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Anogenital and Physical Injuries in Adolescent Sexual Assault Patients: The Role of Victim–Offender Relationship, Alcohol Use, and Memory Impairment

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ABSTRACT

Prior research has documented high rates of anogenital and physical injuries among adolescent sexual assault patients. Although a number of factors related to rates of injury detection in adolescents have been identified, there may be additional features of the assault that are disclosed in the patient history that could be important indicators of injury risk. The purpose of the current study was to expand this literature by examining whether factors that are salient in sexual assaults committed against adolescents—victim–offender relationship, substance use, and memory impairment—are associated with documented anogenital and physical injury rates. Results indicated that victim–offender relationship, substance use, and assault memory are significantly related to the number of anogenital injuries and, particularly, the number of physical injuries detected in adolescent sexual assault patients. These results highlight the importance of a comprehensive patient history, including assessment of alcohol and drug use and memory impairment, to guide the medical forensic examination.

KEY WORDS:

adolescents; anogenital injuries; medical forensic examination; physical injuries; sexual assault

Sexual violence is a pervasive social problem in the United States, as 17%–25% of women are sexually assaulted in their lifetimes (Breiding, 2014). Female adolescents between the ages of 10 and 17 years are at a particularly high risk for sexual violence, and they are twice as likely to experience sexual assault as their adult counterparts (Centers for Disease Control and Prevention, 2011; Department of Justice, 2016; Finkelhor, Turner, Ormrod, & Hamby, 2009; Howard, Wang, & Yan, 2007; Snyder, 2000; Snyder & Sickmund, 2006). Nationally representative survey data indicate that 26.6% of 17-year-old female adolescents have been sexually assaulted in their lifetime (Finkelhor, Shattuck, Turner, & Hamby, 2014).

Despite these high rates of violence, adolescent sexual assault victims have low rates of postassault help-seeking (Broman-Fulks et al., 2007; Casey & Nurius, 2006). It is likely that fewer than 50% of adolescent victims seek postassault medical care (Campbell, Wasco, Ahrens, Sefl, & Barnes, 2001; Resnick, Acierno, Holmes, Dammeyer, & Kilpatrick, 2000), and the National Victimization Survey of Adolescents found that only 13% of adolescent sexual assaults were reported to the police (Kilpatrick, Saunders, & Smith, 2003). This age group may choose not to seek

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formal help because of fear of shame, blame, anger, stigma, lack of knowledge about available services, embarrassment, concerns of confidentiality, or cultural or familial factors (Angelone, Mitchell, & Pilafova, 2007; Fehler-Cabral & Campbell, 2013; Finkelhor & Wolak, 2003; Fisher, Cullen, & Turner, 2000; Kogan, 2004; Rickwood, Deane, Wilson, & Ciarrochi, 2005; Wilson & Deane, 2001). Because of their age and inexperience navigating formal helping systems, adolescents may also be unaware that community services exist or, if they are aware, may not know how to access them (Finkelhor, Wolak, & Berliner, 2001; Logan, Evans, Stevenson, & Jordan, 2005).

Yet, despite these barriers, some victims are able to seek formal medical care, as national surveillance data indicate that, from 2004 to 2006, an estimated 55,857 female adolescents aged 10–17 years received emergency medical services for nonfatal injuries sustained from a sexual assault (Centers for Disease Control and Prevention, 2009). Female adolescents who sought postassault medical forensic care have found high rates of documented anogenitial injuries, with 66%–85% of patients having documented lacerations, abrasions, or bruises on the labia, posterior fourchette, fossa navicularis, hymen, vagina, cervix, perineum, and/or perianal area (Adams, Girardin, & Faugno, 2001; Baker & Sommers, 2008; Jones, Rossman, Wynn, Dunnuck, & Schwartz, 2003; Markowitz, 2012). Some studies have found that adolescent patients have higher rates of documented anogenital injuries as compared with those aged 18 or older (Drocton, Sachs, Chu, & Wheeler, 2008; Rosay & Henry, 2008). Rates of physical injury tend to be lower (compared with anogenital injuries), with 27%–37% of adolescent sexual assault patients having documented lacerations, abrasions, or bruises to body areas not encompassed by anogenital injuries (Adams & Knudson, 1996; Lynch & Duval, 2010; Sugar, Fine, & Eckert, 2004).

Prior research has identified a number of factors related to rates of injury detection in adolescent sexual assault patients. For example, the use of specific examination techniques and equipment (e.g., digital magnification, Foley catheters, toluidine blue dye) can help healthcare practitioners more easily detect anogenital injury, as compared with direct visual inspection (Jones, Rossman, Wynn, et al., 2003; Zink et al., 2010). Timing of the medical forensic examination is also crucial as higher rates of anogenital injury have been documented in adolescents who seek medical care within 72 hours of the assault (Adams, Girardin, & Faugno, 2000; Drocton et al., 2008; Murphy, Potter, Stapleton, Wiesen-Martin, & Pierce-Weeks, 2010; Sugar et al., 2004). For example, anal abrasions or tearing to the area immediately below the vaginal opening tend to heal rapidly and are most frequently detected within 72 hours (Grossin et al., 2003). Emerging research also suggests that external anogenital injury detection is more likely in women with lighter skin tones as compared with women with darker skin, although internal anogenital injuries are not affected by skin color (Sommers et al., 2008, 2009).

The roles of examination techniques, examination timing, and patient skin color in injury detection are reasonably well documented in the literature and are factors forensic nurses know they must attune to in their work with patients. However, there may also be specific features of the assault that are disclosed in the patient history that could be important indicators of injury risk. For example, victim–offender relationship may be a salient risk factor for injury. Most adolescent victims aged 10–17 years are assaulted by individuals known to them (74%–84%; Finkelhor et al., 2014; Kilpatrick et al., 2003; Jones, Rossman, Wynn, et al., 2003; Ybarra & Mitchell, 2013). These assaults are more likely to involve coercion and less likely to be committed through the use of weapons or physical force (Hanson et al., 2003; Jones, Rossman, Wynn, et al., 2003; Snyder & Sickmund, 2006; Tjaden & Thoennes, 2006). Conversely, stranger-perpetrated assaults are more likely to be committed through physical force or weapon use, two tactics that often result in greater risk of physical injury (Sugar et al., 2004), although it is unknown whether these assault characteristics increase the risk for anogenital injuries.

Substance use is also a common component in the victimization of many adolescents with as many as 46% of adolescent victims and 55% of perpetrators reporting drug or alcohol use before or during the assault (Adams et al., 2001; Fehler-Cabral & Campbell, 2013; Girard & Senn, 2008; Jones, Rossman, Wynn, et al., 2003; Rickert, Wiemann, Vaughan, & White, 2004). Adolescent patients may be reluctant to disclose that they had been using alcohol or drugs during the patient history interview, given that it is illegal for minors to use such substances (Fehler-Cabral & Campbell, 2013). Nevertheless, it is important to understand if the assault occurred within the context of substance abuse—either by the victim or assailant—because prior research has found that perpetrator use of alcohol is associated with increased rates of victim injury among adult victims (Martin & Bachman, 1998; Ullman, Karabastos, & Koss, 1999), although it is unclear if this association is also present among adolescent patients.

Finally, some adolescent sexual assault patients may not remember the entire assault or parts of the assault, which they may disclose to their healthcare practitioners during the patient history (or it may become clear through patient history questions that the victim's memory of the assault is incomplete). Certainly, substance use can impair memory, but it is not uncommon for victims to have incomplete recall due to the trauma of the assault itself. Research on the neurobiology of trauma has substantiated that traumatic experiences, like sexual assault, may disrupt the ways in which the brain organizes, retains, and recalls relevant memories (Diamond, Campbell, Park, Halonen, & Zoladz, 2007; Hopper & van der Kolk, 2001; Kozlowska, Walker, McLean,

& Carrive, 2015). For adolescent patients, these memory gaps may be particularly distressing if they do not understand why they do not remember all details of the assault. If patients cannot recall specific details of the assault, it will limit their ability to give complete information in the patient history, which could in turn affect injury detection (as the history guides the examination). To date, there is no published literature on whether there is an association between memory impairment and injury, and such exploratory work is needed.

Taken together, the extant literature suggests that many factors may affect injury detection in adolescent patients, some of which are a function of examination techniques used by the healthcare practitioner, but others are related to assault characteristics that may, or may not, be disclosed during the patient history. Prior research has established that forensic nurses are adept at engendering patient trust (Campbell, Greeson, & Fehler-Cabral, 2013; Campbell, Patterson, Adams, Diegel, & Coats, 2008; Fehler-Cabral, Campbell, & Patterson, 2011), and the details disclosed in the patient history could provide useful insight into possible injuries sustained by the victim. Therefore, the purpose of the current study is to expand this literature by examining whether factors that are salient in sexual assault committed against adolescents—victim–offender relationship, substance use, and memory impairment—are associated with documented injury rates. If these factors are associated with higher rates of injury, this would underscore the importance of exploring these assault features in patient history interviews to guide medical forensic examinations.

Methods

Sample

The current study was conducted in collaboration with two Midwestern Sexual Assault Nurse Examiner (SANE) programs. A chart review was conducted in each program, and cases were sampled for inclusion in this study based on four primary criteria: (a) the victim was an adolescent aged 13–17 years at the time of the assault[1], (b) the victim received a medical forensic examination for sexual abuse/assault at one of these two SANE programs, (c) the assault was reported to law enforcement[2], and (d) the victim consented to having information from their files reviewed for research purposes. For this study on injury detection, we added a fifth sampling criterion: the victim was female. The two SANE programs we collaborated with for this research project do serve adult/adolescent male patients of sexual assault, but only a small number of men met the other sampling criteria, making the subsample of men too small for separate analyses on injury detection (and the male sample would need to be analyzed separately in a study of anogenital injuries). Three hundred ninety-five cases met the first four sampling criteria; adding the fifth criterion (female patients only) reduced the sample size to 381 cases. To assess sampling reliability, a research team member randomly selected and reviewed 30% of the SANE records to determine that the cases were accurately selected on the four eligibility criteria (100% agreement).

Procedures

De-identified medical forensic records were obtained for each of the sampled cases. Records had the potential to include detailed narratives of the assault (as recorded by nurses), body diagrams with corresponding notation, and charts/lists of medical forensic examination findings. A detailed codebook was created based on trauma guidelines established by the American Professional Society on the Abuse of Children (2002) and definitions in Taber's Cyclopedic Medical Dictionary (Venes, 2013) to avoid misrepresentation or interpretation of the nurses' documentation. All codes were then reviewed by the SANE program director for accuracy. Two research assistants independently double-coded 30% of the cases to assess reliability of the coding procedures. Kappas were computed to assess the degree of intercoder agreement (correcting for chance agreement; Pett, 2015). Excellent intercoder agreement was established with final kappas across all variables of 0.98. These procedures were approved by the IRB for the ethical protection of human subjects in research at Michigan State University.

Measures

Four sets of variables were coded or extracted from the medical forensic examination records for the 381 cases that met our sampling criteria. First, patient demographics included victim's age at the time of the assault, Tanner stage, and victim race, which was coded into five categories: White (1), African American (2), Latina (3), biracial/multiracial (4), and other (5). Victim skin color was not documented in the medical forensic examination records, so we were not able to examine injury detection as a function of patient skin color.

Second, time elapsed between the assault and when the medical forensic examination was recorded (in hours and calendar date) was treated as a continuous variable (in hours).

For 50 of the files we reviewed, it was not possible to determine the exact number of hours elapsed from the assault to examination because only date information was recorded

[1]The institutional review board (IRB) that provided ethical oversight for this project allowed us to review records only for patients aged 13–17 years; we were not permitted to review records for younger adolescent patients (10–12 years old). The IRB made this determination based on the age limit at which adolescents could obtain reproductive healthcare without the consent of a parent/guardian in the state in which this research was conducted (which is at the age of 13 years).

[2]This sampling criterion was required for another component of this project, which examined how the SANE examination findings were used by police and prosecutors in these two collaborating communities (see Deleted to Ensure Blind Review).

(as opposed to date and time information about the assault and examination), but it was possible to impute the missing data based on the information that was available in these files. We first examined the date information in the records to determine whether the examination occurred within 24, 24–48, 48–72, or 72+ hours. Then, within each of these time frames, we computed a simple imputation for estimated time elapsed based on the cases that did have complete data. For example, for the cases in which the examination was conducted within 24 hours of the assault but the exact time lapse (in hours) was not known, we computed the mean time lapse for the other cases in the data set that were within 24 hours for which there were complete data. These same procedures were used to estimate the mean hour time lapse for the other time intervals (i.e., 24–48, 48–72, or 72+ hours).

Third, assault characteristics were recorded, including victim–offender relationship, victim use of drugs or alcohol before or during the assault, and victim memory impairment. Victim–offender relationship was coded into two categories: nonstranger offender and stranger offender. Nonstranger offenders (0) were people known to the victim, such as friends, intimate partners, family members, or acquaintances. Stranger offenders (1) were people the victim did not know. Victim use of drugs or alcohol before or during the assault was coded into two categories: no drugs or alcohol use before or during the assault (0) and drugs or alcohol use before or during the assault (1). Victim memory impairment was coded into two categories: victim could not remember part or all of the assault (0) and victim remembered the assault in totality (1).

Finally, we coded the total number of anogenital injuries recorded and the total number of physical injuries recorded by the forensic nurse during the medical forensic examination. Anogenital injuries included both the hymen injuries and other genital injuries. Instances where the forensic nurse had coded the number of genital injuries as "numerous" were recoded to the mean of all genital injuries greater than or equal to 1. Physical injuries included all injuries to areas not encompassed by anogenital injuries. Cases in which physical injuries were recorded as "numerous" by the forensic nurse were recoded to the mean of all physical injuries greater than or equal to 1 and then summed to create the final physical injuries variables.

Data Analytic Plan

As is common in chart review research, some patient files were missing information on the focal variables/measures of interest in this study. Fourteen cases had missing data on one of the focal independent variables: 13 were missing victim–offender relationship, and one was missing drug or alcohol data. Little's Missing Completely at Random (MCAR) test produced a nonsignificant chi-square of 2.803 ($df = 2$, $p = 0.246$), indicating that the missing data were missing completely at random. Several files were missing data on one of the covariate/control variables. Thirty-seven cases were missing information on patient Tanner stage, and eight were missing data on time between assault and examination (i.e., no date was provided, so we could not impute the missing data). Again, Little's MCAR test produced nonsignificant chi-squares ($\chi^2 = 0.160$ [$df = 2$, $p = 0.923$] for Tanner stage and $\chi^2 = 0.382$ [$df = 2$, $p = 0.826$] for time between assault and examination), indicating that these data were also missing data completely at random. Given that the data were missing completely at random (for both the independent and covariate/control variables), listwise deletion was used in the analyses to account for incomplete data. For the remaining cases, evaluation of assumptions of unequal sample sizes, linearity, normality, and singularity were satisfactory. Mahalanobis distance was used to evaluate whether there were any multivariate outliers in the data set, and none was detected (below $p < 0.001$).

Multivariate analysis of covariance (MANCOVA) was selected as the primary analytic strategy as it allows for the analysis of two or more dependent variables at one time (i.e., anogenital injuries and physical injuries). MANCOVA is a preferred analytic strategy over a series of univariate ANCOVAs as it protects against inflated Type I error due to multiple tests on multiple dependent variables (Stevens, 2012; Tabachnick & Fidell, 2013). MANCOVAs evaluate whether the focal independent variables—and interactions among these variables—significantly affect a composite dependent variable, controlling for other factors (covariates) that may also affect the dependent variables. Univariate ANCOVAs are performed after significant effects have been documented in the MANCOVAs to "assess the contributions of the various DVs to a significant effect" (Tabachnick & Fidell, 2013, p. 247). In these MANCOVAs, the independent variables were victim–offender relationship (nonstranger vs. stranger), substance use (use of drugs or alcohol: yes vs. no), and victim memory impairment (victim remembers entire assault vs. victim does not remember a part of their assault). We included two covariate/control variables in these analyses: (a) Tanner stage of the victim at the time of the assault to account for naturally occurring differences as a result of physical development across adolescence and (b) time elapsed between the assault and examination to account for the fact that the ability to detect injuries decreases with time (see Markowitz, 2012). IBM SPSS MANCOVA was used for the analyses. Order of entry of the independent variables was victim–offender relationship, then substance use, and then victim memory impairment.

Results

Descriptive Analyses

Descriptive analyses were performed on the final sample of $N = 381$ adolescent sexual assault patients, all of whom were female (per sampling criteria), and most of which were

White (79.0%), as would be expected given the racial composition of the counties in which these SANE programs operate. At the time of the assault, the patients were, on average, 15 years old (SD = 1.28 years old) and between the fourth and fifth Tanner stages (M = 4.78, SD = 0.47). Most victims received a medical forensic examination soon after the assault (M = 26.46 hours, SD = 29.72 hours), with a range of 30 minutes to 251 hours postassault. Most victims knew the offender (72.3%), most had not used drugs or alcohol before or at the time of the assault (58.4%), and one fifth could not remember their entire assault (21.0%). Most of these patients (61.4%) had at least one anogenital injury, with a range of 0–13 injuries (M = 1.72, SD = 2.27). Many of these patients (48.8%) had at least one physical injury, with a range of 0–40 injuries (M = 2.43, SD = 4.58; see Table 1). Measures of associations between all focal variables are presented in Table 2. The specific measures of association reported in Table 2 vary depending on the specific pairs of variables analyzed: Phi is reported to describe associations between categorical variables, Pearson's correlation is reported to describe associations between continuous variables, and a special case of the Person's correlation, point biserial, is reported to describe associations between categorical and continuous variables (Pett, 2015; Siegel & Castellan, 1988).

Multivariate Effects of Victim–Offender Relationship, Drug or Alcohol Use, and Victim Memory on Injuries

To examine how victim–offender relationship, drug or alcohol use, and victim memory impairment were related to injuries among adolescent victims of sexual assault, we conducted a between-subject MANCOVA, while controlling for Tanner stage and time elapsed between assault and examination. These analyses revealed a significant three-way interaction between victim–offender relationship, use of drugs/alcohol, assault memory, and the dependent variables (number of anogenital injuries and number of physical injuries; Pillai's trace = 0.033, $F(2, 315) = 5.407$, $p = 0.005$; see Table 3). Specifically, anogenital injuries were highest in cases of nonstranger sexual assault in which the victim had not been using drugs/alcohol at the time of the assault but did have memory impairment (i.e., the victim was not able to remember all of the details of her assault). For nonstranger sexual assaults in which the victim did not have memory impairment, the numbers of documented anogenital injuries were similar in cases with and without substance use (see Figure 1A). In contrast, in stranger-perpetrated sexual assaults in which the victim did have memory impairment, rates of documented anogenital injuries were greater in cases with substance use. For stranger-perpetrated sexual assaults without victim memory impairment, anogenital injuries were higher when the victim had not been using drugs or alcohol at the time of the assault (see Figure 1B). Regarding physical injuries, in nonstranger sexual assaults with victim memory impairment, there were more injuries documented when the victim had used drugs/alcohol at the time of the assault. Similar results were found for nonstranger sexual assaults without memory impairment (see Figure 2A). For stranger-perpetrated sexual assaults with victim memory impairment, there were

TABLE 1. Patient and Assault Characteristics

Variable	Descriptives		Multivariate codes
Victim age	M = 15.10 (SD = 1.28)	Range = 13–17 years	
Tanner stage	M = 4.78 (SD = 0.47)	Range = 2–5	
Time between assault and examination (hours)	M = 26.46 (SD = 29.76)	Range = 0.5–251 hours	
Number of anogenital injuries	M = 1.72 (SD = 2.27)	Range = 0–13 injuries	
Number of physical injuries	M = 2.43 (SD = 4.58)	Range = 0–40 injuries	
Race/ethnicity	White	260 (79.0%)	
	African American	51 (15.5%)	
	Latino/a	4 (1.2%)	
	Biracial/multiracial	11 (3.3%)	
	Other	3 (0.9%)	
Victim–offender relationship	Nonstranger offender	266 (72.3%)	0 = Nonstranger offender
	Stranger offender	102 (27.7%)	1 = Stranger offender
Substance use	No	222 (58.4%)	0 = No substance use
	Yes	158 (41.6%)	1 = Substance use
Assault memory	Any part of assault unknown	80 (21.0%)	0 = Any part of assault stranger
	Assault fully known	301 (79.0%)	1 = Assault fully known

TABLE 2. Associations Between Focal Variables

Variable(s)	1	2	3	4	5	6	7
1. Tanner stage	-						
2. Time between assault and examination	−0.035[a]	-					
3. Number of anogenital injuries	0.089[a]	−0.104*[a]	-				
4. Number of physical injuries	0.060[a]	−0.062[a]	−0.005[a]	-			
5. Victim–offender relationship	−0.045[b]	.044[b]	−0.019[b]	−0.210*[b]	-		
6. Substance use	0.10[b]	−0.005[b]	−0.023[b]	0.155*[b]	−0.225*[c]	-	
7. Assault memory	0.010[b]	−0.082[b]	−0.022[b]	−0.103*[b]	0.149*[c]	−0.331*[c]	-

Note. Given that some variables are categorical (i.e., victim–offender relationship, substance use, and assault memory) and some are continuous (i.e., anogenital injuries, physical injuries, Tanner stage, and time between assault and examination), different statistical indices were computed for these measures of association, depending on the specific pair of variables analyzed (Pett, 2015; Siegel & Castellan, 1988).

[a]Pearson's correlations describe associations between continuous variables.

[b]A special case of the Pearson's correlation, point biserials, describes associations between categorical and continuous variables.

[c]Phis describe associations between categorical variables.

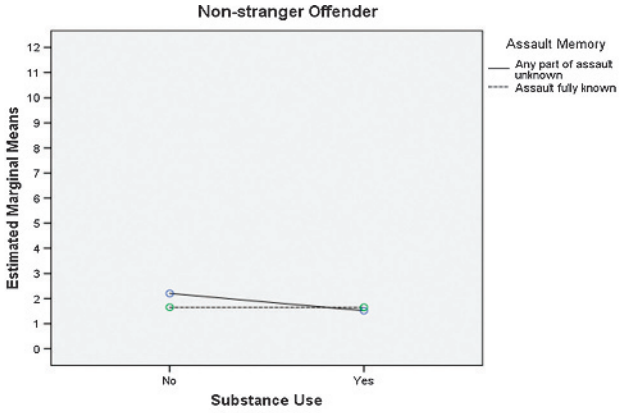
*$p < .05$

more physical injuries documented when drugs/alcohol were not present; for stranger-perpetrated sexual assaults without victim memory impairment, the number of physical injuries was higher when drugs/alcohol were present (see Figure 2B).

A significant two-way interaction was also found between victim–offender relationship and assault memory (Pillai's trace = 0.021, $F(2, 315) = 3.430$, $p = 0.034$; see Table 3) such that, in nonstranger sexual assaults, the number of anogenital injuries was higher when the victim experienced memory impairment; for stranger-perpetrated sexual assaults, anogenital injuries were similar for victims who could and could not remember all parts of their assault. Regarding physical injuries, for nonstranger sexual assaults, the effect of victim memory impairment on injuries was marginal. However, for stranger-perpetrated sexual assaults, the number of injuries was higher when the victim experienced memory impairment. Another significant two-way interaction was found between drug or alcohol use and assault memory (Pillai's trace = 0.020, $F(2, 315) = 3.265$, $p = 0.039$; see Table 3). For victims who experienced memory impairment, the number of anogenital injuries was greater when drugs or alcohol were not factors in the assault. For victims who did not experience memory impairment, the effect of drug or alcohol use on anogenital injuries was marginal. With respect to physical injuries, for victims who experienced memory impairment, the effect of drug or alcohol use was such that the number of injuries was greater when drugs or alcohol were not factors in the assault. However, the inverse was true for victims who did not experience memory impairment. There was also a significant main effect of victim–offender relationship (nonstranger vs. stranger; Pillai's trace = 0.066, $F(2, 315) = 11.104$, $p = 0.000$) such that the number of anogenital injuries was higher in nonstranger sexual assaults and the number of physical injuries was higher in stranger-perpetrated sexual assaults. There were no significant interactions between victim–offender relationship and drug or alcohol use, and there were no significant multivariate main effects for drug or alcohol use or victim memory impairment. Overall, these results consistently indicate that nonstranger perpetrators inflict more anogenital

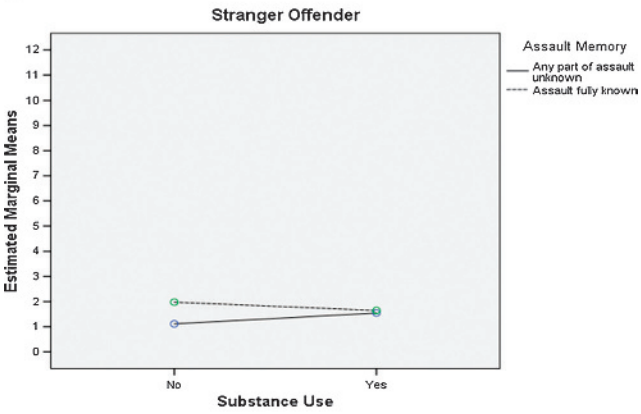
TABLE 3. MANCOVA Results of Victim–offender Relationship, Substance Use, and Assault Memory on Anogenital and Physical Injuries

Variable(s)	Pillai's trace	*F*	*df*	Error *df*	*p*	Partial η^2
Tanner stage	0.008	1.319	2	315	0.269	0.008
Time between assault and examination	0.012	1.835	2	315	0.161	0.012
Victim–offender relationship	0.066	11.104	2	315	0.000*	0.066
Substance use	0.002	0.332	2	315	0.717	0.002
Assault memory	0.013	2.017	2	315	0.135	0.013
Victim–offender relationship × Substance use	0.012	1.934	2	315	0.146	0.012
Victim–offender relationship × Assault memory	0.021	3.430	2	315	0.034*	0.021
Substance use × Assault memory	0.020	3.265	2	315	0.039*	0.020
Victim–offender relationship × Substance use × Assault memory	0.033	5.407	2	315	0.005*	0.033



Note. Covariates appearing in the model are evaluated at the following values: Tanner Stage = 4.77. Time between Exam and Incident in hours = 26.46.

A



Note. Covariates appearing in the model are evaluated at the following values: Tanner Stage = 4.77. Time between Exam and Incident in hours = 26.46.

B

FIGURE 1. (A) Estimated marginal means of number of anogenital injuries for nonstranger offenders. (B) Estimated marginal means of number of anogenital injuries for stranger offenders.

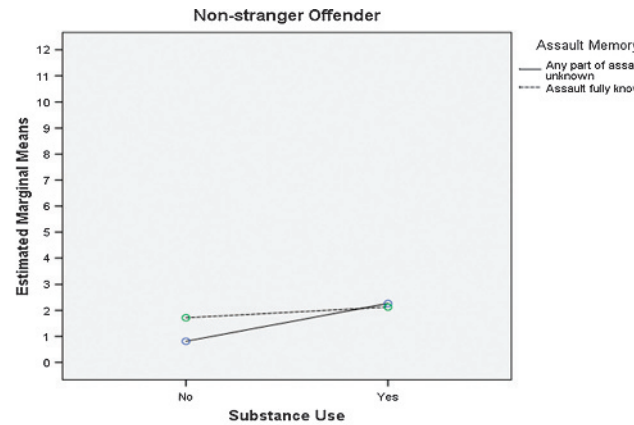
injuries, whereas stranger perpetrators inflict more physical injuries.

Unpacking Multivariate Effects of Victim–Offender Relationship, Drug or Alcohol Use, and Victim Memory on Anogenital Injuries

To examine the significant three-way interaction more closely, we conducted separate univariate ANCOVAs on the anogenital injury outcome variable, controlling for Tanner stage and time elapsed between assault and examination. These results indicated nonsignificant three- and two-way interactions between the independent variables and nonsignificant main effects of victim–offender relationship, drug or alcohol use, and victim memory impairment on anogenital injury. These findings suggest that, when each of these variables is evaluated separately, they do not have a significant relationship with the number of anogenital injuries documented.

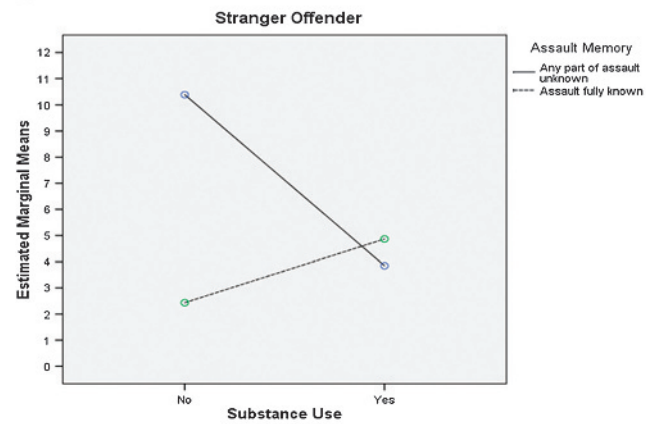
Unpacking Multivariate Effects of Victim–Offender Relationship, Drug or Alcohol Use, and Victim Memory on Physical Injuries

To further examine the MANCOVA's significant three-way interaction, we conducted an additional separate univariate ANCOVA on physical injuries, controlling for Tanner stage and time elapsed between assault and examination. For physical injuries, a significant three-way interaction was revealed between victim–offender relationship, use of drugs or alcohol, and victim memory impairment ($F(1, 316) = 10.096$, $p = 0.002$, $\eta^2 = 0.031$) in the same direction as the multivariate three-way interaction. In addition, a significant two-way interaction was revealed between victim–offender relationship and victim memory impairment ($F(1, 316) = 6.164$, $p = 0.014$, $\eta^2 = 0.019$) and between drug or alcohol use and victim memory impairment ($F(1, 316) = 6.550$, $p = 0.011$, $\eta^2 = 0.020$). For physical injuries, there were



Note. Covariates appearing in the model are evaluated at the following values: Tanner Stage = 4.77. Time between Exam and Incident in hours = 26.46.

A



Note. Covariates appearing in the model are evaluated at the following values: Tanner Stage = 4.77. Time between Exam and Incident in hours = 26.46.

B

FIGURE 2. (A) Estimated marginal means of number of physical injuries for nonstranger offenders. (B) Estimated marginal means of number of physical injuries for stranger offenders.

no significant interactions between victim–offender relationship and memory impairment or between drug or alcohol use and memory impairment. Significant univariate main effects were found for victim–offender relationship ($F(1, 316) = 22.093$, $p = 0.000$, $\eta^2 = 0.065$) and memory impairment ($F(1, 316) = 3.939$, $p = 0.048$, $\eta^2 = 0.012$) such that stranger-perpetrated sexual assaults and memory impairment were associated with more physical injuries. There was no effect of drug or alcohol use on physical injury ($F(1, 316) = 0.572$, $p = 0.468$, $\eta^2 = 0.002$). Taken together, these results suggest that the significant multivariate effects were largely due to the association between victim–offender relationship, substance use, and victim memory impairment and the number of documented anogenital and physical injuries.

Discussion

The current study both corroborates findings from the prior literature and provides new insight on injuries sustained during adolescent sexual assaults. Our findings indicate that nonstranger-perpetrated sexual assaults are associated with more anogenital injuries and stranger-perpetrated sexual assaults are associated with more physical injuries. These results are consistent with prior studies on victim–offender relationship, which suggest that nonstranger offenders are less likely to assault victims with weapons or by physical force and are more likely to assault victims in ways that do not result in bodily injury, whereas stranger offenders are more likely to assault victims with weapons or by physical force and assault in ways that do result in bodily injuries (Hanson et al., 2003; Jones, Rossman, Wynn, et al., 2003; Peipert & Domagalski, 1994; Snyder & Sickmund, 2006; Tjaden & Thoennes, 2006). However, the current study also revealed that this relationship is more complicated, such that the effect of victim–offender relationship on injuries is moderated by victim use of alcohol or drugs and victim memory impairment.

We also found that anogenital injuries were greater when (a) the assault did not involve drugs or alcohol, (b) the victim could not remember all aspects of the assault, and (c) the victim knew her perpetrator. Physical injuries were greater when (a) the assault did not involve drugs or alcohol, (b) the victim could not remember her assault, and (c) the victim did not know her perpetrator. Conventional wisdom would suggest that assault memory is negatively affected by substance consumption (e.g., an adolescent will not remember an assault as a result of drinking alcohol), and of course, this is likely for many cases. However, in this study, we saw separate significant effects of alcohol use and memory on the focal dependent variables, suggesting that these factors do not always co-occur but rather can happen separately. This suggests that victims' inability to remember all aspects of the assault cannot be due solely to alcohol or drug use and could be due to the trauma itself (Hopper & van der Kolk, 2001).

These findings should be considered in light of the study's limitations. First, our dependent variables, anogenital and physical injuries, reflected the number of injuries sustained but did not consider the specific type of injury (e.g., bruising, lacerations, etc.). Future research should examine if there is a relationship between specific types of injuries and victim–offender relationship, substance use, and victim memory impairment. Second, we did not record information from the patient files regarding what specific examination techniques were used by the forensic nurses to document injuries (e.g., Foley catheters, toluidine blue dye), although we do note that both programs had colposcopes for their examinations; as such, we could not control for whether specific examination techniques affected rates of injury detection. Finally, patient skin color was not documented in the medical forensic examination records, which is another factor that can affect injury detection (Sommers et al., 2008, 2009). Approximately 75% of our sample was White, and although this is consistent with the racial makeup of the counties that participated in this study, we note that skin tone and race/ethnicity are not necessarily correlated. Therefore, we do not know the range of skin tones in the patient populations in these programs, nor do we know how these factors could have impacted injury detection among adolescent sexual assault patients.

Implications for Clinical Forensic Nursing Practice

Despite these limitations, the findings from this research have a number of clinical implications for forensic nursing practice. These results highlight the utility of a high-quality, detailed patient history. A number of assault characteristics above and beyond those typically considered for injury assessment (e.g., weapon use, force) should be considered as possible risk factors for anogenital and physical injuries. Specifically, the relationship between the victim and offender, drug and alcohol use, and the patient's ability to remember the assault may affect the presence of anogenital or physical injury. These results indicate that forensic healthcare practitioners need to consider the implication of relying solely on adolescent patients' memories when making care-based decisions. A full examination of the patient's body and anogenital area may be warranted, even if the adolescent patient does not recall experiencing particular types of trauma. This practice is commonplace when patients indicate memory gaps as a result of drug or alcohol consumption, but the current study suggests that thorough examinations may be beneficial when victims lack clarity about their assault for any reason. However, it is of utmost importance that such promotion of thorough medical forensic examinations is balanced with

the encouragement of patients' agency surrounding their postassault medical care (Campbell et al., 2013). Therefore, this research suggests that forensic healthcare practitioners should offer and explain the benefits of a thorough medical forensic examination, particularly anogenital and physical injury detection, anytime a victim indicates being unable to remember the assault in part or in totality. Taken together, these findings indicate how forensic nurses have the opportunity to improve medical services for adolescent victims of sexual assault by understanding the complex dynamics of sexual violence against adolescents and performing thorough medical examinations guided by multiple factors as described by victims in the patient history interview.

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