Inclusive class is 1.41 times higher relative to the Attractors class. For every 1-unit decrease in cigarette use, the odds of membership in the Online Abstinent class is .76 times higher relative to the Attractors class. Whereas, for every 1-unit increase in cigarette use, the odds of membership in the Online Inclusive class is 1.52 times higher relative to the Attractors class. For every 1-unit decrease in alcohol use, the odds of membership in the Online Abstinent class is .91 times higher relative to the Attractors class. Whereas, for every 1-unit increase in alcohol use, the odds of membership in the Online Inclusive class is 1.22 times higher and odds of membership in the Seekers class is .79 times higher relative to the Attractors class.

Discussion

The present study built upon prior work on adolescent sexual experiences by conducting an exploratory and descriptive examination of patterns of online sexual experiences among female adolescents in the US. The use of LCA in this study enabled the identification of different latent classes of online sexual experiences, differences in probability of class membership by maltreatment status, and how offline sexual and substance use behaviors correlate with class membership. Four different patterns of online sexual experiences emerged, including a low probability of having endorsed any of the eight online sexual experiences (Online Abstinent), a high probability of having endorsed all eight online sexual experiences (Online Inclusive), and split engagement in specific online sexual experiences (Attractors and Seekers). Due to the sophistication of LCA, we were able to uncover an

unexpected class (Online Inclusive) as well as identify different correlates of unique patterns of online sexual experiences. Although class structure did not significantly differ between maltreated and non-maltreated female adolescents, the likelihood of class membership did, with maltreated female adolescents more likely to be members of the Online Inclusive class and less likely to be members of the Online Abstinent class than non-maltreated female adolescents. Several offline sexual and substance use behaviors were also correlated with class membership.

As expected, a class emerged with a high probability of having had online experiences that were indicative of attracting attention from others. Indeed, the Attractors had a high probability of posting a sexy profile picture, having others request sexy photos, having others comment on how sexy they are, and having someone make an online request to engage in offline sexual behavior. Although presenting oneself online in a provocative way may be considered sexual exploration, prior research suggests there might be consequences that have the potential to impact sexual development. For example, online sexual self-presentation behaviors are associated with an increase in unwanted sexual solicitation (Mitchell et al., 2007; Noll et al., 2009) as well as an increase in emphasis on the sexual-self for overall identity formation (Van Oosten, 2015). Thus, future research should continue to measure self-presentation behaviors in studies of online and offline sexual experiences among female adolescents.

A class emerged with high engagement in experiences that could be considered 'seeking' sex online, named the Seekers. Contrary to what was expected, there was not a higher probability of having had engaged in cybersex/role-play in this class. The Seekers had a high probability of having used internet pornography, having initiated a chat about sex online, having had someone request sexy photos of them, and having had someone comment about how sexy they are online. Thus, the Seekers may be curious about sex and seeking information about sex, but they are not yet receiving much attention from others in an online context. However, it is noteworthy that the Seekers were more likely to have been pregnant, yet had a lower number of sexual partners, and a lower number of occasions of drinking alcohol than the Attractors did. It is possible that the Seekers are having unprotected sex in the context of longer-term relationships compared to unprotected casual sex in an environment with alcohol. Therefore, future research should examine the role of romantic relationship status in patterns of behaviors both online and offline among female adolescents.

As expected, a class emerged with a low probability of having had any of the eight online sexual experiences (Online Abstinent). However, we did not expect a class to emerge with a high probability of reporting all eight online sexual experiences (Online Inclusive). Having had more self-reported STIs as well as having used cigarettes and alcohol on more occasions was associated with a higher likelihood of membership in the Online Inclusive class compared to the Attractors class. These findings suggest that 'attracting' experiences, or attracting experiences in tandem with 'seeking' experiences, are associated with more offline sexual behavior and substance use than online sex seeking experiences alone.

Maltreated adolescents were more likely to be members of the Online Inclusive class and less likely to be members of the Online Abstinent class than non-maltreated adolescents. These results are corroborated by prior work which showed a proclivity toward more online risk behaviors for maltreated adolescents as well as adolescents from non-cohesive families (Baumgartner et al., 2012; Noll et al., 2009; Noll et al., 2013). Furthermore, having more STI diagnoses is associated with a higher likelihood of membership in the Online Inclusive class than the Attractors class. Given that maltreated participants were more likely to be members of the Online Inclusive class, maltreated participants could be driving this result, as prior work has shown maltreatment to be associated with a greater risk for HIV and other STIs (Forhan et al., 2009; Morokoff et al., 2009). Future research should explore how associations between online and offline sexual behaviors vary by maltreatment status.

Given that half of our sample experienced substantiated maltreatment, it is important to consider the act of receiving nude photo requests, especially from a male adult, may exacerbate trauma symptoms among sexually abused youth as they may trigger prior abuse experiences (Briere & Runtz, 1993). Similarly, due to the fact that maltreated youth are more likely to experience sexual and physical revictimization in adolescence and adulthood than non-maltreated youth (Barnes et al., 2009; Go´mez, 2011), internet-initiated victimization should be integrated into trauma treatments. In addition, our results suggest that child protective services could provide internet safety information as part of case management and educate caregivers about monitoring online behaviors. Further, mental health professionals delivering trauma treatments could be educated about the tendency for maltreated youth to use the internet and social media for sexual exploration.

Targeted Prevention Implications

Our results suggest differential prevention implications for each class of online sexual experiences. As expected, having more sex partners, more STIs, or used alcohol on more occasions was associated with a higher likelihood of membership in the Attractors class compared to the Seekers class or Online Abstinent class. Given the higher likelihood of sexual solicitations and comments for the Attractors, our findings suggest that the Attractors could benefit from sexual refusal and assertiveness skill-building which teaches individuals how to refuse unwanted sexual attention (Kennedy & Jenkins, 2011; Schry & White, 2013). Sexual refusal and assertiveness skill-building would equip female adolescents to ward off sexual advances from strangers online as well as adhere to their own sexual boundaries offline, potentially including condom use to prevent STIs.

In contrast, participants who had been pregnant were more likely to be members in the Seekers class than the Attractors class. Thus, it is likely that adolescents who actively seek sexual content online may have an increased need for pregnancy prevention programming, as opposed to STI prevention. Our results also provide support for a growing body of literature which suggests that female adolescents who are at risk for teen pregnancy or motherhood are different from those at risk for STIs, as pregnant female adolescents have lower educational attainment goals and less future orientation, whereas female adolescents with STI diagnoses are lower in condom use self-efficacy (Bunting & McAuley, 2004).

Therefore, inclination toward certain online sexual experiences could signal the need for differential prevention programming.

It is important to note that membership in the Online Inclusive and Seekers classes included high probabilities of visiting pornographic websites as well as a greater likelihood to have had an STI or to have been pregnant (respectively). In accordance with Sexual Scripting Theory (Simon & Gagnon, 1984), these findings suggest that female adolescents in the Online Inclusive and Seekers classes may benefit from sexual media literacy to mitigate harmful sexual scripts that are portrayed in internet pornography such as not using a condom or normalizing violence toward women (Barron & Kimmel, 2000; Bridges et al., 2010; Klaassen & Peter, 2015). Media literacy programs address the interpretation, realism, desirability, and identification with media portrayals to help viewers become more critical of the content and therefore less vulnerable from its potential influence (Hobbs & Jensen, 2013). Sexual media literacy programs have been shown to change key attitudes toward sexual behavior such as a greater efficacy to delay sexual activity and a lower likelihood to overestimate sexual activity among peers (Jeong & Hwang, 2012; Pinkleton, Austin, Cohen, Chen, & Fitzgerald, 2008). Thus, integrating sexual media literacy into existing sex education programming in order to address pornography may be a promising next step in making such programming more relevant and effective for today's digital natives.

Limitations and Future Directions

There are a few limitations that should be taken into consideration when interpreting these findings. First, participants were recruited with substantiated maltreatment through CPS and it remains unknown how maltreatment experiences that do not meet the threshold of substantiation might impact online sexual experiences. Second, our sample was an all-female sample, and therefore results cannot be generalized to male adolescents. Although caution should be made when extending results to other populations of adolescents, this study includes a population of female adolescents with a diverse range of experiences, which is imperative to move the field forward and develop better sexuality education and internet safety programming. Third, our effect sizes for maltreatment differences in class membership and offline behavioral covariates as predictors of class membership were small, thus interpreting the magnitude of results should be made with caution. Finally, the design of this study is cross-sectional, therefore causality between online sexual experiences and offline behaviors cannot be determined.

Future research could improve upon the current study in a few ways. First, latent class research that examines how patterns of online sexual experiences predict future outcomes would be better able to assert causality. Second, future research could examine if there is a cyclical process in online and offline sexual experiences by modeling how latent classes and their correlates transition over time. Such knowledge would allow us to identify the etiology of online behaviors and offline risk to determine ideal time points for intervention. Third, among high school students, 49% indicated their use of technology to communicate with partners about sexual health, with rates of consistent condom use three times higher among adolescents who communicate about sexual health through technology as compared to adolescents who do not use technology to communicate about sex (Widman, Nesi, Choukas-

Bradley, & Prinstein, 2014). Therefore, future research should determine who is using technology in a positive way as a means of teaching those skills to adolescents who are already experienced in online sexual behaviors. Finally, the sexual experience of male adolescents should be examined to determine links between their online and offline sexual experiences that may be unique for them.

Conclusion

To our knowledge, the current study was the first to apply a person-centered approach to online sexual experiences among female adolescents in the US. LCA allowed the holistic examination of online sexual experiences, and identification for whom online sexual experience patterns co-occur with offline sexual and substance use behaviors in ways traditional analytic approaches do not afford. Overall, our findings suggest that the majority of female adolescents have a low probability of having had online sexual experiences. For those who are having online sexual experiences however, engagement in offline sexual and substance use behaviors occurs in tandem suggesting that prevention programming should include education for online experiences. Furthermore, maltreated female adolescents were more likely to have had online sexual experiences than non-maltreated female adolescents, which indicates that future research should investigate the effect of online sexual experiences on the developmental processes of vulnerable populations.

Over the past few decades, researchers have focused on the role that exposure to sexual media plays in female adolescent sexual development and, in particular, on sexual socialization (Aubrey, 2006; Dohnt & Tiggemann, 2006; Peter & Valkenburg, 2016; Noll et al., 2013; Ward et al., 2016). However, it has been difficult for models of prevention to keep pace with the ever-evolving landscape of access to internet-based sexual media, especially since the advent of high-speed internet. Regardless of the exact causal pathways, this study suggests that online sexual experience patterns are differentially associated with offline sexual and substance use behaviors. LCA can be a means of identifying individuals at greater risk for the purpose of adaptive or tailored interventions (Lanza & Rhoades, 2013). In accordance, information from this study could be used to identify individuals who could benefit from tailored messages during internet safety or sex education programing in order to capitalize on technology as the online context proves to be an important one for adolescent sexual development.

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Table 1

Descriptive statistics and statistical tests for differences in online sexual experiences and offline behavioral covariates between maltreated and non-maltreated female adolescents

Variable	Type	Whole Sample Valid % N = 312	Maltreated Valid % N = 154	Non-Maltreated Valid % N = 158	Group Differences
					Odds Ratios
Participant has visited a porn site	frequency	37.7	46.7	28.0	2.19***
Participant has engaged in cybersex or sexual role-play online	frequency	34.8	49.1	23.6	2.10***
Participant has initiated a chat about sexual things online	frequency	28.8	30.9	27.0	.64
Participant has sent a nude photo/video of self over the internet/phone	frequency	21.2	23.5	18.3	.55
Participant has a sexy profile picture	frequency	66.1	78.6	58.6	1.59**
Someone has posted comments about how sexy the participant is	frequency	44.4	44.3	41.4	.22
Someone has requested nude photos	frequency	35.8	38.5	32.3	.29
Stranger has solicited participant online for sexual behavior	frequency	36.9	41.9	30.5	1.08*
Ever had oral sex	frequency	53.0	56.2	49.3	.56
Ever pregnant	frequency	17.7	19.8	8.9	2.11***
					t-tests
Number of lifetime romantic partners[1]	M	4.6	5.8	4.2	2.40*
	SD	1.1	1.7	2.1	
Number of lifetime penetrative sex partners[2]	M	2.3	3.8	1.7	3.36**
	SD	.4	.5	.8	
Age at first voluntary penetrative sex[3]	M	14.1	13.2	15.3	2.32*
	SD	3.3	1.8	1.1	
Number of lifetime STIs[4]	M	.51	.89	.49	3.75***
	SD	.76	1.33	.63	
Lifetime cigarette use occasions[5]	M	2.8	.8	3.9	4.63***
	SD	1.1	1.0	1.8	
Lifetime alcohol use occasions[6]	M	4.2	4.2	1.1	2.12**
	SD	1.8	5.3	1.9	
Lifetime marijuana use occasions[6]	M	2.2	3.1	1.9	3.96***

Variable	Type	Whole Sample Valid % N = 312	Maltreated Valid % N = 154	Non-Maltreated Valid % N = 158	Group Differences
	SD	1.2	1.0	1.5	

Note.

*
$p < .05$,

**
$p < .01$,

***
$p < .00$;

No missing data, all cases were observed on all variables. Latent class indicators are bolded. Each class indicator was scored as 1 = not endorsing the item and 2 = endorsing the item. Maltreated participants were coded as 1, non-maltreated as 0. Type = whether the presented statistic for that variable is a mean or a frequency count. Odds ratios were conducted to detect differences in binary or dichotomous variables; whereas t-tests were conducted to detect differences in continuous variables.

[1] Number of romantic partners ranged from 0-8.

[2] Number of penetrative sex partners ranged from 0-5 and included participants who were not sexually active.

[3] Age at first voluntary penetrative sex means are based upon the scale described in the text, not chronological age.

[4] Number of STIs ranged from 0-6.

[5] Lifetime cigarette use occasions ranged from 0-4.

[6] Lifetime alcohol and marijuana occasions ranged from 0-6.

Table 2

Model fit statistics and selection criteria for LCAs of adolescent online sexual experiences with 1-5 classes

No. of classes	AIC	BIC	CAIC	aBIC	LL	BLRT	Parameters
1	1688.50	1714.60	1722.60	1689.26	-836.25	--	8
2	1453.27	1508.74	1525.74	1454.89	-709.64	$p < .00$	17
3	1431.06	1515.89	1541.89	1433.53	-689.53	$p < .00$	26
4	**1419.49**	**1533.68**	**1568.68**	**1422.81**	**-674.74**	**$p < .00$**	**35**
5	1420.22	1563.77	1607.77	1424.39	-666.11	$p > .05$	44

Note. *** $p < .00$; AIC = Akaike information criterion; BIC = Bayesian information criterion; CAIC = consistent AIC; aBIC = adjusted BIC; BLRT = Bootstrap likelihood ratio test (χ^2 *diff*); Entropy (R^2).
Bolded values indicate the selected class.

Table 3

Latent class prevalence rates and item-response probabilities for the 4-class model of online sexual experiences

Overall prevalence		Online Abstinent*	Online Inclusive*	Attractors	Seekers
		52% (n = 162)	19% (n = 60)	16% (n = 49)	13% (n = 41)
Group prevalence	**Non-maltreated**	57% (n = 91)	14% (n = 21)	14% (n = 22)	15% (n = 24)
	Maltreated	47% (n = 71)	25% (n = 40)	16% (n = 24)	12% (n = 19)
Indicators	**Sample proportion**		Item-Response Probabilities		
Visit porn sites	.37	0.05	0.55	0.00	0.50
Sex chat	.28	0.05	0.56	0.00	0.68
Cybersex/role-play	.34	0.03	0.95	0.00	0.05
Sexting	.21	0.11	0.65	0.29	0.22
Sexy profile pic	.66	0.00	0.50	0.74	0.00
Sex solicitation	.36	0.04	0.76	0.58	0.27
Sexy comments	.44	0.40	0.94	1.00	1.00
Sexy photos	.35	0.08	0.99	0.55	0.41

Note.

*
$p < .05$

maltreatment differences in latent class prevalences. Item-response probability table entries indicate the proportions of adolescents within classes that reported the particular online sexual experiences. Bolded font indicates a higher likelihood for having that specific online sexual experience.

Table 4

Standardized betas and odds ratios for significant offline sexual and substance use behavior history variables predicting online sexual experience class membership

	Class 1: Online Abstinent			Class 2: Online Inclusive			Class 3: Attractors			Class 4: Seekers			Overall Wald Test
	β	OR	CI	β	OR	CI				β	OR	CI	
Intercept		1.4474			-1.6982		REF				1.2536		18.4587***
Ever pregnant	-0.29	0.90	[0.81-1.11]	0.04	1.01	[0.95-1.12]	REF			1.03	3.75**	[2.99-4.63]	9.02*
Sex partners	-0.32	0.81*	[0.77-0.93]	0.22	1.12	[0.97-1.21]	REF			-0.21	0.84*	[0.78-0.98]	10.22*
# of STIs	-0.41	0.72*	[0.61-0.82]	0.36	1.41*	[1.25-1.68]	REF			-0.12	0.91	[0.78-1.09]	10.39*
Cigarette use	-0.39	0.76*	[0.64-0.89]	0.42	1.52*	[1.32-1.79]	REF			-0.16	0.95	[0.81-1.08]	12.49**
Alcohol use	-0.27	0.91*	[0.85-0.94]	0.29	1.22*	[1.09-1.57]	REF			-0.23	0.79*	[0.68-0.95]	7.69*

Note.

*
$p < .05$,

**
$p < .01$;

CI = 95% confidence interval; Non-significant correlates in the model included number of romantic partners, age at first voluntary intercourse, ever had oral sex, and marijuana use.