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USING LATENT VARIABLE MIXTURE MODELING TO UNDERSTAND
TRAUMA-RELATED OUTCOMES

by

Megan L. Avery

A Dissertation

Submitted in Partial Fulfillment of the

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Abstract

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Posttraumatic stress disorder (PTSD) and sexual difficulties may occur after trauma exposure. Researchers have noted factors (e.g., depression, relationship satisfaction) that are linked to PTSD and sexual functioning, but it is unclear how these variables are related. This paper explored an underlying class structure that differentiated subtypes of women based on trauma-related details, PTSD symptoms, sexual function disturbances, relationship status, and romantic relationship functioning. Groups were compared on depressive symptoms, substance use, and risky sexual behavior. Participants were adult undergraduate female trauma survivors ($N = 280$, 52% Caucasian) who completed self-report measures via an online survey. Latent variable mixture modeling generated four groups, and ANOVAs further explained group differences. “Healthy & Sexually Inactive” group members were single, sexually inactive, denied mental health symptoms, and reported low alcohol use and risky sexual behavior. “Healthy & Sexually Active” group members were in a relationship, were sexually active, did not report any difficulties, and had average alcohol use and risky sexual behavior. “Sexual Difficulties & PTSD” group members were in a relationship, reported mild levels of all forms of sexual difficulties, reported mild PTSD and depressive symptoms, and had average alcohol use and risky sexual behavior. “Sexual Pain” group members were in a relationship and reported sexual pain and some depressive symptoms; they denied PTSD symptoms, and had average alcohol use and risky sexual behavior. Classes were not differentiated by trauma (nonsexual trauma in mid-teens), relationship satisfaction, or

drug use. Results highlight the relations between PTSD, sexual functioning, and depression. Ideas for future research and clinical implications are discussed.

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Using Latent Variable Mixture Modeling to Understand Trauma-Related Outcomes

Exposure to a traumatic event can result in adverse outcomes, including posttraumatic stress disorder (PTSD; American Psychiatric Association, 2013) and sexual functioning difficulties (e.g., Letourneau, Resnick, Kilpatrick, Saunders, & Best, 1996; Lewis et al., 2010). Numerous studies have noted that PTSD and sexual problems may co-occur; however, much remains unknown about this co-occurrence. In an effort to better understand the relationship between PTSD and sexual functioning, researchers have identified other factors related to these outcomes, including trauma type, age at time of trauma, depression, substance use, romantic relationship functioning, and risky sexual behavior.

Posttraumatic Stress Disorder

PTSD is one of the most widely studied outcomes of trauma exposure, and epidemiological research suggests that approximately 7% of adults meet criteria for PTSD in their lifetime (Kessler et al., 2005). As described in the most recent edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, 2013), PTSD includes four clusters of symptoms: reexperiencing (e.g., intrusive memories), avoidance (e.g., avoiding reminders of the traumatic event), negative changes in cognitions and mood (e.g., feelings of detachment from others), and alterations in arousal and reactivity (e.g., hypervigilance). PTSD is associated with reduced quality of life, interpersonal difficulties, social withdrawal, strained physical health, and struggles with employment (American Psychiatric Association, 2000, 2013; Karney, Ramchand, Osilla, Caldrone, & Burns, 2008).

Sexual Function Disturbances

Sexual function disturbances include difficulties with sexual desire, arousal, lubrication, orgasm, pain, and satisfaction (Lewis et al., 2010; Rosen et al., 2000).

Difficulties with desire refer to decreased or absent interest in sexual activities. Arousal difficulties include diminished ability to attain or maintain excitement. Difficulties with lubrication include subjective decreases in ability to attain or maintain lubrication.

Difficulties with orgasm include difficulty reaching orgasm, inability to reach orgasm, or less satisfying orgasms. Pain is characterized as genital pain or discomfort during or after penetration. Sexual dissatisfaction is a lack of enjoyment in sexual activities or finding them less pleasurable than before.

There is a wide range of prevalence rates reported for various types of sexual function disturbances in women. One study indicated that 40% to 45% of women report at least one sexual difficulty in their lifetime (Lewis et al., 2010). Hendrickx, Gija, and Enzlin (2014) compiled prevalence rates for various sexual difficulties in women from numerous recent studies. They found that prevalence rates for women reporting decreased sexual desire ranged from 7% to 55%, and rates for lubrication difficulties ranged from 11% to 31%. Fifteen percent of women reported recurrent pain during intercourse (Lauman, Paik, & Rosen, 1999). Rates for orgasm difficulties ranged from 10% to 42%; however, these estimates did not account for distress associated with orgasm difficulties (Graham, 2010). This is concerning given that only a portion of women with orgasm difficulties report associated distress (Oberg, Fugl-Meyer, & Fugl-Meyer, 2004).

Although sexual function disturbances may occur without trauma exposure, trauma may play a role in the presence of sexual function disturbances (e.g., Letourneau

et al., 1996; Lewis et al., 2010). No studies have reported on epidemiological rates of trauma-related sexual function disturbances, and studies of clinical and community samples have noted a wide range in the percentage of individuals who report sexual function disturbances following a traumatic event. For example, in a sample of abused women, sexual difficulties ranged from 83% (genital pain) to 93% (absent sexual desire) for women who experienced a rape and 13% (sexual aversion) to 19% (genital pain) for women who experienced nonsexual traumas (Faravelli, Giugni, Salvatori, & Ricca, 2004). Despite the large range of prevalence rates of sexual function disturbances, studies have demonstrated that trauma exposure is linked with increased risk of sexual function disturbances. For example, 81% of female crime survivors reported sexual function disturbances, whereas only 19% of women who had not experienced trauma reported sexual function disturbances (Letourneau et al., 1996). Sexual function disturbances can be distressing and are associated with other mental health difficulties and interpersonal problems, particularly difficulties with one's romantic partner and romantic relationship dissatisfaction (American Psychiatric Association, 2000, 2013).

The Co-Occurrence of PTSD and Sexual Function Disturbances

PTSD and sexual function disturbances frequently co-occur following trauma; with reported levels of sexual function disturbances ranging from 29% to 58% in samples of women with PTSD (Bonugli, Brackley, Williams, & Lesser, 2010; Letourneau et al., 1996; Schnurr et al., 2009). PTSD symptoms have been linked to various sexual problems in women, including sexual dissatisfaction, decreased sexual arousal, and increased sexual pain (Bonugli et al., 2010; Eadie, Runtz, & Spencer-Rodgers, 2008; Rellini & Meston, 2006; Rellini, Hamilton, Delville, & Meston, 2009; Seng, Clark,

McCarthy, & Ronis, 2006), and samples of both men and women have linked PTSD symptoms to other types of sexual function disturbances, including decreased sexual desire and orgasm difficulties (Chudakov, Cohen, Matar, & Kaplan, 2008). PTSD symptom severity and reproductive health symptoms were positively correlated in female undergraduates ($r = .29$; Eadie et al., 2008). In a sample of female veterans and active duty military members, sexual concern severity was correlated with PTSD total severity ($r = .18$; Schnurr et al., 2009). A diagnosis of PTSD was related to a lifetime history of sexual problems in female crime survivors ($r = .24$; Letourneau et al., 1996). PTSD severity and objectively-measured sexual arousal were inversely correlated in two different samples of women ($r = -.43$, Rellini & Meston, 2006; $r = -.31$; Rellini et al., 2009). Studies have consistently found a moderate-sized correlation between PTSD and sexual functioning in both subjective and objective measures of sexual functioning. These studies also showed that PTSD and sexual functioning were associated in a variety of samples, including undergraduate women.

When individuals with PTSD are compared to those without PTSD, differences in sexual function disturbances emerge. Rellini and Meston (2006) found that women with PTSD from childhood sexual abuse reported more severe total sexual functioning problems and arousal difficulties than a group of women who experienced childhood sexual abuse but did not have PTSD and a group of women without childhood sexual abuse or PTSD. When comparing women with sexual problems to women without sexual problems, rates of PTSD may differ. Female crime survivors who reported sexual problems were more likely to have a diagnosis of PTSD than survivors who denied sexual problems (Letourneau et al., 1996). Nearly 30% of women with a history of sexual

problems met criteria for PTSD, compared with only 9% of women without a history of sexual problems. These studies did not address the direction of the relationship between PTSD and sexual functioning. It is possible that women with PTSD are likely to also have sexual functioning difficulties; however, it is also possible that women with sexual problems are more likely to develop PTSD than women without sexual problems.

Researchers have demonstrated a link between PTSD and several different types of sexual functioning. PTSD, particularly emotional numbing symptoms, may result in sexual difficulties by making an individual less likely to engage in or enjoy sexual activity. The social avoidance and withdrawal that goes along with PTSD may impact one's relationship with a significant other, which would in turn affect sexual functioning. It is also possible that sexual difficulties serve as a precursor to the development of PTSD, particularly numbing symptoms. Alternatively, following a sexual trauma, particular body sensations associated with sexual activity may trigger reexperiencing of the trauma. Further, an avoidant pattern may be reinforced if an individual avoids sexual activity or ceases sexual activity after being reminded of the trauma. When considering causal models, one must keep in mind that PTSD and sexual difficulties may be bidirectional or have a cyclical pattern. The literature still has yet to explain this connection; however, researchers have begun investigating third variables that are related to both PTSD and sexual functioning, such as trauma type, age at trauma exposure, depression, substance use, romantic relationship functioning, and risky sexual behavior.

Some researchers have begun to take a more comprehensive look at PTSD, sexual functioning, and related issues. Female veterans with any mental health diagnosis had a greater prevalence of sexual difficulties than veterans without a mental health diagnosis

(Cohen et al., 2012). Prevalence rates were highest among women with both PTSD and depression. Adjustments for substance use disorders led to a small reduction of the strength of the relationship between mental health diagnoses and sexual functioning outcomes. This study highlights the impact PTSD, depression, and substance use have on sexual functioning.

One study compared female veterans with a sexual assault history to those not reporting a history of sexual assault on a variety of outcomes (Sadler, Mengeling, Fraley, Torner, & Booth, 2012). Those with a history of sexual assault were more likely to have current PTSD, current depression, history of a substance use disorder, current sexual pain, and less satisfying romantic relationships than those not reporting a sexual assault. Women with PTSD, depression, or both were more likely to report painful sex and less likely to report having a satisfying romantic relationship. This study emphasizes the impact trauma has on mental health and relationship function and the impact mental health diagnoses have on sexual functioning and relationships.

A study of college women investigated PTSD, sexual concerns, risky sexual behavior, and substance use (Messman-Moore, Ward, & Brown, 2009). The results found that PTSD statistically predicted more sexual concerns, increased risky sexual behavior, and alcohol and marijuana use. These more comprehensive studies suggest that PTSD, depression, substance use, sexual function disturbances, risky sexual behavior, and relationship difficulties may occur after trauma exposure. They also bring attention to the complex relationships among these issues.

Trauma-Related Factors

Sexual and nonsexual traumas. A relationship between PTSD and sexual function disturbances was first investigated in rape survivors (e.g., Becker, Skinner, Abel, Howell, & Bruce, 1982; Norris & Feldman-Summers, 1981). The co-occurrence of PTSD and sexual function disturbances seemed logical following a sexual trauma, but researchers also began to document a high rate of PTSD and sexual function disturbance co-occurrence after nonsexual traumas, such as motor vehicle accidents and combat (de Silva, 1999; Ishøy et al., 2001). This sparked a heightened interest in the co-occurrence of PTSD and sexual function difficulties, but it also generated curiosity about the impact of trauma type.

It is possible that sexual traumas are more likely to result in PTSD and sexual functioning difficulties compared to nonsexual traumas. In an epidemiological study, sexual traumas, compared to nonsexual traumas, were associated with a higher prevalence of PTSD (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). In a study that compared women who were recently raped to women who experienced nonsexual traumas, women who were raped were more likely to experience PTSD, lack of sexual desire, and genital pain (Faravelli et al., 2004). Of the women who were raped, 95% met criteria for PTSD and 90% endorsed some form of sexual difficulty. Of the women who experienced other traumatic events, 47% met criteria for PTSD and 19% endorsed some form of sexual difficulty. Women with sexual problems were more likely to report having a history of rape than women without sexual problems (Letourneau et al., 1996).

Sexual traumas may also result in more severe PTSD symptoms and sexual difficulties than nonsexual traumas. In a sample of female veterans and active duty

military members, women reporting sexual traumas had more severe sexual concerns than those reporting nonsexual traumas (Schnurr et al., 2009). Sexual assault severity was positively correlated with PTSD symptom severity and severity of reproductive health symptoms in female college students (Eadie et al., 2008). Experiencing a rape was correlated with a PTSD diagnosis and presence of sexual problems in female crime survivors (Letourneau et al., 1996).

Several studies have shown that sexual traumas may put individuals at greater risk for negative outcomes. However, it is essential to consider the impact of trauma type in conjunction with other factors, such as PTSD. For example, in one study, survivors of sexual abuse had less objectively-measured sexual arousal, compared to individuals who had not been sexually abused; however, after controlling for PTSD symptoms, group differences were no longer present, suggesting that PTSD mediated the relationship between trauma exposure and objective sexual arousal (Rellini et al., 2009). When trauma exposure, PTSD, and sexual functioning are investigated in context of other aspects of functioning, relationships may appear differently.

Age at time of trauma. An individual's age at time of trauma exposure may also have an impact on outcomes. In a meta-analysis, younger age at time of trauma exposure was positively related to PTSD (Brewin, Andrews, & Valentine, 2000). For example, female crime survivors with PTSD were more likely to have first experienced crime at a younger age than survivors without PTSD (Kilpatrick et al., 1989). In a sample of men and women with mixed traumas, childhood traumas were more likely to result in PTSD compared to adult traumas (Breslau, Chilcoat, Kessler, & Davis, 1999).

Younger age at time of trauma is also related to increased sexual functioning difficulties. Age at first trauma was related to sexual problems in female crime survivors (Letourneau et al., 1996). In a sample of men and women who reported a sexual assault, individuals who were younger at the time of assault were more likely to report sexual distress than those who were older at the time of assault (Siegel, Golding, Stein, Burnam, & Sorenson, 1990).

Numerous studies have demonstrated the impact trauma-related details, such as trauma type and age at trauma exposure, have on PTSD and sexual functioning, but it is possible that there is an interaction between trauma type and age at trauma exposure. It is possible that childhood sexual abuse, adult sexual assault, childhood nonsexual trauma, and adult nonsexual trauma each impact PTSD and sexual functioning uniquely, but this has not been investigated.

Depression

Given that both PTSD and sexual functioning disturbances are frequently comorbid with depression (Atlantis & Sullivan, 2012; Hartmann, 2007; Kessler et al., 1995), it is essential to consider the role depression plays with PTSD and sexual functioning. Depression is characterized by a sad mood, anhedonia, and other associated symptoms such as fatigue and sleep disturbances. Following trauma, depression and PTSD are often comorbid, and depression is more common in individuals with PTSD compared to individuals without PTSD. An epidemiological study found that 48% of women with PTSD also met criteria for a major depressive episode and 23% met criteria for dysthymia (Kessler et al., 1995). In women without PTSD, only 19% reported a major

depressive episode and 7% met criteria for dysthymia. Depression and PTSD symptoms have been positively correlated in female undergraduate samples (Eadie et al., 2008).

Depression and sexual function disturbances commonly co-occur. A recent meta-analysis concluded that individuals with depression had a 50% to 70% increased risk of sexual problems compared to individuals without depression, and those with sexual problems had a 130% to 210% chance of developing depression (Atlantis & Sullivan, 2012). In a sample of female crime survivors, women with sexual problems were more likely to be depressed than women without sexual problems (Letourneau et al., 1996). A positive relationship between depression and reproductive health symptoms has been found in female undergraduates (Eadie et al., 2008).

A study looking at PTSD and sexual functioning simultaneously in reproductive-age women receiving Medicaid found that women with PTSD or comorbid PTSD and depression were more likely to have a diagnosis of dyspareunia (genital pain) than those with no mental health diagnosis or depression only (Seng et al., 2006). It is possible that PTSD carries a unique risk for sexual difficulties, beyond depression. There are several other symptoms of PTSD that are not shared with depression that could contribute to sexual functioning difficulties, such as reexperiencing and avoidance symptoms.

The high rate of comorbid PTSD and depression may be partially due to symptom overlap. Specifically, anhedonia, difficulty concentrating, and sleep disturbances are included as symptoms for both PTSD and depression. Depression and sexual function disturbances share an aspect of anhedonia, namely decreased interest in sex. PTSD, sexual function disturbances, and depression may share other related concerns, such as irritability, relationship distress, and negative mood states (e.g., guilt or shame). It is

possible that underlying factors seen in many mental health issues, such as negative affect and general distress, are contributing to high comorbidity.

Substance Use

Another potential difficulty following trauma is alcohol or drug misuse (Avant, Davis, & Cranston, 2011). Substance misuse has consistently been linked to PTSD. In an epidemiological study, 28% of women with PTSD also met criteria for alcohol abuse or dependence whereas only 14% of women without PTSD did (Kessler et al., 1995). Similarly, 27% of women with PTSD also met criteria for a drug abuse or dependence disorder compared to only 8% of women without PTSD.

Substance misuse is also related to sexual functioning. Although low doses of some substances may increase sexual arousal, possibly due to disinhibition, higher doses often suppress sexual responses in the body (Wilson & Lawson, 1976). Physiological responses to alcohol decrease arousal and increase orgasm difficulty (Beckham, 1979; Malatesta, Pollack, Crotty, & Peacock, 1982; Wilson & Lawson, 1976). Women who seek treatment for alcohol misuse may report more sexual problems women who do not report alcohol misuse (Covington & Kohen, 1984). Also, women with substance use report more sexual difficulties than women without substance use (Johnson, Phelps, & Cottler, 2004; Smith, Wesson, & Apter-Marsh, 1984; Warner, 1993). A recent literature review of alcohol and sexual functioning in women concluded that alcohol use resulted in less sexual activity, less sexual satisfaction, and more sexual function disturbances (Sobczak, 2009).

PTSD and sexual functioning disturbances have independently been linked to substance use, and it is possible that substance use plays a role in the relationship

between PTSD and sexual functioning. The link between sexual functioning and substance use may be partially explained by physiological effects of substances.

Romantic Relationship Functioning

In addition to sexual function disturbances, PTSD has been associated with disruptions in other aspects of functioning in romantic relationships. Trauma exposure and PTSD have been associated with interpersonal problems, particularly in the context of romantic relationships (Riggs, Byrne, Weathers, & Litz, 1998). A recent meta-analysis found a medium-sized association between PTSD and intimate relationship discord (Taft et al., 2011). PTSD is associated with higher levels of conflict and lower ratings of relationship satisfaction (Monson, Gradus, La Bash, Griffin, & Resick, 2009; Taft et al., 2009).

Sexual function disturbances are associated with interpersonal problems, particularly difficulties with one's romantic partner and romantic relationship dissatisfaction (American Psychiatric Association, 2000, 2013). In a report generated by an international consultation team on sexual difficulties, relationship conflict, relationship discord, and relationship dissatisfaction were noted as contributing factors to sexual functioning difficulties (Althof et al., 2005). In a national survey of women, poor relationship quality with a sexual partner was a statistical predictor of sexual distress (Bancroft, Loftus, & Long, 2003).

The links between relationship satisfaction and functioning and trauma-related outcomes are likely bidirectional. Social support is an important aspect of recovery after trauma and PTSD (Herman, 1997; Nelson-Goff & Smith, 2005). It is possible that lack of a supportive romantic relationship predicts more longstanding or more severe PTSD.

Relationship difficulties often result in sexual distress, and sexual difficulties may cause relationship dissatisfaction. Further, psychological symptoms such as emotional numbing, irritability, anhedonia, or isolation may put a strain on a romantic relationship and may lead to sexual or nonsexual relationship difficulties.

Risky Sexual Behavior

When considering sexual functioning, it is also essential to take into account risky sexual behavior. Risky sexual behavior is any behavior that increases the probability of sexual consequences (e.g., sexually transmitted diseases or infections) or an unplanned pregnancy. Examples of risky sexual behavior include having multiple partners; having risky, casual, or unknown partners; not discussing risk topics with a partner prior to sexual activity; or not using contraceptives. Much of the research on risky sexual behavior is on adolescents, including high school and college students, as this time is a key period for sexual exploration and development (Brooks-Gunn & Paikoff, 1997; Miller, Christopherson, & King, 1993). Many risky sexual behavior practices are established during adolescence and maintained into adulthood (Viner & Baker, 2005).

Trauma survivors report more risky sexual behavior, including unprotected intercourse, more sexual partners, having multiple partners, casual sex, substance use before sex, and sex with risky partners than individuals who have not been exposed to trauma (Brener, McMahon, Warren, & Douglas, 1999; Chiasson et al., 2005; Fergusson, Horwood, & Lynskey, 1997; Houston & McKirnan, 2007; Rheingold, Acierno, & Resnick, 2004; Zierler et al., 1991). Individuals who experienced childhood sexual abuse are more likely to engage in risky sexual behavior, including having multiple partners, engaging in casual sex, and having unprotected sex than those without childhood sexual

abuse (Fergusson et al., 1997; Zierler et al., 1991). In an epidemiological study of college women, women who reported sexual assault were more likely to report substance use at time of sex and two or more concurrent sex partners than women not reporting sexual assault (Brener et al., 1999). Women who are sexually abused often report more risky sexual behavior, including having unprotected sex, more partners, and sex with a risky partner than women who have not been sexually abused (Cunningham, Stiffman, Dore, & Earls, 1994; Springs & Friedrich, 1992; Wingood & DiClemente, 1998). Most of the research regarding trauma exposure and risky sexual behavior has focused on sexual traumas, particularly childhood sexual abuse. Less is known about individuals reporting only nonsexual traumas or the difference in risky sexual behavior between individuals who experienced sexual traumas and individuals who experienced nonsexual traumas.

The literature on risky sexual behavior has focused more on trauma exposure than PTSD symptoms. However, researchers have found that individuals with more severe PTSD symptoms report more risky sexual behavior, including more sexual partners, more unprotected sex, and more frequent sex while under the influence of a substance, than individuals with less severe PTSD symptoms (Hutton et al., 2001; Munroe, Kibler, Ma, Dollar, & Coleman 2010; Plotzker, Metzger, & Holmes, 2001; Reisner et al., 2009).

A few studies have commented on the relationship between risky sexual behavior and sexual functioning disturbances. Women reporting an arousal disorder or sexual pain were more likely to report more than four lifetime partners than women with no sexual difficulties (Laumann et al., 1999). Sexual difficulties were related to having multiple partners and total number of risky sexual behaviors in a sample of African American women (Robinson, Scheltema, & Cherry, 2005). In a sample of undergraduate women,

sexual satisfaction was positively correlated with motivation to avoid risky sexual behavior (Schick, Calabrese, Rima, & Zucker, 2010).

A couple of studies have investigated risky sexual behavior in the context of other potential influences. One study examined the impact of childhood sexual abuse and adult sexual assault on PTSD, risky sexual behavior, and sexual functioning concerns in a sample of HIV-positive women (Myers et al., 2006). Childhood sexual abuse severity and presence of an adult sexual assault were associated with both increased PTSD symptoms and risky sexual behavior; however, only adult sexual assault was related to sexual functioning concerns. Another study compared female veterans who were sexually assaulted to veterans who had not been sexually assaulted on measures of risky sexual behavior, PTSD symptoms, and alcohol problems (Lang et al., 2003). Women who had been assaulted reported a younger age at their first voluntary intercourse, had more lifetime sex partners, were more likely to have sex before discussing risk with a partner, reported more PTSD symptoms, and were more likely to screen positive for alcohol problems than women who had not been sexually assaulted. This study then investigated PTSD symptom severity as a mediator of the relation between sexual assault history and alcohol use and the relation between sexual assault and engaging in sex before discussing risk. They found that PTSD symptoms mediated the relation between sexual assault history and alcohol screening scores; however, PTSD symptoms did not mediate the relation between sexual assault history and engaging in sex before discussing partner's risk. This is consistent with prior research and some theories regarding PTSD and substance use. This study suggests that sexual trauma, rather than PTSD, accounts for some aspects of sexual risk taking.

Several mechanisms may account for a link between risky sexual behavior, trauma, and mental health outcomes. Individuals who experienced trauma, particularly early life trauma may have also been exposed to situations that put them at higher risk for engaging in risky sex (e.g., running away from home; Lalor & McElvaney, 2010). After experiencing a trauma, some individuals engage in risky behaviors more generally (Killgore et al., 2008), which may include risky sexual behavior. Increased substance use following a trauma or in conjunction with PTSD may disinhibit individuals, increasing the potential for risky sexual behavior (Breslau, Davis, & Schultz, 2003; Jacobsen, Southwick, & Kosten, 2001; Tate, Norman, McQuaid, & Brown, 2007). While some women may avoid sexual activity due to emotional numbing, it is possible that some women engage in increased sexual activity or risky sexual activity in an effort to overcome numbing (Cohen et al., 2012). It is possible that women may blame their partners for sexual difficulties, and seek out other partners for more satisfying sexual encounters (Robinson et al., 2005). It is also possible that more casual partners are less invested in helping to create a satisfying sexual encounter than a more committed romantic partner. Having a more satisfying relationship and sexual relationship with a partner may enhance monogamy, reducing the risk of some risky sexual behavior. Stronger relationships may be characterized by better communication, which would allow for discussion of sensitive topics such as sexual risk and sexual behavior. A positive relationship may serve as a protective factor for some risky sexual behavior, such as having multiple partners.

Using Latent Variable Mixture Modeling to Understand PTSD and Sexual Functioning

Following trauma, numerous concerns may arise, including PTSD, sexual function disturbances, depression, substance misuse, relationship difficulties, and risky sexual behavior. These factors are interrelated, and many of them seem to have functional relationships. Despite the complicated relationships demonstrated by these studies, no studies have investigated these factors simultaneously.

Prior research has noted relations among these variables and has reflected an underlying assumption that these variables interrelate the same way for most women. Given the nascent state of the literature documenting the relations among these issues, a latent variable approach may be the most appropriate next step. It is possible that trauma-exposed women can be classified into groups based on similar patterns of responses on measures using latent variable mixture modeling. This study proposed to identify a latent class that categorizes women with similar reports on the following aspects: relationship status, relationship functioning, trauma type (sexual v. nonsexual), age at trauma exposure, PTSD symptom severity, and various types of sexual function disturbances, including difficulties with desire, arousal, lubrication, orgasm, satisfaction, and pain. While research has focused on relationship discord and relationship satisfaction, relationship status was also included in the latent variable analyses to enhance understanding of sexual functioning disturbances. For example, a woman in a relationship may report more sexual functioning disturbances than a woman who is not in a relationship simply as a consequence of level of sexual activity and availability of a sexual partner. This may also help differentiate women who are avoiding sexual activity

with a partner from women who are not engaging in sexual activity due to a lack of a relationship or available partner. The identified groups were then compared on other related symptoms and behaviors, including depressive symptoms, alcohol use, drug use, and risky sexual behavior. This was an exploratory investigation, as there are no prior studies investigating a classification structure of trauma-related PTSD and sexual function disturbances.

This study was conducted with trauma-exposed female undergraduates because these factors are essential to investigate in this population. Independently, these disorders can be distressing and can interfere with social relationships, academic performance, employment, and daily functioning (American Psychiatric Association, 2000, 2013). When they co-occur, it is possible that these effects are compounded. College students are an important population to study since they have likely been exposed to trauma (Walsh et al., 2012), they may report many of the symptoms of interest (Eadie et al., 2008), many are sexually active (e.g., Cooper, 2002; Munroe et al., 2010), and they are at a key developmental stage to investigate sexual behavior (Brooks-Gunn & Paikoff, 1997; Miller et al., 1993).

Method

Participants

Participants were 280 female adult undergraduate students recruited through a university-based online research study recruitment tool at The University of Memphis. Participants were eligible if they reported a traumatic event that met criterion A for PTSD, i.e., an event that involved actual or threatened death, serious injury, or sexual violence, which allowed for assessment of PTSD symptoms. Participants ranged in age

from 18 to 57 ($M = 21.0$, $SD = 19.0$). The sample was ethnically diverse, with 52% identifying as Caucasian ($n = 146$), 37% as African American ($n = 103$), 6% as multiethnic ($n = 16$), 3% as Asian ($n = 7$), 2% as Hispanic ($n = 6$), and 1% Native American ($n = 2$).

Procedure

Prior to collecting data, this study was approved by the university's Institutional Review Board. Participants were recruited using a posting on the Sona Systems website (memphis.sona-systems.com) advertising a voluntary online survey that aimed to learn more about "stressful life experiences, sexual functioning, mental health symptoms, and behaviors." Emails asking permission to advertise the study were sent to psychology professors whose students were encouraged to participate in research. After professor approval, the study was advertised with a brief verbal description, and students received a small flyer detailing how to access the study in the online system.

All participants provided informed consent prior to completing the study. Participants completed a set of questionnaires through an online survey generated by Qualtrics (qualtrics.com). Participants had the option to withdraw from the study at any time or chose not to answer any question. Following the survey, students were debriefed and provided with mental health resources. The survey took about an hour to complete, and participants were rewarded 1 research credit to apply to a psychology course.

Measures

Demographics. A demographic questionnaire assessed participants' sex, gender, age, ethnicity, income, education level, sexual orientation (via Kinsey Scale; Kinsey, Pomeroy, & Martin, 1948), relationship status, sexual activity history, and relationship

history. Relationship status was divided into “in a relationship” and “not in a relationship.” Participants who reported casually dating one person, casually dating more than one person, being in a committed monogamous relationship, being in a polyamorous relationship, cohabitating, being engaged, or being married were coded as “in a relationship.” Participants who did not any of the previous categories, and reported having casual sex or being single (not seeing or dating anyone), separated, divorced, or widowed were coded “not in a relationship.”

Trauma exposure. Criterion A trauma exposure was assessed with the Traumatic Life Events Questionnaire (TLEQ, Kubany et al., 2000). The TLEQ is a 23-item self-report measure that assesses exposure to numerous traumatic events. Participants were asked to indicate the number of times they experienced each event and emotional reactions to the event. An additional item was included to assess which event participants rated as the most distressing. This question was used to create a trauma type (sexual or nonsexual) variable. They were asked at what age the most distressing trauma occurred. If the trauma was ongoing participants indicated their age when the event first occurred. This question provided a continuous measure of age at trauma exposure.

Posttraumatic stress symptoms. The PTSD Checklist-5 (PCL-5; Weathers et al., 2013) is 20-item self-report measure that assesses DSM-5 PTSD symptoms in the past month. Symptoms were anchored to the event that participants indicated as the most distressing. The PCL-5 used a 5-point Likert scale from 0 “not at all” to 4 “extremely” to rate how much an individual is bothered by a symptom. Items were summed for a score of total severity (range = 0-80). The PCL-5’s psychometric properties are currently being tested, but the previous version for DSM-IV symptoms (PCL; Weathers, Litz, Herman,

Huska, & Keane, 1993), was psychometrically sound. The PCL was related to other measures of PTSD, including the Clinician Administered PTSD Scale, with $r = .93$ (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996), and the PCL demonstrated excellent test-retest reliability with $r = .96$ (Orsillo, 2001). The PCL-5 demonstrated excellent internal consistency in this sample ($\alpha = .95$).

Sexual functioning. The Female Sexual Functioning Index (FSFI; Rosen et al., 2000) is a 19-item self-report measure that assesses sexual functioning domains of desire, arousal, lubrication, orgasm, satisfaction, and pain in the past month. Items were scored and subscales were summed and weighted, resulting in subscale scores that ranged from 0 to 6. Subscales were summed for a total continuous score of sexual functioning, with lower scores indicating more sexual function difficulties (range = 2-36). The clinical cutoff score is 26.55. Good construct validity has been demonstrated when comparing control groups to groups with sexual functioning difficulties, and the FSFI had excellent test-retest reliability with $r = .79$ to $.86$ (Rosen et al., 2000). This scale demonstrated acceptable to excellent internal consistency in this sample for the total score ($\alpha = .98$) and subscales (Desire, $\alpha = .90$; Arousal, $\alpha = .97$; Lubrication, $\alpha = .97$; Orgasm, $\alpha = .96$; Satisfaction, $\alpha = .79$; Pain, $\alpha = .97$).

Depressive symptoms. The Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item self-report measure that assesses depressive symptoms. Items are rated 0-3, and scores were summed for a total score of depression severity, with higher scores indicating more severe depression (range = 0-63). The BDI-II has several cutoffs to indicate minimal depression (0-13), mild depression (14-19), moderate depression (20-28), and severe depression (29-63). Convergent validity was evidenced by

a high correlation with the BDI-I ($r = .93$). One-week test-retest reliability was excellent ($r = .93$; Beck et al., 1996), and 5-week test-retest reliability was good ($r = .75$; Huprich & Roberts, 2012). The internal consistency in this sample was excellent ($\alpha = .94$).

Alcohol use. A modified version of the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985) was used to assess alcohol use. The original version asks participants to report the number of standard drinks (12 ounces of beer, 5 ounces of wine, or 1.5 ounces of liquor) consumed for each day for the previous 3 months. In the modified version, participants reported the number of standard drinks consumed for each day during a typical week in the past month. Responses were summed for a total score of average drinks per week. The DDQ has been correlated with other indicators of self-reported drinking ($r = .78$; Kivlahan, Marlatt, Fromme, Coppel, & Williams, 1990). Miller et al. (1998, as cited in Murphy, McDevitt-Murphy, & Barnett, 2005) found excellent 1-week test-retest reliability ($r = .93$). The modified version has been used in numerous studies with college students (e.g., Murphy et al., 2005).

Drug use. Participants were asked to report the number of days in the past month they used any of the following drugs: marijuana, cocaine, designer drugs, hallucinogens, heroin, methamphetamine, or prescriptions not taken as prescribed. Examples of prescription medications were provided, including sleeping medications, sedatives, anxiolytics, stimulants, or opioids. This number provided a continuous measure of drug use severity. A preferred measure of drug use has not emerged in substance use research, and many studies have included similar continuous measures of substance use (e.g., Moshier, Ewen, & Otto, 2013).

Romantic relationship satisfaction. The Relationship Assessment Scale (RAS; Hendrick, 1988) was used to measure romantic relationship satisfaction. The RAS is a 7-item self-report measure. Items are rated on a scale of 1 “low satisfaction” to 5 “high satisfaction,” and were summed for a total score (range = 7-35) with higher scores indicating higher relationship satisfaction. The measure has demonstrated good internal consistency ($\alpha = .86$). The measure has been correlated with measures of love, commitment, and other measures of relationship adjustment ($r = .55$ to $.80$; Hendrick, 1988). The RAS has also shown to be psychometrically sound when assessing other types of close relationships (Renshaw, McKnight, Caska, & Blais, 2010). Participants were asked to complete the RAS with regard to their current dating partner, romantic partner, or sex partner. If they had multiple partners, participants were instructed to complete the RAS based on the person they have sex with most frequently. The internal consistency in this sample was excellent ($\alpha = .91$).

Risky sexual behavior. The Sexual Risk Survey (SRS; Turchik & Garske, 2008) was used to assess risky sexual behavior in the past 6 months. The SRS is a 23-item self-report measure that asks participants to report frequency of sexual risk behaviors by entering the number of times they have engaged in a behavior. Frequencies are not anchored to a particular partner or partners. The SRS asks about various behaviors that could be engaged with same or opposite sex partners. A coding rubric developed by the authors was used to convert responses into scores ranging from 0 to 4, and scores were summed for a total severity score. The measure has shown good test-retest reliability over a 2-week period ($r = .93$; Turchik & Garske, 2008). The SRS has demonstrated good convergent and concurrent validity as evidenced by its relations with greater number of

sex partners, increased sensation seeking, and reduced sexual inhibition (Turchik & Garske, 2008). The internal consistency in this sample was excellent ($\alpha = .97$).

Results

Data Analysis Plan

According to minimum sample size recommendations and parameters ratios, this sample size (280) should have ensured sufficient power to detect statistically significant findings. Descriptive statistics were derived using Predictive Analytics SoftWare (PASW). Latent variable mixture modeling was used to divide participants into mutually exclusive classes of individuals with similar response patterns on a series of questionnaires. Latent variable mixture modeling determined the most parsimonious solution that represented groups of individuals with varying reports on the measures. The following variables were included in the latent variable mixture model analysis: trauma type (categorized dichotomously as sexual or nonsexual), age at time of trauma exposure, PTSD symptom severity as measured by PCL-5 total score, sexual desire difficulties as measured by the Desire subscale of the FSFI, sexual arousal difficulties as measured by the Arousal subscale of the FSFI, lubrication difficulties as measured by the Lubrication subscale of the FSFI, orgasm difficulties as measured by the Orgasm subscale of the FSFI, lack of sexual satisfaction as measured by the Satisfaction subscale of the FSFI, and sexual pain severity as measured by the Pain subscale of the FSFI, relationship status (in a relationship or not in a relationship), and romantic relationship satisfaction as measured by the RAS total score. Latent variable mixture model analyses were conducted with the Mplus software package. The first step was to serially examine several different models, increasing the number of classes by one until reaching the point that an

uninterpretable solution was identified (one in which one of the groups had less than 10 participants assigned). To determine the model with the best fit, I considered several fit indices, including the Akaike information criteria (*AIC*), Bayesian information criteria (*BIC*), sample-size adjusted BIC (*SABIC*), and the Lo-Mendell-Rubin likelihood ratio test (*LMR LRT*). I took into account previous research and theoretical implications of classes as suggested by Muthén (2003). Below I discuss the various models, commenting on class characteristics. I discuss the fit of the models and my rationale for choosing the model that best represented the data.

After the classes were determined, I compared the resulting groups on a series of variables. I compared demographic characteristics and tested differences in trauma type, age at time of trauma exposure, PCL-5 score, FSFI subscale scores, and RAS score to confirm latent variable mixture modeling results. I also compared groups on depressive symptoms as measured by the BDI-II total score, alcohol use severity as measured by the number of drinks in a typical week indicated on the DDQ, drug use severity as measured by number of days drugs were used in the past month, and risky sexual behavior as measured by the SRS total score. PASW was used to conduct chi-square tests and independent samples analysis of variance tests (*ANOVAs*) which determined if group differences existed, and least significant difference (*LSD*) post hoc tests were conducted to determine the nature of group differences. The *LSD* post hoc test was chosen given high power and unequal group sizes.

Descriptive Statistics

A majority of participants (60%, $n = 168$) reported currently being in a romantic relationship. The majority of participants reported an exclusively heterosexual orientation

(80%, $n = 224$), 17% ($n = 48$) participants reported a bisexual orientation, 2% ($n = 5$) reported an exclusively homosexual orientation, and 1% ($n = 3$) reported being asexual. Few participants reported never engaging in sexual activity (10%, $n = 29$). The most common reason for abstaining from sexual activity was religion (50%, $n = 14$), followed by not finding a suitable partner (25%, $n = 7$). Nineteen percent ($n = 52$) reported never engaging in intercourse. The most common reasons for intercourse abstention were religion (8%, $n = 22$) and not meeting a suitable partner (4%, $n = 11$).

On average, participants reported having experienced 4 traumatic events, with death of a loved one (61%, $n = 170$), accident of a loved one (54%, $n = 36$), unwanted sexual attention (36%, $n = 101$), and domestic violence (30%, $n = 84$) being the most common. Over half (52%, $n = 146$) of participants reported experiencing a sexual trauma, including assault, unwanted sexual attention, and stalking. Nearly a third (30%, $n = 84$) of participants reported a sexual assault. Participants most often ranked sudden death of a loved one (30%, $n = 83$), life-threatening event of a loved one (9%, $n = 25$), and motor vehicle accident (8%, $n = 23$) as the most distressing trauma. The majority of the most distressing traumas were nonsexual (85%, $n = 239$) rather than sexual. Most traumas were one-time-occurrences (68%, $n = 191$) as opposed to ongoing traumas. The average age at the time of trauma or the first occurrence of an ongoing trauma was 15.3 years ($SD = 6.28$).

On average, the mean score on the PTSD Checklist-5 was in the non-clinical range ($M = 19.97$, $SD = 17.15$). On the FSFI, participants reported clinical sexual function disturbance severity ($M = 21.51$, $SD = 10.76$). Individuals who are not sexually active may appear to have sexual dysfunction on the FSFI due to low scores, when in fact

they may be not experiencing distress or dysfunction. When FSFI scores for only sexually active participants were included, scores were non-clinical ($M = 26.90$, $SD = 7.33$). Subscale averages for sexually active participants were high, indicating few sexual difficulties in these domains (Desire: $M = 4.16$, $SD = 1.22$; Arousal: $M = 4.65$, $SD = 1.59$; Lubrication: $M = 4.51$, $SD = 1.43$; Orgasm: $M = 4.02$, $SD = 1.71$; Satisfaction: $M = 4.88$, $SD = 1.30$; and Pain: $M = 4.68$, $SD = 1.80$). On the BDI-II, the mean for the sample suggested mild depressive symptoms ($M = 12.56$, $SD = 11.58$). Participants reported consuming an average of 3.26 ($SD = 5.81$) alcoholic drinks per week on the DDQ. Nearly a quarter (23%, $n = 63$) of participants reported consuming drugs in the past month. Drug users reported an average of 9.73 ($SD = 10.59$) days of use. The most common drugs used were marijuana (23%, $n = 65$) and opioids (5%, $n = 14$). Participants reported high relationship satisfaction on the RAS ($M = 28.42$, $SD = 6.09$). Participants reported engaging in an average of 77.65 ($SD = 272.57$) risky sexual behaviors in the past month (SRS scoring template $M = 13.93$, $SD = 13.19$).

Latent Variable Mixture Modeling

I conducted latent variable mixture modeling in a series of analyses examining solutions that included from two to four classes. Results for each solution are reported below, followed by a description of selection of the best-fitting model.

Two-class solution. The two-class solution included a class of individuals (30%) characterized by a high probability of a nonsexual trauma (88%), with an average age of 15 ($SD = 5.61$) at time of trauma exposure. They had a low probability of being in a relationship (29%) with an average RAS score of 26.80 ($SD = 6.65$). Mean score on the PCL-5 was 18.09 ($SD = 16.76$). Participants scored in the mid-range for FSFI Desire (M

= 2.70, $SD = 1.45$) and Satisfaction ($M = 2.48$, $SD = 1.13$) subscales. They reported lower scores on FSFI Arousal ($M = 0.31$, $SD = 0.77$), Lubrication ($M = 0.18$, $SD = 0.54$), Orgasm ($M = 0.22$, $SD = .79$), and Pain ($M = 0.32$, $SD = 1.01$) subscales.

The second class of individuals (70%) was characterized by a high probability of a nonsexual trauma (84%), with an average age of 15 ($SD = 5.84$) at the time of the trauma. They had high probability of being in a relationship (73%) with an average RAS score of 28.66 ($SD = 5.99$). Mean score on the PCL-5 was 20.76 ($SD = 17.29$). FSFI subscale scores were high (Desire: $M = 4.18$, $SD = 1.11$; Arousal: $M = 4.88$, $SD = 1.07$; Lubrication: $M = 4.80$, $SD = 0.77$; Orgasm: $M = 4.28$, $SD = 1.36$; Satisfaction: $M = 4.86$, $SD = 1.23$; Pain: $M = 4.95$, $SD = 1.48$).

Both classes indicated a likelihood of a nonsexual trauma around the age of 15, and the classes reported average relationship satisfaction on the RAS. These two classes differed in relationship status, PCL-5 scores, and FSFI scores. The first class was likely to be single, have slightly lower than average PCL-5 scores, have mid-range FSFI scores for Desire and Satisfaction, but have lower scores for Arousal, Lubrication, Orgasm, and Pain. The second class was likely to be in a relationship, have average PCL-5 scores, and have low indications of sexual function disturbances for all FSFI scales.

Three-class solution. The first class in the three-class solution was similar to the first class in the two-class solution. This class (29%) was characterized by a high probability of a nonsexual trauma (88%), with an average age of 15 ($SD = 5.66$) at the time of the trauma. They had low probability of being in a relationship (28%) with a RAS score of 27.24 ($SD = 6.12$). The average PCL-5 score was 17.24 ($SD = 15.69$). Participants scored in the mid-range for FSFI Desire ($M = 2.68$, $SD = 1.48$) and

Satisfaction ($M = 2.49$, $SD = 1.12$) subscales, but they reported low scores on FSFI Arousal ($M = 0.22$, $SD = 0.57$), Lubrication ($M = 0.10$, $SD = 0.35$), Orgasm ($M = 0.91$, $SD = 0.78$), and Pain ($M = 0.23$, $SD = 0.87$) subscales.

A second class of individuals (55%) was similar to class two in the two-class solution. This class was characterized by a high probability of a nonsexual trauma (85%), with an average age of 15 ($SD = 6.07$) at the time of the trauma. They had a high probability of being in a relationship (74%) with an average RAS score of 29.16 ($SD = 5.58$). The average PCL-5 score was 19.42 ($SD = 5.58$). Participants reported high FSFI scores (Desire: $M = 4.46$, $SD = 0.99$; Arousal: $M = 5.29$, $SD = 0.64$; Lubrication: $M = 5.12$, $SD = 0.39$; Orgasm: $M = 4.55$, $SD = 1.26$; Satisfaction: $M = 5.21$, $SD = 0.96$; Pain: $M = 5.16$, $SD = 1.38$).

The three-class solution included a new class of individuals (16%) that was characterized by a high probability of a nonsexual trauma (83%), with an average age of 16 ($SD = 4.91$) at the time of the trauma. They had a moderately high probability of being in a relationship (69%) with an average RAS score of 26.42 ($SD = 7.32$). The average PCL-5 score was 26.11 ($SD = 20.70$), and FSFI scores were in the mid-range (Desire: $M = 3.21$, $SD = 0.94$; Arousal: $M = 3.37$, $SD = 0.97$; Lubrication: $M = 3.55$, $SD = 0.73$; Orgasm: $M = 3.17$, $SD = 1.38$; Satisfaction: $M = 3.57$, $SD = 1.29$; Pain: $M = 4.14$, $SD = 1.61$).

All classes indicated a likelihood of a nonsexual trauma around the age of 15 or 16, and the classes reported average relationship satisfaction on the RAS. These classes differed in relationship status, PCL-5 scores, and FSFI scores. The first class was likely to be single, have slightly lower than average PCL-5 scores, have mid-range FSFI scores

for Desire and Satisfaction, but have lower scores for Arousal, Lubrication, Orgasm, and Pain. The second class was likely to be in a relationship, have average PCL-5 scores, and have low indications of sexual function disturbances for all FSFI subscales. The third class was likely to be in a relationship, have higher than average PCL-5 scores, and have mid-range scores for all FSFI subscales.

Four-class solution. In the four-class solution, the first class was similar to class one in previous solutions. This class (28%) of individuals was characterized by a high probability of a nonsexual trauma (89%), with an average age of 14 ($SD = 5.15$) at the time of the trauma. They had low probability of being in a relationship (28%) with an average RAS score of 27.24 ($SD = 6.12$). The average PCL-5 score was 16.71 ($SD = 15.05$). Participants scored in the mid-range for FSFI Desire ($M = 2.70$; $SD = 1.48$) and Satisfaction ($M = 2.50$; $SD = 1.12$) subscales, but they reported lower scores of FSFI Arousal ($M = 0.20$; $SD = 0.56$), Lubrication ($M = 0.09$; $SD = 0.33$), Orgasm ($M = 0.18$; $SD = 0.77$), and Pain ($M = 0.15$; $SD = 0.58$) subscales.

The second class of individuals resembled the second class found in three-solution analyses. This class (52%) was characterized by a high probability of a nonsexual trauma (86%), with an average age of 16 ($SD = 4.41$) at the time of the trauma. They had a 76% probability of being in a relationship with an average RAS score of 29.16 ($SD = 5.57$). The average PCL-5 score was 19.77 ($SD = 16.66$), and FSFI scores were high (Desire: $M = 4.46$, $SD = 0.99$; Arousal: $M = 5.29$, $SD = 0.65$; Lubrication: $M = 5.10$, $SD = 0.42$; Orgasm: $M = 4.57$, $SD = 1.24$; Satisfaction: $M = 5.27$, $SD = 0.93$; Pain: $M = 5.46$, $SD = 0.72$).

The third class resembled the third class in the previous solution. This class of individuals (15%) was characterized by a high probability of a nonsexual trauma (83%), with an average age of 16 ($SD = 3.01$) at the time of the trauma. They had 66% probability of being in a relationship with an average RAS score of 26.33 ($SD = 7.04$). The average PCL-5 score was 26.12 ($SD = 21.00$), and FSFI scores were around the mid-range (Desire: $M = 3.00$, $SD = 0.95$; Arousal: $M = 3.09$, $SD = 0.82$; Lubrication: $M = 3.52$, $SD = 0.83$; Orgasm: $M = 3.05$, $SD = 1.29$; Satisfaction: $M = 3.52$, $SD = 1.35$; Pain: $M = 4.45$, $SD = 1.36$).

The fourth class was newly formed. This class of individuals (5%) was characterized by a high probability of a nonsexual trauma (67%), with an average age of 14 ($SD = 5.79$) at the time of the trauma. They had 60% probability of being in a relationship with an average RAS score of 28.00 ($SD = 8.00$). The average PCL-5 score was 22.20 ($SD = 17.49$). Scores for FSFI Desire ($M = 4.32$; $SD = 0.85$), Arousal ($M = 5.20$; $SD = 0.69$), Lubrication ($M = 4.58$; $SD = 1.02$), Orgasm ($M = 4.00$; $SD = 1.74$), and Satisfaction ($M = 3.91$; $SD = 1.37$) subscales were high, but Pain ($M = 1.07$; $SD = 1.30$) was low.

All classes were likely to report a nonsexual trauma around the age of 14 to 16, and the classes reported average relationship satisfaction on the RAS. The first class was likely to be single, to have slightly lower than average PCL-5 scores, low FSFI scores for Arousal, Lubrication, Orgasm, and Pain, and mid-range scores for Desire and Satisfaction. This group appeared to have some difficulties with sexual functioning due to low FSFI scores on some subscales; however, these scores were likely low due to lack of sexual activity, as opposed to genuine sexual difficulties. Nearly a third (32%, $n = 25$) of

this class reported never engaging in any sexual activity (e.g., kissing, fondling), over half (53%, $n = 42$) reported never engaging in sexual intercourse, and most of them (85%, $n = 67$) were not currently in a sexual relationship. Given these findings, this class will be referred to as the “Healthy & Sexually Inactive” group.

The second class was likely to be in a relationship, have average PCL-5 scores, and have low indications of sexual function disturbances for all FSFI subscales. Similar to the first group, this group appeared to be high-functioning, but the differentiation between the two was sexual activity. Nearly every member of this class reported having engaged in sexual activity (99%, $n = 144$) and sexual intercourse (99%, $n = 143$), and most of them (86%, $n = 125$) were currently in a sexual relationship. Therefore, this group was referred to as the “Healthy & Sexually Active” group.

The third class was named the “Sexual Difficulties & PTSD” group. This group was likely to be in a relationship, have higher than average PCL-5 scores, and have mid-range scores for all FSFI subscales.

The fourth class, or “Sexual Pain” group, was only slightly more likely to be in a relationship than to be single. This class had average PCL-5 scores. FSFI scores for Desire, Satisfaction, Arousal, Lubrication, and Orgasm did not indicate sexual function disturbances, but this class reported difficulties with sexual pain.

Fit indexes. The *AIC*, *BIC*, and *SABIC* statistics (Table 1) suggested that the four-class model was the best fit, as this solution had the lowest numbers for each of these statistics. *The LMR LRT* pointed to a three-class model, as the test failed to detect a difference between the three-class and four-class models ($p = .28$). The three-class solution may have represented the most parsimonious solution; however, the four-factor

model produced classes that differed from each other in terms of clinical relevance. The third and fourth classes differed in degree and type of sexual functioning difficulties. Further, since these analyses were exploratory, it may be most beneficial to the literature to begin with a model with the most differentiation and test it in future studies to see which classes are replicated or excluded. Considering these fit statistics and the substantive meaning of each model, the four-class model appeared to be the best fit for this sample, and was used to assign participants to groups for additional analyses. Entropy for the four-class solution was excellent (.98), indicating that participants fit well into their groups. Figure 1 illustrates characteristics of these classes.

Five class solution. A five-class solution was generated; however, it was uninterpretable due to small class size (i.e., < 10). While this solution's statistics for *AIC* and *SABIC* improved, the *BIC* statistic indicated a poorer fit and *LMR LRT* was non-significant, providing evidence that a four-factor model was a better solution.

Group Descriptions and Comparisons

Descriptive statistics for each group and group comparisons are presented in Table 2. All groups were comparable to the full sample regarding racial and ethnic identity, age, and sexual orientation. Consistent with findings in the latent variable mixture model analyses, groups did not differ in type of their most distressing trauma (sexual v. nonsexual) or the age at which they experienced that trauma. The Healthy & Sexually Inactive group had a lower rate of lifetime sexual trauma ($n = 30, 38\%$) than all other groups, $\chi^2(3) = 10.24, p = .017$. All other groups reported rates of lifetime sexual trauma consistent with the full sample. The most common traumas in each group

Table 1

Fit Indices and Entropies for Latent Variable Mixture Modeling Analyses

| Number of Classes | <i>AIC</i> | <i>BIC</i> | <i>SABIC</i> | <i>LMR LRT</i> | <i>Entropy</i> |
|-------------------|-----------------|-----------------|-----------------|------------------|----------------|
| 1 | 13206.52 | 13279.21 | 13215.79 | - | - |
| 2 | 11476.75 | 11593.06 | 11491.59 | 1728.21*** | .997 |
| 3 | 11083.58 | 11243.51 | 11103.99 | 411.08*** | .978 |
| 4 | 10988.67 | 11192.22 | 11014.64 | 117.18 | .982 |

Note. *AIC* = Akaike information criterion; *BIC* = Bayesian information criterion; *SABIC* = sample-size adjusted Bayesian information criterion; *LMR LRT* = Lo-Mendell-Rubin likelihood ratio test. The null hypothesis for *p* values associated with the *LMR LRT* is that a solution provides the same fit to the data as a solution with one less class. **Bold font** indicates the model with the strongest fit for that statistic. *** $p < .001$.

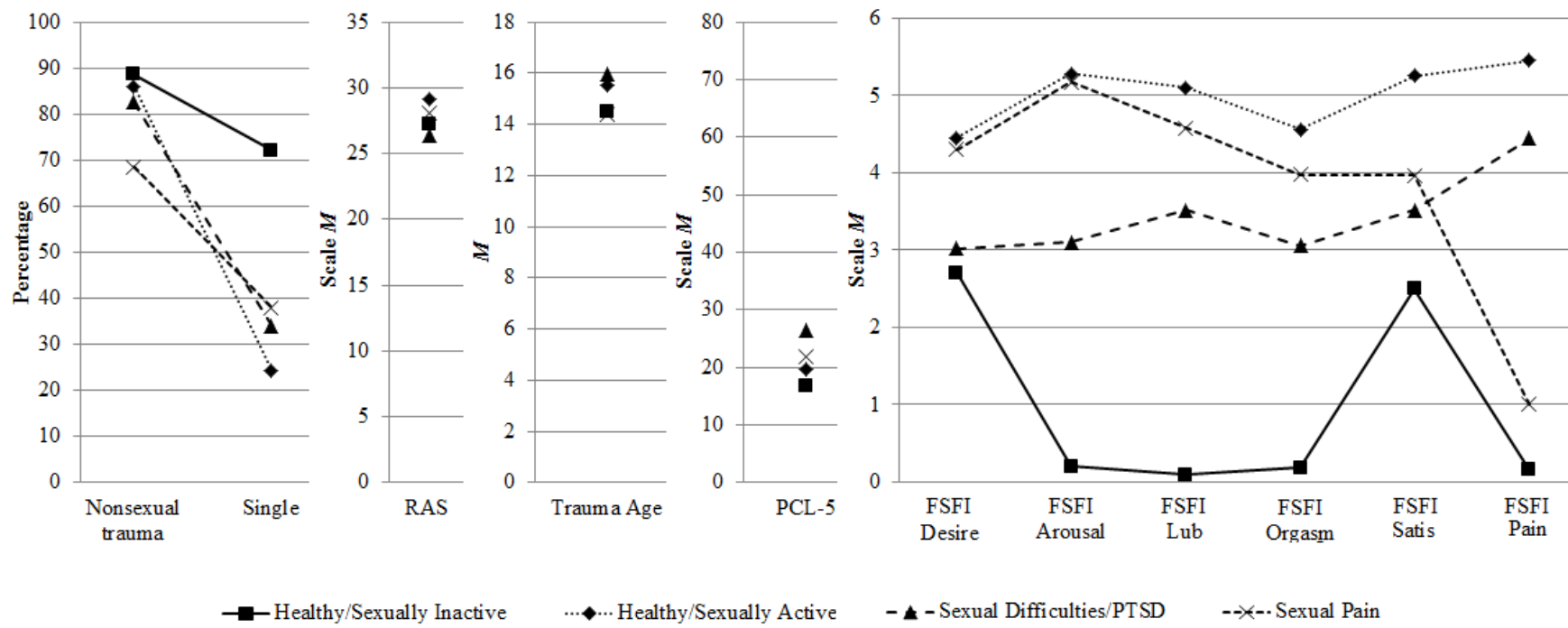


Figure 1. Four-class solution generated by latent variable mixture modeling. The left vertical axis reflects the percentage of participants endorsing that category in dichotomous measures. Each of the other measures is depicted on a separate set of axes.

Table 2

Descriptive Statistics and Group Comparisons for the Full Sample and Each Class

| | Full Sample | Healthy/ Sexually Inactive Group | Healthy/ Sexually Active Group | Sexual Difficulties/ PTSD Group | Sexual Pain Group | Comparison Test |
|---------------------|--------------|--|--------------------------------------|--|----------------------|------------------------|
| | <i>n (%)</i> | <i>n (%)</i> | <i>n (%)</i> | <i>n (%)</i> | <i>n (%)</i> | χ^2 (<i>df</i>) |
| Race | | | | | | 19.33 (15) |
| Caucasian | 146 (52) | 37 (47) ^a | 73 (50) ^a | 25 (61) ^a | 11 (73) ^a | |
| African American | 103 (37) | 31 (39) ^a | 57 (39) ^a | 13 (32) ^a | 2 (13) ^a | |
| Multiethnic | 16 (6) | 4 (5) ^a | 9 (6) ^a | 2 (5) ^a | 1 (7) ^a | |
| Asian | 7 (3) | 4 (5) ^a | 2 (1) ^a | 1 (2) ^a | 0 ^a | |
| Hispanic | 6 (2) | 2 (3) ^a | 4 (3) ^a | 0 ^a | 0 ^a | |
| Native American | 2 (1) | 1 (1) ^a | 0 ^a | 0 ^a | 1 (7) ^a | |
| Single | 112 (40) | 57 (72) ^a | 35 (24) ^b | 14 (34) ^c | 6 (40) ^c | 49.81 (3)*** |

(Table continues)

Table 2 continued

| | Full Sample | Healthy/ Sexually Inactive Group | Healthy/ Sexually Active Group | Sexual Difficulties/ PTSD Group | Sexual Pain Group | Comparison Test |
|---------------------------|--------------|--|--------------------------------------|--|----------------------|------------------------|
| | <i>n (%)</i> | <i>n (%)</i> | <i>n (%)</i> | <i>n (%)</i> | <i>n (%)</i> | χ^2 (<i>df</i>) |
| Sexual Orientation | | | | | | 25.23 (21) |
| Heterosexual | 224 (80) | 66 (84) ^a | 114 (79) ^a | 32 (78) ^a | 12 (80) ^a | |
| Bisexual | 48 (17) | 8 (10) ^a | 28 (19) ^a | 9 (22) ^a | 3 (20) ^a | |
| Homosexual | 5 (2) | 2 (3) ^a | 3 (2) ^a | 0 ^a | 0 ^a | |
| Asexual | 3 (1) | 3 (4) ^a | 0 ^a | 0 ^a | 0 ^a | |
| Sexually active | 169 (60) | 12 (15) ^a | 125 (86) ^b | 24 (59) ^c | 8 (53) ^c | 108.22 (3)*** |
| Sexual index trauma | 41 (15) | 9 (11) ^a | 20 (14) ^a | 7 (17) ^a | 5 (33) ^a | 5.14 (3) |
| Lifetime sexual trauma | 146 (52) | 30 (38) ^a | 80 (55) ^b | 26 (63) ^b | 10 (67) ^b | 10.24 (3)* |

(Table continues)

Table 2 continued

| | Full Sample | Healthy/ Sexually Inactive Group | Healthy/ Sexually Active Group | Sexual Difficulties/ PTSD Group | Sexual Pain Group | Comparison Test |
|--------------------------------|---------------|--|--------------------------------------|---------------------------------------|-----------------------------|-----------------|
| | <i>M (SD)</i> | <i>M (SD)</i> | <i>M (SD)</i> | <i>M (SD)</i> | <i>M (SD)</i> | <i>F (df)</i> |
| Age | 21.00 (1.90) | 21.61 (7.39) ^a | 20.72 (4.41) ^a | 20.76 (3.01) ^a | 20.40 (1.72) ^a | 3.58 (3, 276) |
| Age at time of index trauma | 15.30 (6.28) | 14.31 (5.15) ^a | 15.80 (7.14) ^a | 16.09 (4.92) ^a | 14.33 (5.79) ^a | 0.41 (3, 276) |
| PCL-5 Total | 19.97 (17.15) | 16.71 (15.05) ^a | 19.77 (16.66) ^a | 26.12 (21.00) ^b | 22.20 (17.49) ^{ab} | 2.72 (3, 276)* |
| PCL-5 negative beliefs | 0.96 (1.29) | 0.77 (1.12) ^a | 0.88 (1.26) ^a | 1.54 (1.52) ^b | 1.07 (1.39) ^{ab} | 3.62 (3, 276)* |
| PCL-5 anhedonia | 0.76 (1.13) | 0.65 (1.06) ^a | 0.68 (1.13) ^a | 1.24 (1.24) ^b | 0.87 (0.99) ^{ab} | 3.14 (3, 276)* |
| PCL-5 feeling distant | 0.91 (1.20) | 0.62 (1.02) ^a | 0.92 (1.19) ^{ab} | 1.32 (1.42) ^b | 1.13 (1.19) ^{ab} | 3.39 (3, 276)* |
| PCL-5 irritability | 0.86 (1.19) | 0.59 (0.99) ^a | 0.84 (1.21) ^a | 1.29 (1.29) ^b | 1.20 (1.42) ^{ab} | 3.60 (3, 276)* |

(Table continues)

Table 2 continued

| | Full Sample | Healthy/ Sexually Inactive Group | Healthy/ Sexually Active Group | Sexual Difficulties/ PTSD Group | Sexual Pain Group | Comparison Test |
|----------------------|---------------|--|--------------------------------------|---------------------------------------|-----------------------------|-------------------|
| | <i>M (SD)</i> | <i>M (SD)</i> | <i>M (SD)</i> | <i>M (SD)</i> | <i>M (SD)</i> | <i>F (df)</i> |
| FSFI Total | 21.51 (10.76) | 5.83 (2.25) ^a | 30.14 (2.66) ^b | 20.63 (3.30) ^c | 23.07 (3.17) ^d | 3.97 (3, 276)** |
| FSFI Desire | 3.74 (1.40) | 2.70 (1.48) ^a | 4.46 (0.99) ^b | 3.00 (0.95) ^a | 4.32 (0.85) ^b | 7.86 (3, 276)*** |
| FSFI Arousal | 3.52 (2.31) | 0.20 (0.56) ^a | 5.29 (0.65) ^b | 3.09 (0.82) ^c | 5.20 (0.69) ^b | 6.32 (3, 276)*** |
| FSFI Lubrication | 3.43 (2.23) | 0.09 (0.33) ^a | 5.10 (0.42) ^b | 3.52 (0.83) ^c | 4.58 (1.02) ^d | 31.43 (3, 276)*** |
| FSFI Orgasm | 3.08 (2.22) | 0.18 (0.77) ^a | 4.57 (1.24) ^b | 3.05 (1.29) ^c | 4.00 (1.74) ^b | 18.53 (3, 276)*** |
| FSFI Satisfaction | 4.16 (1.62) | 2.50 (1.12) ^a | 5.27 (0.93) ^b | 3.52 (1.35) ^c | 3.91 (1.37) ^c | 5.08 (3, 276)** |
| FSFI Pain | 3.58 (2.51) | 0.15 (0.58) ^a | 5.46 (0.72) ^b | 4.45 (1.36) ^c | 1.07 (1.30) ^d | 33.52 (3, 276)*** |
| RAS | 28.42 (6.09) | 27.24 (6.12) ^a | 29.16 (5.57) ^a | 26.33 (7.04) ^a | 28.00 (8.00) ^a | 1.73 (3, 197) |
| BDI-II | 12.56 (11.58) | 10.64 (9.44) ^a | 11.81 (10.73) ^a | 17.51 (14.56) ^b | 15.73 (14.98) ^{ab} | 4.00 (3, 276)** |
| Drinks/ week | 3.26 (5.81) | 1.68 (3.78) ^a | 3.67 (5.88) ^b | 3.54 (4.78) ^{ab} | 4.24 (6.66) ^{ab} | 2.82 (3, 276)* |

(Table continues)

Table 2 continued

| | Full Sample | Healthy/ Sexually Inactive Group | Healthy/ Sexually Active Group | Sexual Difficulties/ PTSD Group | Sexual Pain Group | Comparison Test |
|---------------------|---------------|--|--------------------------------------|---------------------------------------|----------------------------|-------------------------------|
| | <i>M (SD)</i> | <i>M (SD)</i> | <i>M (SD)</i> | <i>M (SD)</i> | <i>M (SD)</i> | <i>F (df)</i> |
| Drug days/ month | 2.17 (6.39) | 0.28 (0.96) ^a | 0.70 (1.44) ^a | 0.87 (1.56) ^a | 0.55 (1.45) ^a | 2.35 (3, 276) |
| SRS | 13.93 (13.19) | 6.34 (9.69) ^a | 17.29 (11.58) ^b | 15.22 (12.74) ^b | 13.98 (16.78) ^b | 15.51 (3, 276) ^{***} |

Note. Index trauma = trauma selected as most distressing. PCL-5 = PTSD Checklist 5. FSFI = Female Sexual Functioning Index. RAS = Relationship Assessment Scale. BDI-II = Beck Depression Inventory-II. Drinks/week = drinks per week. Drug days/month = number of days used drugs in past month. SRS = Sexual Risk Survey. * $p < .05$. ** $p < .01$. *** $p < .001$. Similar superscripts indicate a non-significant statistical difference between groups.

mirrored those of the full sample. Groups differed on FSFI scores in a manner consistent with latent variable mixture modeling findings (p 's < .05, see Table 2). Groups did not differ in RAS scores.

Groups differed statistically in PCL-5 scores, $F(3, 276) = 2.72, p = .045$. The Healthy & Sexually Inactive group and the Healthy & Sexually Active group had statistically similar PCL-5 scores, and these scores were lower than those of the Sexual Difficulties & PTSD group (p 's < .05). The Sexual Pain group did not differ from any group regarding PCL-5 scores. Group differences regarding PCL-5 items were investigated. Groups only differed on four PCL-5 items, including items 9: Negative Beliefs about yourself or others, item 12: Anhedonia, item 13: Distance from Others, and item 15: Irritability (p 's < .05). The Sexual Difficulties & PTSD group reported more severe scores on items 9: Negative Beliefs, 12: Anhedonia, and 15: Irritability than the Healthy & Sexually Inactive and Healthy & Sexually Active groups (p 's < .05). The Sexual Difficulties & PTSD group reported more a severe score on item 13: Distance from Others than the Healthy & Sexually Inactive group (p 's < .05). No other differences were noted.

The groups were compared on BDI-II scores, drinks per week, days of drug use in past month, and SRS scores, and these results are also reflected in Table 2. Groups differed with respect to mean BDI-II scores, $F(3, 276) = 4.00, p = .008$. The Sexual Difficulties & PTSD group had the highest mean BDI-II score, which was in the mild range. This group differed statistically from the Healthy & Sexually Active group ($p = .004$) and the Healthy & Sexually Inactive group ($p = .002$) groups, which had minimal depressive symptoms and did not differ from each other. The Sexual Pain group reported

mild depression, and did not differ from any other group. Groups differed on number of drinks consumed per week, $F(3, 276) = 2.82, p = .04$. The Sexual Pain group reported drinking the most drinks per week, followed by the Healthy & Sexually Active group, Sexual Difficulties & PTSD group, and Healthy & Sexually Inactive group. The only statistical differences were between the Healthy & Sexually Active and Healthy & Sexually Inactive groups ($p = .007$). Groups did not differ on drug use ($p = .07$). Groups differed on SRS scores, $F(3, 276) = 15.51, p < .001$. The Healthy & Sexually Inactive group reported the lowest SRS scores, and they differed from all other groups (p 's $< .05$). Other groups did not differ from each other on SRS scores.

Discussion

This study used latent variable mixture modeling to identify an underlying class structure of trauma type (sexual or nonsexual), age at time of trauma exposure, PTSD symptoms, sexual functioning difficulties, relationship status, and relationship satisfaction in a sample of trauma-exposed female undergraduate students. This study then tested differences among the identified classes on the following variables: depressive symptoms, alcohol use severity, drug use severity, and risky sexual behavior.

Latent variable mixture modeling supported a four-class solution. All classes had a higher probability of a nonsexual trauma as opposed to a sexual trauma, the average age of trauma exposure was 14 to 16 years, and all classes reported similar relationship or dating satisfaction. Classes were differentiated by relationship or dating status, PTSD symptoms, and sexual functioning symptoms, which was confirmed via chi-square tests and ANOVAs. Differences in PTSD were mostly accounted for by a few symptoms: irritability, anhedonia, distance from others, and negative belief systems. ANOVAs

revealed group differences on depressive symptoms, alcohol use, and risky sexual behavior, but not drug use.

Participants in the “Healthy & Sexually Inactive” class were likely to be single, sexually inactive, and high-functioning. They reported minimal PTSD and depressive symptoms. The majority of this class was single, even when a broad definition of relationship was used. They had scores suggesting difficulties with arousal, lubrication, orgasm, and pain during vaginal penetration, but these low scores likely reflected a lack of sexual activity and few opportunities for arousal, lubrication, orgasm, and pain, rather than sexual difficulties. This would explain why desire and satisfaction concerns were not elevated, as participants were not reporting distress regarding their sexual functioning, and they were likely experiencing typical levels of desire and were satisfied with their sexual practices. They reported the lowest number of alcoholic drinks consumed per week, significantly lower than the Healthy & Sexually Active group. As most of this group was sexually inactive, they reported the lowest number of risky sexual behaviors of all classes. Religion was a highly endorsed reason for abstaining from sexual activity, so it is possible that spirituality served as a protective factor for mental health symptoms (Berry & York, 2011; Wortmann, Park, & Edmondson, 2011), risky behavior such as alcohol use (Yonker, Schnabelrauch, & DeHaan, 2012), and risky sexual practices (Simons, Burt, & Peterson, 2009). It is possible that the low level of sexual activity in this group was linked to their low alcohol use, as alcohol use and sexual behavior are often related in college samples (Barnett et al., 2014). Lower alcohol use may also be a protective factor for both depressive and PTSD symptoms, as higher levels of alcohol use are related to elevated PTSD symptoms (Kessler et al., 1995; Putnam, 2003).

Members of the “Healthy & Sexually Active” group were likely to be in a relationship or dating, to be sexually active, and report no mental health concerns. On average, they denied PTSD, depression, and sexual symptoms. They reported drinking nearly 4 drinks per week, consistent with the sample average, and they reported engaging in an average level of risky sexual behaviors. This group likely included high-functioning, healthy individuals that were engaging in sexual activity. This group may have represented highly resilient individuals who were not negatively impacted by trauma or quickly recovered from trauma-related difficulties.

The “Sexual Difficulties & PTSD” group was the most severe group that emerged. This group reported difficulties with PTSD and all types of sexual functioning symptoms, including desire, arousal, lubrication, orgasm, satisfaction, and pain. These participants also reported mild depressive symptoms. However, many of the participants in this group were functioning well enough to maintain a satisfying romantic relationship. They reported drinking several drinks per week, similar to the sample average, and they reported levels of risky sexual behavior consistent with the sample average. It is important to consider that the average PCL-5 score for this group ($M = 26.12$) was not at a clinical level (clinical cut score = 38). While their PTSD symptom severity was higher than other groups, many of the members of this group likely were not experiencing clinically significant PTSD. Only a few PTSD symptoms, including irritability, anhedonia, negative belief systems, and distance from others, differentiated this group from other classes. It is possible that these particular PTSD symptoms, and not the entire construct of PTSD, were key in separating this class from other classes. Their scores on sexual function disturbances differentiated them from other groups, but it should be noted

that the scores were in the mid-range, which indicated that participants were having some difficulties with sexual functioning, but they may not have been particularly severe. Despite these subclinical symptom reports, it is noteworthy that a group with co-occurring PTSD symptoms, sexual difficulties, and depressive symptoms emerged, as this highlights the overlap between these difficulties. Given previous evidence of the co-occurrence of PTSD, sexual difficulties, and depression (Seng et al., 2006), it was not surprising that these symptoms were all elevated in the same group. The comorbidity of symptoms seen here may have been due to genuine co-occurrence of mental health disturbances; i.e., individuals may have been struggling with PTSD symptoms, depressive symptoms, and sexual difficulties.

There are several different ways PTSD symptoms, sexual difficulties, and depression symptoms could be related, including bidirectional or cyclical relationships. It is possible that PTSD, particularly emotional numbing and hyperarousal symptoms such as irritability, anhedonia, negative belief systems, and distance from others, partially account for depression and sexual difficulties. Depressive symptoms could contribute to sexual difficulties and further complicate PTSD symptoms. Social withdrawal that is common to individuals struggling with PTSD or depression may impact the romantic relationship, including the sexual relationship. Sexual difficulties could lead to or amplify depressive symptoms, and sexual difficulties may contribute to some PTSD symptoms, particularly emotional numbing. It is also possible that these symptom groupings were elevated due to an overlap of symptoms in their respective disorders and not unique difficulties. Symptom overlap could include anhedonia, difficulty concentrating, sleep disturbances, irritability, and negative mood states. It is also possible that common

underlying factors, such as negative affect and general distress, could be responsible for these symptoms or relationships. Given the design of this study, it is impossible to detect how these difficulties are related, what the direction of these relationships may be, or how these relationships shift over time. More research is needed to address this area.

The “Sexual Pain” group appeared to be struggling only with vaginal penetration pain and mild depressive symptoms. They were likely to be in a relationship or dating, did not report other sexual functioning difficulties, reported few PTSD symptoms, endorsed average risky sexual behavior, and drank the average number of alcoholic drinks per week, relative to the full sample. Given that vaginal penetration pain symptoms were elevated in the absence of arousal or lubrication problems, these women may have been experiencing a primary vaginal pain problem, as opposed to pain resulting from lack of arousal or lubrication. It is possible that their report of depressive symptoms was related to their sexual pain, as these have been linked together in previous studies (Frohlich & Meston, 2002). Many models have been proposed that attempt to explain the link between pain, including sexual pain, and depression (Meana, 1998). Theories suggest that that pain may lead to depression, or depression causes pain. Models also recognize that a bidirectional relationship likely exists between depression and pain and that third variables may be accounting for both pain and depression. Research has yet to favor a model, so more work is needed to address this area.

Trauma type (sexual or nonsexual) and age at time of trauma exposure of participants’ most distressing traumas did not have a bearing on class detection. It is somewhat surprising that a class characterized by sexual trauma and sexual difficulties in the presence of PTSD symptoms did not emerge as literature has found relationships

between trauma type and age at time of trauma exposure with PTSD (Brewin et al., 2000) and sexual functioning (Faravelli et al., 2004; Letourneau et al., 1996), The lack of such a class suggests that relationship status, PTSD symptoms, and sexual functioning characteristics, as opposed to trauma-related details, differentiated individuals from each other in this sample. These may be positive results, as trauma exposure is typically out of the survivor's control and unalterable, but symptoms such as PTSD, depression, and sexual dysfunction are amenable with treatment. These findings also suggest that many trauma survivors go on to be high-functioning, without struggling with PTSD, depression, or sexual difficulties.

It is also possible that focusing on lifetime occurrences of sexual trauma, as opposed to the nature of the most distressing trauma, would have yielded different results. Several groups, including the Healthy & Sexually Active, Sexual Difficulties & PTSD, and Sexual Pain groups did not differ on presence or absence of lifetime sexual trauma; however, the Healthy & Sexually Inactive group reported a lower prevalence rate of ever experiencing a sexual trauma. It is possible that the never experiencing a sexual trauma could impact membership in this group. Evidence shows that individuals who experience sexual trauma may be more likely to engage in sexual behaviors (e.g., Fergusson et al., 1997; Zierler et al., 1991), so perhaps never experiencing a sexual trauma is related to a delay in consensual sexual activity. It is also possible that other group characteristics, such as low alcohol use, may have been related to sexual trauma. For example, studies have found that female college students are more likely to be sexually assaulted when they are intoxicated (Abbey, 2002; Mohler-Kuo, Dowdall, Koss, & Wechsler, 2004).

It was surprising that relationship satisfaction did not influence class membership given previous evidence of a link between relationship satisfaction and sexual functioning (Althof et al., 2005) and PTSD (Taft et al., 2009). It is possible that relationship satisfaction was not relevant for sexual functioning and PTSD in this sample. It may also be possible that this sample, which was a young and mostly healthy sample, had generally satisfying relationships and did not have enough variance in relationship satisfaction to see an effect. It is also possible that the way relationship satisfaction was measured in this study altered the way it behaved as a variable. Relationship satisfaction was measured for long-term, short-term, and causal relationships, so this method may have assessed satisfaction of some relationships that only included casual sex. Therefore, this variable might not have functioned the same way it did in other studies that found links between relationship satisfaction and sexual functioning and PTSD.

There were no group differences on drug use. It is possible that drug use would not differ between presentations of PTSD symptoms and sexual functioning; however, this contradicts other studies that found a link between drug use and PTSD and sexual functioning (Kessler et al., 1995; Johnson et al., 2004). It is also possible that differences were not detected since the level of drug use in this sample was low and variance was truncated.

While there were group differences regarding alcohol use, the overall rate of alcohol use in the full sample and each group was low. It is possible that different groups would have emerged if the sample reported heavier alcohol use or if there was greater variance in amount of drinks consumed.

Limitations

There were several limitations to this study that should be considered. The sample consisted of female undergraduates, and these results may not generalize to other samples, including males, women of other demographics, or clinical samples. Future studies should investigate more diverse samples, including women of more varying ages, clinical samples, and men.

This study's advertising techniques may have altered the sample, resulting in biased results. The advertisement for the study noted questions about trauma, mental health symptoms, and sexual functioning, so it is possible that women who were engaging in avoidant strategies due to a history of sexual trauma or PTSD symptoms opted to not take the survey. This may have resulted in a less severe sample, which may have had an impact on findings.

Results from latent variable mixture modeling could be biased based on researcher interpretation. Although a four-class solution was chosen in this study, it is possible that a three-class solution was a better fit. Study replications could either support these findings or suggest a new solution. It is possible that data from different samples would produce a similar four-class solution, the more parsimonious three-class solution, or they would yield unique solutions. For example, it is possible that a clinical sample could have a different latent variable that generates unique classes based on their responses.

The data were collected via self-report measures, which may have reduced the specificity of symptom measures. Future studies should use structured interviews in order to provide opportunities for a more nuanced investigation of symptoms and diagnostic

comparisons. Although the FSFI is widely used to measure female sexual functioning, it may have false positive results for sexual difficulties in women who are sexually inactive, which was a concern in this study. The FSFI's Pain subscale only assessed pain associated with vaginal penetration, and failed to capture pain associated with other sexual activities. Future research should use a measure that assesses sexual pain more thoroughly. Some measures used in this study lacked evidence of sound psychometric properties. Although similar measurements for these variables (e.g., alcohol drinks consumed per week) have been used by researchers, future papers should test psychometric properties prior to collecting data with these measures.

The data were cross-sectional, which did not allow me to determine the impact trauma exposure had on the variables of interest. In the future, prospective designs would help determine the role trauma exposure and trauma-related details have on these factors; however, prospective designs investigating trauma exposure are difficult to implement. This design did not allow me to determine causal or temporal relations among the variables, which would be valuable for other research to investigate.

Measures used in this study assessed current and recent symptoms (i.e., in the past month), and our results may only generalize to current functioning in this sample, not lifetime experience of symptoms. It is possible that women experienced some symptoms in the past from which they recovered. Epidemiological studies could determine the course of these difficulties following a trauma.

Future Directions

In addition to the suggestions for future research listed above, there are numerous other directions for future research. These results should be replicated to see if these

groups are generated in other samples. Researchers should test additional samples, including samples with clinical levels of PTSD or sexual difficulties. Additional clinical samples, such as those with alcohol or drug use difficulties may also shed light on the role these variables may play in group differences. Although group membership was not based on trauma type, it would be interesting to see if similar groups would be generated in samples with specific trauma types, such as sexual assault.

Future research should further investigate the role relationship satisfaction plays in PTSD and sexual functioning. While relationship satisfaction was not a relevant factor in this study, it may be relevant for other samples, such as those in serious relationships or dissatisfying relationships.

Future research should attempt to explain the overlap between PTSD, sexual difficulties, and depression. It remains unclear if these are co-occurring but distinct issues, or if they appear to be co-occurring issues due to overlapping symptoms. If these are indeed distinct issues that are co-occurring, research should also explain the directional and temporal relations between these variables.

Additional research would help address relevant clinical questions that arise from these findings. Research could test how PTSD, sexual, and depressive symptoms improve following various treatments. It is possible that these symptoms would respond to a treatment targeting one of these symptoms. For example, it is possible that PTSD, depression, and sexual difficulties could all improve following treatment for PTSD. It is also possible that some symptoms would need to be addressed individually or in treatment packages that combine several relevant techniques.

Clinical Implications

These findings could help inform assessment practices. When a client presents with a history of trauma, clinicians may consider assessing for all relevant symptoms, including PTSD, depression, and sexual dysfunction. For clients presenting with PTSD, clinicians should consider assessing for relationship difficulties, including sexual struggles. For clients presenting with sexual difficulties, an assessment of trauma history and a PTSD assessment, if warranted, may be helpful. Clinicians should keep in mind that a young woman may present with a symptom profile similar to one of the groups generated. These findings could also inform treatment planning. Assessing for relevant symptoms or struggles will help clinicians know which difficulties should be addressed and which interventions to consider.

Conclusion

Latent variable mixture modeling generated four unique classes of trauma-exposed young women, and chi-square tests and ANOVAs further explained group differences. The groups generated by latent variable mixture modeling differed from each other statistically, and the differences appeared to be clinically distinct and relevant. Group differences found in chi-square tests and ANOVA analyses helped clarify group characteristics and provided further evidence that the classes created by latent variable mixture modeling were unique from each other. These results suggest that the variables investigated in this study do not behave the same way for all women. Instead, there may be four unique symptom profiles that trauma-exposed women display, two of which are healthy, high-functioning profiles.

“Healthy & Sexually Inactive” group members were single, sexually inactive, denied mental health symptoms, and reported low alcohol use and risky sexual behavior. “Healthy & Sexually Active” group members were in a relationship, were sexually active, did not report any difficulties, and reported average alcohol use and risky sexual behavior. “Sexual Difficulties & PTSD” group members were in a relationship, reported moderate level of all types of sexual difficulties, reported mild PTSD and depressive symptoms, but reported average alcohol use and risky sexual behavior. “Sexual Pain” group members were in a relationship and reported sexual pain and mild depressive symptoms, but they did not report PTSD symptoms. They reported average alcohol use and risky sexual behavior. Classes did not differ by trauma, relationship satisfaction, or drug use. All groups were likely to report a nonsexual trauma in their mid-teens, high relationship satisfaction, and minimal to no drug use.

This study joins other literature (e.g., Bonugli et al., 2010; Eadie et al., 2008; Rellini & Meston, 2006; Rellini et al., 2009; Seng et al., 2006) in providing evidence that PTSD and sexual difficulties are linked. However, this study also found that sexual difficulties can exist in the absence of PTSD symptoms, as one group reported sexual pain with low PTSD symptoms. These findings also demonstrated a link between PTSD, sexual difficulties, and depression, which has been found in prior research (Seng et al., 2006).

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doi:10.2105/AJPH.81.5.57

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Date: Tue, 20 Aug 2013 19:59:13 +0000

Hello,

The University of Memphis Institutional Review Board, FWA00006815, has reviewed and approved your submission in accordance with all applicable statuses and regulations as well as ethical principles.

PI NAME: Megan Avery

CO-PI:

PROJECT TITLE: :* Life: events, thoughts, feelings, and behavior

FACULTY ADVISOR NAME (if applicable): Meghan McDevitt-Murphy

IRB ID: #2788

APPROVAL DATE: 8/20/2013

EXPIRATION DATE: 8/9/2014

LEVEL OF REVIEW: Full Board

Please Note: Modifications do not extend the expiration of the original approval

Approval of this project is given with the following obligations:

- 1. If this IRB approval has an expiration date, an approved renewal must be in effect to continue the project prior to that date. If approval is not obtained, the human consent form(s) and recruiting material(s) are no longer valid and any research activities involving human subjects must stop.**
- 2. When the project is finished or terminated, a completion form must be completed and sent to the board.**
- 3. No change may be made in the approved protocol without prior board approval, whether the approved protocol was reviewed at the Exempt, Exedited or Full Board level.**
- 4. Exempt approval are considered to have no expiration date and no further review is necessary unless the protocol needs modification.**

Approval of this project is given with the following special obligations:

Thank you,

Ronnie Priest, PhD

Institutional Review Board Chair

The University of Memphis.

Note: Review outcomes will be communicated to the email address on file. This email should be considered an official communication from the UM IRB. Consent Forms are no longer being stamped as well. Please contact the IRB at IRB@memphis.edu if a letter on IRB letterhead is required.