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## Assessing Women's Sexual Arousal in the Context of Sexual Assault History and Acute Alcohol Intoxication

Amanda K. Gilmore, MS<sup>1</sup>, Rebecca L. Schacht, MS<sup>1</sup>, William H. George, PhD<sup>1</sup>, Jacqueline M. Otto, BS<sup>1</sup>, Kelly Cue Davis, PhD<sup>2</sup>, Julia R. Heiman, PhD<sup>3</sup>, Jeanette Norris, PhD<sup>4</sup>, and Kelly F. Kajumulo, MPH<sup>5</sup>

<sup>1</sup>University of Washington- Department of Psychology, Seattle, Washington, USA

<sup>2</sup>University of Washington, School of Social Work, Seattle, Washington, USA

<sup>3</sup>Indiana University- Kinsey Institute for Research in Sex, Gender, and Reproduction, Bloomington, Indiana, USA

<sup>4</sup>University of Washington- Alcohol and Drug Abuse Institute, Seattle, Washington, USA

<sup>5</sup>University of Washington- Department of Psychology, Seattle, Washington, USA

### Abstract

**Introduction**—Few studies have examined differences in women's sexual arousal based on sexual assault history (SAH) or in-the-moment alcohol intoxication. Only one has examined combined effects. Findings regarding the relationship between SAH and arousal are contradictory.

**Aim**—We aimed to determine the relationship between SAH, alcohol intoxication, and sexual arousal.

**Main Outcome Measures**—Genital response was measured by vaginal pulse amplitude (VPA) using vaginal photoplethysmography while watching erotic films. Self-reported sexual arousal was assessed after watching erotic films.

**Methods**—Women were randomly assigned to an alcohol (target blood alcohol level = .10%) or control condition and categorized as having a SAH or not. After beverage administration, all women watched erotic films while genital arousal (vaginal pulse amplitude; VPA) was measured. Afterwards self-reported sexual arousal was measured.

**Results**—Women with a SAH had smaller increases in genital arousal in response to the films than women without a SAH. Intoxicated women had smaller increases in genital arousal than sober women. However, no differences for SAH or intoxication were found in self-reported arousal.

**Conclusion**—SAH and alcohol intoxication are associated with smaller increases in genital arousal compared to women without a SAH and sober women, suggesting that these co-occurring factors impact sexual arousal.

### Introduction

Research has established a link between sexual assault and harmful sexual health outcomes, including risky sexual behavior,<sup>1,2</sup> sexual re-assault,<sup>3,4,5</sup> and sexual dysfunction.<sup>6,7</sup> In this

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**Conflict of Interest:** None

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paper, sexual assault history (SAH) refers to adult sexual assault (ASA) and/or childhood sexual abuse (CSA) unless otherwise stated. Research examining sexual arousal in women with a SAH is limited.<sup>8,9,10</sup> Although SAH is related to higher rates of alcohol consumption,<sup>11,12,13</sup> only one study<sup>10</sup> examined the influence of alcohol intoxication on the sexual responding of women with a SAH. The current study adds to past research by evaluating differences in genital and self-reported sexual arousal based on SAH and alcohol intoxication. It extends previous work by increasing alcohol dose and including a large sample of community women with diverse SAHs rather than solely focusing on women with a history of CSA.

### **Sexual Assault History and Sexual Arousal**

Approximately 20% of women report at least one lifetime rape experience.<sup>3,14</sup> CSA, often defined as sexual contact under a consenting age, occurs in approximately 17% of women.<sup>15</sup> Sexual assault may result in the pairing of sexual stimuli and fear, which can lead to an inhibited physiological sexual response to sexual stimuli.<sup>16</sup> Other theories posit that negative feelings associated with a CSA event may mediate the relationship between CSA and adjustment problems<sup>17</sup> and women may use emotional avoidance to cope with these experiences.<sup>18</sup> Schloretdt and Heiman<sup>19</sup> found that women with a history of CSA have higher rates of negative affect during sexual arousal than women without such history. The cybernetic model of human sexual function suggests that negative sexual experiences may block sexual arousal because they may lead to lowered libido, decreased arousal, and lack of orgasm, whereas positive sexual experiences will increase these phenomena.<sup>20</sup> Few studies have compared women's genital responding based on SAH. Rellini and Meston<sup>9</sup> examined sexual arousal to an erotic film based on CSA history, posttraumatic stress disorder diagnosis, and physical exercise. Vaginal pulse amplitude (VPA)<sup>21</sup> increased with exercise in women with no CSA history but not in women with a CSA history. No group differences were found for self-reported sexual arousal. Laan and Everaerd<sup>8</sup> found that women reporting a history of sexual assault, rape, or incest exhibited smaller increases in genital response than women without a SAH. However, it is unclear how SAH was measured in this study and whether it included CSA, ASA, or both. In addition, preliminary evidence suggests that women with hypoactive sexual desire disorder respond to testosterone and vardenafil as treatment to increase genital arousal only if there is no history of CSA.<sup>22</sup> This suggests that SAH may affect response to treatment for sexual dysfunction.

Taken together, these findings imply that women with a SAH have smaller increases in genital response compared to women without a SAH. However, assault was limited to CSA or the abuse definition was unclear, suggesting that further research is necessary to understand differences in sexual arousal based on SAH. In addition, these studies did not include contextual factors, such as alcohol, often present in sexual situations.<sup>23</sup>

### **Sexual Assault, Alcohol, and Sexual Arousal**

Few studies have examined the effect of acute alcohol consumption on women's sexual arousal. Wilson and Lawson<sup>24</sup> found a negative linear relationship between alcohol dosage and genital arousal, with increased dosage resulting in lower arousal. Conversely, alcohol consumption resulted in higher self-reported sexual arousal. Wilson and Lawson<sup>25</sup> evaluated the effects of alcohol expectancy set (expected vodka-tonic or tonic only) and alcohol (received vodka-tonic or tonic only) on sexual arousal using a balanced placebo design. No differences were found based on alcohol expectancy set; however, intoxicated subjects exhibited smaller increases in genital arousal compared to sober women, whereas self-reported sexual arousal increased with alcohol. Malatesta et al.<sup>26</sup> found that orgasm latency increased and self-reported arousal increased with intoxication. Although increased self-reported sexual arousal with alcohol intoxication is a consistent finding, the explanation

given for the finding is speculative. Alcohol is a CNS depressant and thus interferes with physiological responding<sup>27</sup> which could explain why alcohol attenuates genital arousal. Alcohol expectancies could provide an explanation for why self-reported sexual arousal increases with alcohol; however, research has not yet supported this claim. The incongruence between self-reported sexual arousal and genital arousal could be explained by alcohol myopia theory.<sup>28</sup> For example, women may over-focus on impelling cues (e.g., erotic stimuli or a partner's arousal) relative to inhibiting cues (e.g., a lab setting or STI risk) and thus conclude that they are more aroused when intoxicated than when sober, despite their physical arousal being dampened by intoxication.

Because women with a SAH report higher rates of overall and pre-sex alcohol consumption compared to women without a SAH,<sup>13</sup> research regarding the possible synergistic effects of alcohol and SAH on sexual arousal is warranted. In the first study to examine this issue, Schacht et al.<sup>10</sup> examined the co-occurring effects of SAH, alcohol intoxication, and instructional set (maximize or suppress arousal) in women. Women with a SAH did not differ on genital arousal based on instructional set; however, women without a SAH exhibited increased genital arousal when instructed to maximize arousal compared to the suppress instruction set group. In addition, women with a SAH self-reported increased arousal in the intoxicated group compared to the sober group, whereas intoxicated women without a SAH reported decreased arousal. In a subsequent study, Schacht et al.<sup>29</sup> found that SAH was not associated with differences in women's genital response to erotic stimuli, but was associated with increases in likelihood of sexual risk-taking in intoxicated women, implying that alcohol intoxication and SAH may interact to affect sexual behavior.

## Aims

Little is known about the relationship between SAH and sexual arousal despite the alarmingly high prevalence of victimization. This study expands current literature by including women with diverse SAH's in a large sample of community women and by examining the co-occurring effects of SAH and alcohol intoxication on sexual arousal using a higher peak blood alcohol level (BAL) than in prior studies. A high peak blood alcohol level was used to more accurately reflect the real-world drinking habits of young social drinkers, who report frequent binge drinking episodes (e.g., Brewer & Swahn),<sup>30</sup> and to maximize the chance that we would detect alcohol effects on sexual responding. We hypothesized that women with a SAH would exhibit smaller increases from neutral to erotic stimuli in VPA compared to women without a SAH, consistent with past research.<sup>8,9,10</sup> Based on prior studies,<sup>26,24,25</sup> we hypothesized that, compared to sober participants, all intoxicated women would exhibit smaller increases in VPA in response to sexual stimuli but would report higher levels of sexual arousal. Finally, we hypothesized an interaction between alcohol and SAH on self-reported arousal, consistent with past research,<sup>10</sup> such that intoxicated women without a SAH would report less sexual arousal than sober women without a SAH and that intoxicated women with a SAH would report more sexual arousal than sober women with a SAH.

## Methods

### Participants

One hundred and forty-four women completed the sexual arousal procedures. Fourteen subjects' data were excluded from the analyses because they could not be classified by SAH (1 due to computer problems and 13 due to missing data). The final sample included 130 women (21-35 years old; mean = 25, *SD* = 3) recruited from an urban community and university in the U.S. Northwest. Most were employed (68%), not students (67%), and identified as Caucasian (72%), with the remainder as follows: 9% multiracial, 8% African-

American, 6% Asian/Pacific Islander, 6% Latina, and 6% other or did not identify. Fifty-one women were categorized as women without a SAH and 69 were categorized as women with a SAH (27 ASA, 19 CSA, 23 ASA and CSA). Most (71%) reported sexual activity in the last month, with an average of 15 lifetime vaginal sex partners ( $SD = 14$ ) and reported drinking an average of 12 drinks per week ( $SD = 9$ ).

All procedures were approved by the university IRB. Recruitment occurred through advertisements for a study involving “social drinking and decision-making.” Participants underwent a phone screening for eligibility and were informed that procedures included viewing sexually explicit films and genital measures of arousal. Women were not recruited based on SAH and SAH was not assessed in the phone screen. Nine hundred and ninety-three women called in response to the recruitment ad. Of these, 24% ( $n = 234$ ) did not participate because they were ineligible; 14% ( $n = 136$ ) declined to participate after hearing about the study, and 48% ( $n = 479$ ) passively declined to participate by not returning the screeners’ phone calls. The remaining 14% ( $n = 144$ ) participated in the study. Only social drinking women with no medical contraindication to alcohol consumption were included. Only sexually active women not in monogamous relationships were included in the study to meet criteria for the larger study examining women with a greater likelihood of engaging in risky sexual behavior. Participants were paid \$15 per hour.

## Measures and materials

**Sexual assault history groups**—Participants were classified as women with or without a SAH using computer administered questionnaires. Childhood sexual abuse (CSA) history was measured with behaviorally specific items from Finkelhor’s<sup>31</sup> questions assessing at least one sexual contact event (touching, sexual fondling, oral sex, and/or intercourse) before their 14<sup>th</sup> birthday with someone five or more years older. Women reporting unwanted sexual contact ranging from genital touching to completed rape after the age of 15 were identified as having an ASA history.<sup>14</sup> Women were identified as having a SAH if they reported a history of CSA or ASA or both. Sixty-eight (58% of the sample) women were classified as having a SAH (19 CSA only, 26 ASA only, 23 CSA and ASA) and the remaining 51 (43%) women were classified as having no SAH.

**Stimulus films**—Participants were shown a sexually-neutral 2.5-minute bird documentary (BBC-TV), followed by two 3-minute erotic films (New Era Productions and VCA Productions). The erotic films induced equivalent self-reported increases in arousal during pilot testing and portrayed explicit consensual sexual activities (kissing, oral sex, and vaginal intercourse) between an adult man and woman.

## Procedure

Upon arrival, a female experimenter verified the participant’s age and that she had a blood alcohol level (BAL) of zero through a breath test (Intoxilyzer 5000; CMI Inc., Owensboro, KY). The experimenter then obtained informed consent, checked for pregnancy (Osom hCG-Urine Test, Genzyme General Diagnostics, San Diego, CA), and weighed the participant to establish correct dosing. Participants completed background questionnaires on a computer in a private room.

**Alcohol procedures and administration**—Dosage was 1 ml 190-proof grain alcohol/kg mixed with Cran-Apple juice consumed over nine minutes and was intended to raise peak BAL to .10%. The experimenter assessed participant BAL levels every three minutes until a criterion level ( $BAL \geq .045$ ) was reached and the participant began the sexual arousal procedures. To reduce error variance in between-subjects intoxication levels, a yoked control design was used such that each control participant was yoked with an intoxicated

individual and breathalyzed and began dependent measures at the same time.<sup>32,33</sup> We did not include a placebo condition because when placebo participants are instructed to expect a high dose, the probability of manipulation failures dramatically increases.<sup>34</sup>

**Sexual arousal assessment**—The experimenter instructed the participant on placement of the vaginal probe before administering alcohol. Once a participant reached criterion BAL, she was left alone to place the probe with computerized instructions for reference and the ability to contact the experimenter via intercom with questions. VPA signals were monitored in another room on a computer by the experimenter. After a short adjustment period, participants viewed a neutral video to obtain a baseline VPA. Two erotic films were then shown uninterrupted while VPA measurements were taken. Participants subsequently rated their sexual arousal on a computer, followed by instructions via intercom to remove the vaginal probe.

**Detoxification and debriefing**—After completing the experiment, intoxicated participants were taken to a separate private room to detoxify. After reaching .03% BAL for alcohol participants and immediately following experiment completion for control participants, they were debriefed, paid, and released.

## Main Outcome Measures

### Genital arousal

Genital arousal was assessed using vaginal photoplethysmography (Behavioral Technology, Inc., Salt Lake City, UT).<sup>21</sup> VPA was systematically sampled at a rate of 62.5 samples per second. VPA data were recorded using Acqknowledge software, version 3.7.2 (BioPac Systems, Inc.).

**VPA data cleaning and reduction**—VPA data signals were reduced to 25 samples per second. Researchers visually inspected all waveform data files to remove detectable movement artifacts and reduced the waveforms to 30-second means. Following digital transformation, a 100% increase or decrease in VPA relative to the adjacent 30-second intervals was classified as movement. Mean values of the adjacent intervals were imputed to replace artifactual values, thus smoothing these anomalies to yield clean data. Ten subjects' data were excluded from the VPA analyses: 5 withdrew before beverage administration (2 due to positive pregnancy tests), 4 because of technical problems, and 1 with a percentage increase score more than 3 standard deviations above the mean; 120 women remained for VPA analyses.

VPA data were computed into percentage change scores:  $[(\text{maximum during erotic film} - \text{maximum during neutral film}) / \text{maximum during neutral film}] \times 100$ .<sup>9</sup> Women with different assault histories were collapsed into one assault category because no differences in genital or self-reported sexual arousal were found among the CSA only, ASA only, and re-assaulted women.

### Self-reported ratings of sexual arousal

Following the films, participants rated their sexual arousal on four items using a seven-point Likert scale (1= no sexual arousal and 7 = extremely sexually aroused): overall sexual arousal,<sup>35</sup> sensation in genitals,<sup>36</sup> sexual warmth,<sup>37</sup> and sexual absorption in the sensory components of the film.<sup>38</sup> The scale included the average of these items and was reliable ( $\alpha = .94$ ).



## Results

### Genital Arousal: Vaginal Pulse Amplitude

Although there were differences based on SAH for drinking behaviors and sexual experiences (see Table 1), these variables were not significantly related to genital arousal and were not included in the analyses (see Table 2). A  $2 \times 2$  between-subjects analysis of variance examined the effect of SAH and alcohol on VPA. The results revealed main effects of SAH,  $F(1,116) = 4.89, p = .03, \eta_p^2 = .04$ ; and alcohol,  $F(1,116) = 4.15, p = .04, \eta_p^2 = .04$ . Women with a SAH had smaller increases in arousal to the erotic films ( $M = 103.08, SD = 93.74$ ) than did women without a SAH ( $M = 147.18, SD = 121.49$ ). Intoxicated women had smaller increases in arousal ( $M = 103.21, SD = 86.64$ ) than did sober women ( $M = 143.10, SD = 125.92$ ). No significant interactions were found.

### Self-Reported Sexual Arousal

A  $2 \times 2$  between-subjects analysis of variance revealed no main effects or interaction for SAH and alcohol condition on self-reported sexual arousal ( $M = 4.54, SD = 1.43$ ).

## Discussion

As hypothesized, women with a SAH experienced smaller increases in genital arousal in response to sexual stimuli compared to women without a SAH. Also, intoxicated women experienced smaller increases in genital arousal following exposure to sexual stimuli relative to their sober peers. Contrary to expectations, we did not find an interaction between alcohol intoxication and SAH for genital arousal. We also did not find any effects of alcohol and SAH for self-reported arousal.

Previous findings regarding women's laboratory sexual responding based on sexual assault have revealed an attenuating association of SAH on VPA response<sup>8,9</sup> or an attenuating interaction.<sup>10</sup> The current study revealed an attenuating main effect of SAH on VPA. Thus, evidence that SAH is associated with smaller increases in genital arousal in response to erotic stimuli has now accrued across a variety of abuse definitions, research groups, and VPA data processing techniques. Although the effect sizes were small in this study, the consistency of the effect across different studies supports the reliability of the current finding.

It is unclear how the association between SAH and attenuated VPA response relates to data indicating that women with a SAH report more sexual partners relative to their non-assaulted counterparts.<sup>1,2</sup> Women with a SAH may experience less physical pleasure from sexual activity than do women without a SAH; if so, their motivations for engaging in sexual activity may be driven less by sexual desire and more by other variables, such as partner relationship. However, similar to past research, we found no differences in self-reported arousal based on SAH.<sup>9,10</sup> This may imply that, in spite of exhibiting less genital arousal relative to women without a SAH, women with a SAH do not experience their sexual responding differently. Decreased genital arousal in women with a SAH may be a result of the pairing of a negative sexual experience with physiological responding, however, the same pattern does not emerge with self-reported sexual arousal. The genital and self-reported arousal measures were not both continuous; thus, direct comparisons are difficult. It may be possible for women to experience different levels of physiological and cognitive arousal at the same time.<sup>16</sup>

Congruent with past research,<sup>26,24,25</sup> intoxicated women exhibited smaller increases in genital arousal than did sober women in response to erotic stimuli. In contrast to past research, we did not find that reported arousal increased with alcohol intoxication. This

could be due to the single assessment of self-reported arousal rather than the use of a continuous measure<sup>9</sup> that may have more accurately corresponded with the genital measure. Also in contrast to past work<sup>10</sup> we did not find an interaction between alcohol condition and SAH on genital arousal, perhaps because of differences in dosing (.08 vs. .10 target BAL). This 25% increase in blood alcohol level may be cognitively experienced differently due to the physiological factors that contribute to sexual arousal. In past research, intoxicated women reported higher sexual arousal than sober women; however, at such high levels of intoxication perhaps the negative physiological effects of alcohol play a more prominent role. Women who have a .10 BAL may be more aware of the effects of the CNS depressant on their physiological arousal. Future research should attempt to replicate these findings to determine whether Schacht et al.'s<sup>10</sup> finding was isolated or whether the current null finding is due to cross-study methodological differences such as sampling or alcohol dose variation. Although in theory we would expect an interaction between abuse history and alcohol, without a larger body of extant research in this area, it is impossible to say with certainty why past findings were not replicated in the current study. Generalizability of these findings is limited due to participant bias in studies involving genital measures of sexual responding.<sup>39</sup> Sex research volunteers are more sexually experienced and have more positive sexual attitudes than non-volunteers.<sup>39</sup> Self-reported sexual arousal may be less variable in this sample because sex research volunteers may have higher arousal ratings than non-volunteers. Findings are also limited because this study measured arousal to erotic stimuli in a laboratory setting, which may not directly relate to arousal during sexual activity. In addition, findings may not generalize to higher or lower BALs or non-drinking or problem drinking populations. Finally, a placebo condition was not practical due to the high dosage of alcohol;<sup>34</sup> thus, these findings cannot evaluate possible expectancy set effects of alcohol on women's sexual arousal. Future work should explore why these findings diverge from past work,<sup>10</sup> evaluate possible expectancy effects at lower dosages among women with a SAH, evaluate possible mediators of the relation between abuse history and arousal, and assess other factors influencing the sexual responding of women with a SAH.

## Conclusion

This research provides further evidence that SAH is associated with attenuated VPA response, adding to the literature by having a higher alcohol dose and including a large sample of women with a range of abuse histories, overcoming the lack of statistical power and limited sampling that has characterized past work. These findings add to an emerging understanding of the association between SAH and women's subsequent sexual behavior.

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**Table 1**

Mean and Standard Deviations by Sexual Assault History (SAH)

Variable	Positive SAH <i>M (SD)</i>	Negative SAH
Age	25.76 (3.60)*	24.10 (3.66)*
Number of Vaginal Sex Partners	18.20 (15.12)**	11.40 (12.13)**
Number of Drinks in Last Binge	7.77 (3.25)*	6.51 (3.00)*
Average Number of Drinks per Week	12.47 (8.65)	10.71 (8.44)

*Notes.*\*  
 $p < .05$ ,\*\*  
 $p < .01$ .The overall omnibus MANOVA was significant,  $F(5,115) = 4.01$ ,  $p < .01$ ,  $\eta_p^2 = .15$ .

Table 2

Correlation Table of Demographics and Sexual Arousal

Variable	1	2	3	4	5	6
1. Genital Arousal	--					
2. Self-Reported Arousal	.11	--				
3. Age	-.09	.10	--			
4. Number of Vaginal Sex Partners	.18	.12	.39**	--		
5. Number of Drinks in Last Binge	-.11	.05	-.13	.04	--	
6. Average Drinks per Week	-.01	.13	.05	.15	.58**	--

Note.

\*  $p < .05$ ,

\*\*  $p < .01$ .