EXPERIENCES OF POSTTRAUMATIC STRESS IN A SAMPLE OF SEXUAL ASSAULT SURVIVORS: A LONGITUDINAL LATENT CLASS ANALYSIS INCORPORATING STRUCTURAL AND FUNCTIONAL SOCIAL SUPPORT

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Psychology—Doctor of Philosophy

2020

ABSTRACT

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Sexual assault is a major public health crisis, with national epidemiological studies reporting that approximately one-in-five women will be sexually assaulted in their lifetime. Experiential and empirical data indicate that sexual assault causes significant distress for those who experience it, with approximately one-third of sexual assault survivors evidencing lifetime posttraumatic stress disorder (PTSD). In recent years, there have been increasing calls to expand recognition of PTSD beyond its binary framing and to incorporate contextual variables into the study of PTSD so that understandings of posttraumatic stress are more fully situated within the context of trauma survivors' lives. The current study responds to these stated needs.

This study utilized two waves of a longitudinal data set in which sexual assault survivors were surveyed annually about their posttraumatic stress symptoms and social support. Using this data, I conducted a latent transition analysis (LTA) to identify latent classes of posttraumatic stress experiences and model the probability of transitioning between latent classes over time. With the goal of highlighting existing strengths in survivors' communities and better understanding optimal utilization of those resources, I also incorporated structural and functional social support as predictors of class membership and class transition.

Four latent classes emerged at each time point and were named the High Severity, Depressed & Anxious, Avoidant & Reactive, and Low Severity classes. These classes demonstrated both quantitative (i.e., overall severity) and qualitative (i.e., symptom cluster

severity) differences. Transition probabilities illustrated a general pattern of de-escalation. As would be expected, de-escalation was more likely when both types of social support were high compared to when both types of social support were low. Notable differences between the latent classes emerged, however, when one type of social support was high and the other was low. Specifically, while participants assigned to the High Severity class at Time 1 were more likely to de-escalate when structural support was high and functional support was low than the reverse, the opposite pattern was true for participants assigned to the Depressed & Anxious class.

The intermediate classes identified in this latent class analysis highlight the limitations of categorical understandings of posttraumatic stress in which one either "has" or "does not have" PTSD. These findings support the calls that have been made by researchers and clinicians to introduce a "subclinical" level of PTSD to the Diagnostic and Statistical Manual, while also encouraging nuance beyond what even a subclinical designation would provide. Specifically, while a subclinical designation would reflect some amount of *quantitative* variation between the latent classes, it would be unlikely to reflect the *qualitative* differences found in the current study. These qualitative differences were especially relevant to understanding the longitudinal relationship between posttraumatic stress and social support, with functional support appearing to be especially relevant to those in the High Severity class and structural support especially relevant to those in the Depressed & Anxious class. The findings indicate that sexual assault survivors' social support needs may vary based on the specific symptoms that define their experience of posttraumatic stress at a given point in time. These findings also provide guidance for clinical and non-clinical practitioners regarding how to help survivors engage their support networks most effectively in the aftermath of trauma.

This dissertation is dedicated to sexual assault survivors
and those who support them.

ACKNOWLEDGMENTS

I cannot imagine starting these acknowledgments with anything other than my most sincere appreciation for my adviser and chair, Dr. Rebecca Campbell. I have learned so much about who I want to be as a teacher, a researcher, a mentor, and a person from watching you. I could not possibly list the many ways you have supported me, but please know that I remember and am grateful for them all.

Thank you, also, to my committee members: Drs. Cris Sullivan, Shaunna Clark, and Sarah Ullman. Cris, you go out of your way to share positive feedback and I hope you know how appreciated that is. Shaunna, there is truly no way that I could have made it through this project without you. Your patience and—I'll just name it for what it is—statistical genius are gifts I am forever grateful to have received. Sarah, I cannot thank you enough for entrusting me with the data that made this dissertation possible. I hope this is only the beginning of many collaborations.

To the absolutely amazing friends I have made throughout this journey—my RMC Advisee family, cohort littermates, #compscamp counselors, book club crew, and friend reunion travelers—I honestly cannot imagine the last six years without you. I don't know how people get through doctoral programs (or life) without the support you've shown me at every turn. A special thank you to Dani, who has been there quite literally since Day 1 and has helped me plan and celebrate every academic and non-academic proposal. A huge thank you, also, to Shaw, Jenna, Mikell, Cato, and Joel, who have stuck by me through graduate school from afar, and to Jonathan, who taught me that at some point, the next step is just your life and helped me build that life with purpose and authenticity.

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INTRODUCTION

Sexual assault is a major public health crisis, with national epidemiological studies reporting that approximately one-in-five women will be sexually assaulted in her lifetime[1] (Black et al., 2011, Breiding et al., 2014). Experiential and empirical data indicate that sexual assault causes significant distress in those who experience it, often leading to feelings of fear, anxiety, shame, depression, and anger (Campbell, Dworkin, Cabral, 2009). Women's responses to sexual assault have long been recognized as consistent with symptoms of Posttraumatic Stress Disorder (PTSD) (Hanson, 1990; Herman, 1992), and a recent meta-analysis confirmed that approximately one in three sexual assault survivors evidenced lifetime PTSD (Dworkin, 2018).

In recent years, however, there has been increasing recognition that a survivor's experience of posttraumatic stress may not be as straightforward as "having" or "not having" PTSD. Some have warned that the reliance on PTSD as an explanatory framework for trauma response has pathologized human suffering and imposed a Westernized view of mental health as universal truth (Marsella, 2010; Summerfield, 2004). Other clinicians and researchers support the construct but struggle with its application, specifically with diagnostic criteria that are structured such that trauma survivors may experience significant posttraumatic stress symptoms but do not qualify for a PTSD diagnosis unless their symptoms combine in specific ways (Galatzer-Levy & Bryant, 2013; Hoge et al. 2016). This classification system can impose challenges for trauma survivors seeking third-party reimbursement for posttraumatic stress treatment (Clark et al., 2017; Wasco, 2003) and can complicate clinical interventions due to the thousands of symptom combinations categorized under a single diagnosis (Galatzer-Levy & Bryant, 2013). There is also

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[1] Sexual assault is perpetrated against people of all genders, and at particularly high rates against transgender and gender diverse populations. The data that will be used in this dissertation is comprised of female-identified individuals, and therefore the literature review will focus on sexual assault perpetrated against female-identified individuals, as well.

evidence that commonly-used PTSD treatment approaches are not equally effective for all survivors and uncovering the source of these differences has been identified as an important area for future research (Bradley, 2005; Bryant, 2019).

As a field that prioritizes understanding human behavior in context (Shinn & Rapkin, 2000; Trickett, 1996), community psychology is well-situated to contribute to this ongoing area of study. Rapkin and Luke (1993) encouraged community psychologists to utilize analytic methods capable of uncovering underlying diversity and heterogeneity in their data. Luke (2005) expanded upon this call in a later paper, suggesting that analytic methods designed to group cases together on the basis of underlying similarity could help community psychologists uncover naturally occurring groups and discover new social contexts. The identification of naturally occurring groups in reference to PTSD symptom patterns could be crucial in expanding clinical conceptualizations of posttraumatic stress such that they more accurately reflect the lived experiences of trauma survivors.

In this dissertation, I conducted a study that used analytic techniques capable of identifying heterogeneity in sexual assault survivors' experiences of posttraumatic stress in order to identify latent symptom profiles and clarify how those symptom profiles change over time. Most previous studies exploring heterogeneity in sexual assault survivors' reports of posttraumatic stress have focused on symptoms in the first year after an assault (e.g., Armour, Shevlin, Elklit, & Mroczek, 2012; Steenkamp, Dickstein, et al., 2012), and the current study expands this line of inquiry to include survivors whose assaults took place many years prior. Based on a desire to highlight existing strengths in survivors' communities and better understand optimal utilization of those resources, this study also included social support as a predictor of posttraumatic stress symptom profiles. Social support has been identified as a key protective

factor against negative mental health outcomes in the aftermath of gender-based violence (Bybee & Sullivan, 2002; Patterson, Greeson, & Campbell, 2009) but the relationship is complex, with different types of social support impacting trauma survivors in different ways (Guay, Billette, & Marchand, 2006; Trotter & Allen, 2009). Longitudinal research is particularly well-suited to exploring the impact of contextual variables on individuals' experiences (Bogat, Levendowsky, & von Eye, 2005), and it was based on that strength that this analysis evaluated the impact of multiple theoretically-relevant types of social support on posttraumatic stress symptom profiles over time.

This document begins with a literature review that introduces posttraumatic stress disorder, including the components of a PTSD diagnosis and critiques that have been levied against the construct of PTSD. The literature review then turns to posttraumatic stress in the context of sexual assault and the role of social support in posttraumatic stress development and recovery. The literature review concludes with a review of the analytic strategies used to study posttraumatic stress. The current study is then introduced, and the methods and analytic plan are reviewed. The results are then presented by primary research question. The document concludes with a discussion of key findings, implications, and future directions for research.

LITERATURE REVIEW

Introduction to Posttraumatic Stress Disorder

Over 90% of Americans report experiencing one or more traumatic events in their lives (Kilpatrick et al., 2013), and most individuals who experience trauma report at least some physiological and psychological responses in the days and weeks following the traumatic event (Ford, Grasso, Elhai, Courtois, 2015; Langton & Truman, 2014). These responses, characterized as symptoms of posttraumatic stress, are often described as a "normal response to an abnormal event" (Schiraldi, 2016, p. 3), highlighting that the trauma survivor's response makes sense and can be understood as a coping mechanism employed when one's usual coping mechanisms were insufficient in the face of trauma. When the symptoms reach a point of persistence and severity that they disrupt the trauma survivor's daily life, they are typically recognized in Western culture as potential signs of Posttraumatic Stress Disorder (PTSD) (Ford et al., 2015; Schiraldi, 2016).

Though most trauma-exposed individuals do not develop PTSD, studies indicate that 10-25% of trauma-exposed individuals report diagnosable levels of PTSD symptoms at some point after their traumatic incident (see Ford et al., 2015, for a review). National epidemiological studies indicate that 8% of adults in the United States experience PTSD at some point in their lives, with a lifetime morbid risk of approximately 10% (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). Fully understanding the origin and implications of these figures and their impact requires understanding the distinct parts of a PTSD diagnosis and how those components have evolved over time. The following sections briefly review this information, as well as the primary critiques that have been leveled against PTSD as a diagnostic construct.

Traumatic stressor. Beginning in the mid 1800's, physicians and clinicians began to explore the physiological and psychological impacts of emotional trauma. Much of the study focused on the impact of combat exposure (DaCosta, 1871/1951; Kardiner, 1941; Myers, 1870), though railway accidents (Jordan 1873, cited in DiMauro et al., 2014), sexual abuse (Burgess & Holmstrom, 1974; Freud, 1896), domestic violence (Parker, 1965; Parker & Schumacher, 1977), and life-threatening illness (Abram, 1970) were, at times, incorporated into the conversation, as well. There was ongoing disagreement in the medical community, particularly through the mid 1900's, about whether showing symptoms of trauma-related distress was a natural response or a character flaw (Crocq & Crocq, 2000; Horwitz, 2018), but the sheer volume of veterans returning from the Vietnam War with such symptoms encouraged recognition that ongoing distress after trauma warranted diagnosis and treatment (Kulka et al., 1990; Shatan, 1973).

The third edition of the Diagnostic and Statistical Manual for Mental Disorders (*DSM-III*) (APA, 1980) formally recognized the impact of traumatic stressors with the introduction of posttraumatic stress disorder (PTSD) as an official diagnostic category. Qualifying traumatic events were defined as those that were outside the realm of usual human experience and that would cause significant distress in almost anyone. Seven years later, in the revised third edition (*DSM-III-R*; APA, 1987), an additional requirement was added that the event should have induced feelings of intense fear, terror, or helplessness. In response to critiques that what was "outside the realm of usual human experience" for one person might be an everyday occurrence for another (Brown, 1991), the *DSM-IV* (APA, 1994) attempted to clarify the traumatic stressor definition by including specific objective and subjective criteria. Objectively, the individual must have experienced, witnessed, or been confronted with an incident that involved actual or threatened death, serious injury, or a threat to physical integrity (Criterion A1); subjectively, that

the individual's response must have involved fear, helplessness, or terror (Criterion A2). However, there were arguments made after the publication of the *DSM-IV* (and the subsequent text revision, *DSM-IV-TR*) that the traumatic event criterion had become too expansive and the construct of PTSD was suffering from "conceptual bracket" or "criterion" creep (McNally, 2003; Rosen, 2004), in which an ever-expanding list of events could qualify as a traumatic stressor. The *DSM-5* (APA, 2013) narrowed the definition of traumatic stressors by removing the broadly worded "threats to physical integrity" phrase and replacing it with specific references to actual or threatened death or sexual violence. It further restricted the qualifying types of indirect trauma exposure, such that the traumatic event needed to be witnessed directly, experienced by one's relative or close friend, or experienced during the course of one's occupational duties.

Symptom cluster criteria. Since the first iteration of PTSD in the *DSM-III* (APA, 1980), PTSD symptoms have been divided into symptom clusters, such that a certain number of symptoms in each cluster must be present for a diagnosis to be conferred. The original PTSD diagnostic criteria in the *DSM-III* included twelve symptoms across three symptom clusters: (1) re-experiencing (e.g., feeling as though the event is reoccurring), (2) numbing (e.g., detachment from others), and (3) arousal/avoidance (e.g., exaggerated startle response, avoidance of reminders of the traumatic event). To be diagnosed with PTSD, individuals had to report at least one of three re-experiencing symptoms, at least one of three numbing symptoms, and at least two of six arousal/avoidance symptoms. The *DSM-III-R* (APA, 1987) expanded the number of included symptoms from twelve to seventeen and reorganized symptoms across clusters, such that avoidance was now grouped with numbing, rather than arousal. Within this revised framework, individuals had to report at least one of four re-experiencing symptoms, at least three of seven avoidance/numbing symptoms, and at least two of six hyperarousal

symptoms. The *DSM-IV* (APA, 1994) and *DSM-IV-TR* (APA, 2000) retained much of the *DSM-III-R* symptom structure, though physiological reactivity to trauma reminders were associated with the hyperarousal, rather than re-experiencing, symptom cluster and therefore the breakdown of required symptoms within clusters changed slightly.

Between the publication of the *DSM-IV* and *DSM-5*, a great deal of attention was paid to whether the three PTSD symptom clusters (re-experiencing, avoidance/emotional numbing, and hyperarousal) accurately represented the underlying construct of PTSD. While some empirical studies found support for the three-factor model reflected in the *DSM-III* and *DSM-IV,* other factor analyses were used to advocate for a four-factor model, in which avoidance and emotional numbing were separated into their own distinct symptom clusters (King, Leskin, King, & Weathers, 1998; Stewart et al., 2004). Still other studies supported the four-factor conclusion, but identified those factors as re-experiencing, avoidance, dysphoria, and hyperarousal (Simms, Watson, Doebbeling, 2002; Ullman & Long, 2008). When the final *DSM-5* was published, the PTSD diagnosis included four symptom clusters: 1) intrusion, 2) avoidance, 3) negative alternations in cognition and mood, and 4) alterations in arousal and reactivity (APA, 2013). The renaming of "re-experiencing" as "intrusion" signified that intrusive memories must be involuntary in order to contribute to a PTSD diagnosis (Hoge et al., 2016). The new "negative alterations in cognitions and mood" symptom cluster reflected the requirement, previously part of the trauma stressor criterion, that the traumatic event should cause distress. It also absorbed many of the numbing symptoms that has been part of the *DSM-IV* avoidance/numbing symptom cluster, leaving avoidance in a category by itself. In the current *DSM-5*, trauma survivors must report experiencing at least one of five intrusion symptoms, one of two avoidance symptoms,

two of seven negative alternations in cognition and mood symptoms, and two of six alterations in arousal and reactivity symptoms in order to receive a diagnosis of PTSD.

Critiques of PTSD. There have been substantial critiques of the PTSD diagnosis, based both on the changes implemented in the *DSM-5* and in regard to the construct as a whole. Below, I briefly review two of these critiques and then consider what it means to do research on PTSD with these critiques in mind.

Diagnostic inconsistency and arbitrary diagnostic thresholds. Clinicians and researchers have criticized the *DSM-5* changes to PTSD as "splitting hairs" (Hoge et al., 2016, p. 750) and creating arbitrary distinctions that may keep practitioners from applying a PTSD diagnosis when clinically appropriate. Experts have also raised the concern that assigning avoidance symptoms to their own category (which requires the presence of at least one avoidance symptom for a diagnosis) unduly restricts diagnosis of veterans or emergency responders who have learned to overcome their avoidance through specialized training (Hoge et al., 2016; McFarlane, 2014). Empirical comparisons of diagnoses obtained under *DSM-IV-TR* and *DSM-5* criteria appear to support these concerns. Hoge, Riviere, Wilk, Herrell, and Weathers (2014) compared veterans' PTSD diagnoses as assessed with *DSM-IV-TR* and *DSM-5* criteria and found that 30% of those who received a diagnosis under the former assessment criteria did not receive a diagnosis under the latter. The figure jumped to 45% when discordant diagnoses in both directions were considered.

That nearly half a sample of trauma survivors can receive a discordant PTSD diagnosis based on consecutive diagnostic manuals may indicate flaws in the *DSM-5*, as Hoge and colleagues (2016) and McFarlane (2014) suggest, but it also speaks to a larger issue. Psychological diagnoses, including PTSD, have traditionally operated through a categorical

framework, in which one either has a disorder or does not (Clark et al., 2017; Steenkamp, Nickerson, et al., 2012). This framework may be insufficient for individuals who experience marked distress or functional impairment related to a diagnosable disorder but not to a degree that they qualify for that diagnosis. This is an especially significant issue with PTSD because trauma survivors must report not only an overall number of symptoms but a specific number of symptoms in each cluster category to receive a diagnosis, creating the possibility that a survivor could experience debilitating symptoms in three out of four symptom clusters but not receive a diagnosis due to lack of symptomology in one particular domain. Trauma survivors in this position are sometimes referred to as experiencing "subthreshold" or "subclinical" PTSD (Mylle & Maes, 2004) and the lack of attention to this group within the diagnostic framework represents an important limitation in contemporary understandings of PTSD.

   Ethnocentrism of construct and application. The *DSM* reflects the medical model of psychological illness, operating under the assumption that psychological disorders can be objectively defined and diagnosed (Bracken, 2002; Summerfield, 2004). Though some room for individual variation is built into the diagnosis, the overarching framework posits that PTSD (or major depressive disorder, bipolar disorder, etc.) is recognizable across populations and contexts. Furthermore, treatment is expected to follow a similar path; treatment of PTSD, for example, is generally based on the belief that survivors need to talk about or "work through" their traumatic experiences (Marsella, 2010; Summerfield, 1999). An increasing number of clinicians and theorists have argued, however, that psychological disorders are culturally bound and, resultantly, cultural variation should be expected in onset, duration, manifestation of symptoms, and responses to treatment (Friedman, Resick, Bryant, & Brewin, 2011; Kirmayer, 1989; Marsella, 2010). Some have extended the argument even further, suggesting that applying

expectations of PTSD to non-Western cultures may be harmful, as it can disrupt the socio-culturally constructed coping strategies that have sustained communities for centuries (Lin, 2000; Summerfield, 2004).

Non-Western clinicians and community leaders have also pointed out that the "post" in posttraumatic stress disorder does not fit contexts in which violence is ongoing and trauma survivors lack a safe place from which they can reflect on the trauma they have experienced. Straker and the Sanctuaries Counseling Team (1987) introduced the concept of *continuous traumatic stress* (CTS) in reference to South African anti-apartheid activists in the 1980's who had experienced extreme violence perpetrated by the government and had realistic expectations that they would experience similar violence in the future. The concept has since been applied to trauma-related distress experienced in other parts of the world during times of war, famine, and political unrest (Diamond, Lipsitz, Fajerman, & Rozenblat, 2010; Kaminer, Eagle, & Crawford-Browne, 2018; Newton, 2017). Similar concepts have been explored in reference to the experiences of Western and non-Western minoritized communities who, in addition to discrete traumatic stressors, may also be dealing with ongoing stressors related to socioeconomic or identity-based discrimination (Kira, Alawneh, Aboumediene, Lewandowski, & Laddis, 2014; Zaiontz & Sakar, 2014). Expanding clinical understandings of stress responses in these situations is an ongoing area of study, but what is clear is that trauma survivors' responses and needs may differ based on the cumulative impact of repeated trauma and expectations of future trauma.

Conducting research on PTS(D) in light of critiques. There are multiple opportunities for researchers to incorporate these critiques into their work. First, researchers can avoid codifying diagnostic distinctions between those who "have" PTSD and those who "do not" by studying the full range of posttraumatic stress symptomology. I attempt to bridge these

distinctions in the remainder of this document by, when possible, broadening the discussion to posttraumatic stress rather than focusing specifically on clinically diagnosed PTSD. I also examine posttraumatic stress at the level of individual symptoms rather than severity groupings or diagnostic classifications as an alternative to the categorical framings critiqued above. Second, exploring the impact of protective factors that occur naturally in trauma survivors' lives may highlight communities' strengths and avoid pathologizing human responses to suffering. Subsequent sections in this literature review introduce social support as such a protective factor and detail how it is incorporated into the current study. Finally, researchers can resist assumptions about the universal applicability of PTSD by utilizing analytic methods capable of highlighting heterogeneity in their data. These methods can identify naturally occurring groups and communicate contextual information that might otherwise be missed. The current study utilizes such methods with the goal of evaluating, rather than assuming, the applicability of a PTSD diagnosis in a diverse sample of sexual assault survivors.

PTS(D) and Sexual Assault

Prior research, in addition to decades of survivor testimony and practice-based evidence, has established sexual assault as one of many traumatic events that can precipitate posttraumatic stress symptoms. Approximately three-quarters of sexual assault survivors experience moderate to severe distress after their assault (Langton & Truman, 2014) and, for some, that distress will eventually express itself as severe posttraumatic stress or PTSD. A recent meta-analysis reviewed PTSD rates assessed according to *DSM* criteria and found a lifetime PTSD prevalence rate of 36% among sexual assault survivors, compared to 9% among those who had not experienced sexual assault (Dworkin, 2018). The association between sexual assault and posttraumatic stress appears to be especially strong, with sexual assault survivors consistently

reporting higher rates of posttraumatic stress than what are reported by survivors of other

traumas (Basile & Smith, 2011; Breslau, Chilcoat, Kessler, Peterson, & Lucia, 1999; Kelley,

Weathers, McDevitt-Murphy, Eakin, & Flood, 2009).

There are multiple hypothesized reasons why sexual assault survivors may experience

particularly high rates of posttraumatic stress. Wohlfarth, Winkel, and van den Brink (2002)

identified four factors that put crime victims at particular risk for developing PTSD: being the

victim of a violent crime, knowing the perpetrator, blaming oneself for the incident, and

experiencing the results of the crime as worse than expected. These risk factors are present in

many sexual assaults (Breiding et al., 2014; Ullman, Filipas, Townsend, & Starzynski, 2007) and

may contribute to the high rates of posttraumatic stress among sexual assault survivors. Feminist

scholars have also hypothesized that the particularly intrusive nature of sexual assault may

explain its strong association with posttraumatic stress (Ullman & Filipas, 2001). As was noted

previously during the discussion of ethnocentrism-related critiques, expectations of ongoing or

future harm are also intertwined in survivors' responses to current trauma, and the backdrop of

rape culture may therefore heighten the psychological and emotional impact of sexual assault

(Campbell et al., 2009; Ullman, 2010; Wasco, 2003).

Characteristics of the assault and the survivor have also been examined as potential

predictors of posttraumatic stress. No clear relationships between a survivor's race, ethnicity,

income level, or marital status and their posttraumatic stress symptomology have emerged (see

Campbell, 2009, for a review) but avoidance coping and self-blame after an assault have been

found to predict more severe posttraumatic stress symptoms (Frazier, 2003; Koss, Figueredo, &

Prince, 2002; Littleton & Breitkopf, 2006; Ullman, Towensend et al., 2007). Characteristics of

the assault, such as physical injury and perceived life threat, also appear to predict posttraumatic

stress (Bownes, O'Gorman, & Sayers, 1991; Epstein, Saunders, & Kilpatrick, 1997; Ullman & Filipas, 2001; Stein, Walker, & Forde, 2000) (see Campbell et al., 1999, for an exception).

More recently, increased attention has been paid to understanding survivors' posttraumatic stress responses in the larger context of their lives. Higher rates of cumulative lifetime trauma, including other sexual assaults, consistently predict higher levels of posttraumatic stress and lower self-rated recovery after a sexual assault than what is reported by sexual assault survivors who have not experienced prior traumas (Najdowski & Ullman, 2009; Nishith, Mechanic, & Resick, 2000). Schumm, Briggs-Phillips, and Hobfoll (2006), for example, found that while women who had experienced either childhood abuse or rape were six times more likely to report symptoms aligning with a PTSD diagnosis than women who reported neither, women who had experienced both events were seventeen times more likely to report such symptoms. Such a drastic increase in PTSD diagnoses among survivors who have experienced multiple assaults throughout the lifespan is reminiscent of the theories of continuous traumatic stress discussed earlier and reinforces the importance of understanding posttraumatic stress reactions as a holistic reflection of survivors' lives rather than an isolated response to a discrete event.

Negative responses from one's social support network have also been found to predict posttraumatic stress (Borja, Callahan, & Long, 2006; Campbell et al., 2001; Dworkin, Brill, & Ullman, 2019), as have blaming or otherwise unsupportive reactions from formal support systems such as medical or law enforcement responders (Campbell et al., 2001; Campbell & Raja, 2005; Ullman, Townsend et al., 2007). The relationship between social support and posttraumatic stress is a particularly salient one and is therefore reviewed in greater detail below.

Social support and posttraumatic stress. Social support plays an important role in helping individuals and communities manage the effects of negative life events (Barrera, 2000; Heaney & Israel, 2008; Israel, Farquhar, Schultz, James, & Parker, 2002). It has long been identified as one of the most impactful variables in trauma recovery (Guay et al., 2006; Wagner, Monson, & Hart 2016), including women's emotional and logistical recovery from gender-based violence (Bybee & Sullivan, 2002; Campbell, Dworkin, & Cabral, 2009; Trotter & Allen, 2009). Some theoretical models suggest that social support received from others can lower trauma survivors' stress levels and help them assimilate memories of the traumatic event, whereas a lack of social support can exacerbate stress and encourage avoidance (Joseph, Williams, & Yule, 1997; Lepore, 2001; Thoits, 1986). Other theoretical work has explored social support's ability to promote feelings of self-worth, well-being, and safety (Barrera, 2000; Cohen & Wills, 1985). Research specific to gender-based violence has emphasized its positive impact on survivors' quality of life as well as its protective effect against depression, PTSD, and other indicators of mental and emotional distress (Beeble, Bybee, Sullivan, & Adams, 2009; Campbell et al., 2009; Dworkin, Pittenger, & Allen, 2016). Social support has been identified as a particularly relevant factor for African American women in the aftermath of trauma (Banks-Wallace & Park, 2004; Stevens-Watkins et al., 2014; Sue & Sue, 2008), a finding that Bryant-Davis and colleagues (2011) attribute to culturally-valued principles of collectivism and connection.

Social support is a multifaceted construct, however, and social *interactions* do not necessarily translate to social *support*. A trauma survivor may have frequent contact with others, for example, but if the contact communicates blame or disinterest then it may lack benefits or even cause harm (Goodkind, Gillum, Bybee, & Sullivan, 2003; Maercker & Horn, 2013; Ullman, 2010; Ullman, Townsend, et al., 2007). Sexual assault survivors, in particular, often receive

negative reactions from friends and family when they disclose their traumatic experiences (Littleton, 2010; Relyea & Ullman, 2015) and those negative reactions have been found to cause substantial distress (Andrews, Brewin, & Rose, 2003; Lepore, 2001; Ullman & Peter-Hagene, 2014). Negative reactions can include blaming, stigmatizing, attempting to distract, or attempting to control the survivor, as well as those that require the survivor to provide, rather than receive, support (Ullman, 2000; Ullman, 2010). Relyea and Ullman (2015) found that negative reactions can be understood more broadly as those that convey "unsupportive acknowledgment" or "turning against" the survivor, and that both types of negative reactions predict increased posttraumatic stress. Interestingly, negative reactions appear to exert a stronger influence on posttraumatic stress than do supportive reactions (Dworkin et al., 2019; Goodkind et al., 2003; Relyea & Ullman, 2015). These nuanced distinctions highlight the potential benefits of including multiple measures of social support when studying posttraumatic stress and ensuring that the quality, in addition to quantity, of social support is included.

Differentiating between structural and functional social support is one way to capture these distinctions. Structural social support refers to the number of people available to an individual and the frequency of their contact with them, whereas functional support captures the degree to which those interactions communicate support and validation (Wills & Fenar, 2001; Wills & Shinar, 2000). Tan, Basta, Sullivan, and Davidson (1995) included measures of structural and functional social support in their study of intimate partner violence survivors' wellbeing in the six months after leaving a domestic violence shelter and found that both types of social support were positively related to survivors' wellbeing, with particularly strong correlations reported between functional social support and both quality of life (correlations ranging between .58 and .64) and depression (correlations ranging between -.29 and -.42).

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In their review of social support and posttraumatic stress, Guay and colleagues (2006) point out that functional social support can be further understood with a distinction between global functional social support and functional support specific to the traumatic event. This distinction may be especially useful in understanding the posttraumatic stress experiences of marginalized survivors who often face additional barriers to receiving assault-related services and support (Jones & Thorpe, 2016; Ullman & Lorenz, 2020). African American sexual assault survivors, for example, experience sexual victimization in the sociohistorical context of legalized sexual abuse of Black women and persecution of Black men. This context may complicate decisions to pursue law enforcement or other formal systems' responses to sexual assault and may increase the likelihood of victim-blaming if formal help-seeking is pursued (West & Johnson, 2013). Previous research conducted with racially diverse samples of sexual assault survivors found that both global and assault-specific measures of functional social support were associated with posttraumatic stress symptomology (Ullman, Townsend, et al., 2007), reinforcing the importance of including these multiple types of social support in posttraumatic stress research.

Analytic Strategies Used to Study PTS(D)

As understandings of PTSD and social support have become increasingly nuanced, so too have the analytical approaches used to study posttraumatic stress. Traditionally, posttraumatic stress has been studied using methods that categorize participants based on the number or cumulative severity of their posttraumatic stress symptoms. These categorizations have been used as predictor variables examining, for example, whether having a probable PTSD diagnosis is associated with depression (Thabet, Abed, & Vostanis, 2004) or predicts revictimization (Acierno, Resick, Kilpatrick, Saunders, & Best, 1999). PTSD categorization has also been used

as an outcome variable by exploring whether PTSD is predicted by factors such as the characteristics of the participant's assault (Epstein et al., 1997) or previous traumatic experiences (Schumm et al., 2006).

This approach can be considered a "variable-oriented" approach in that it assumes populations are relatively homogenous and differences between individuals are random (von Eye & Bogat, 2006). Based on these assumptions, variable-oriented analyses aggregate data across all individuals in the sample with the goal of identifying relationships between variables. A "person-oriented" approach, in contrast, focuses on relationships between *individuals*. The goal of person-oriented approaches is to group individuals into categories in which they are similar to others within their category and dissimilar from individuals in other categories (Bergman & Magnusson, 1997; Muthén & Muthén, 2000). This review will primarily focus on mixture models, which are a family of person-oriented analyses in which latent subpopulations are inferred through participants' responses on indicator variables.

Mixture models are being used with increasing frequency in response to many of the previously discussed critiques of PTSD. Because these analytic strategies identify emergent groups in the data, they can avoid reifying categorical distinctions between people who "have" or "do not have" PTSD. Longitudinal mixture models can identify similar data-driven trajectories representing changes in posttraumatic stress symptomology or class membership over time. Because most of the posttraumatic stress research reviewed thus far has been based on variable-oriented analyses, a brief review of posttraumatic stress research that has used mixture modeling techniques is provided below.

Cross-sectional person-oriented analyses. Cross-sectional mixture modeling research on posttraumatic stress has primarily used Latent Class Analysis (LCA) and Latent Profile

Analysis (LPA). Both LCA and LPA identify categorical clusters of individuals, called "classes." The classes are *latent* variables, in that they are not measured directly but rather inferred based on observed indicators. In posttraumatic stress research, the latent classes generally represent subgroups of posttraumatic stress symptom experiences.

Multiple studies utilizing both *DSM-III-R* and *DSM-IV* PTSD measures have found that three latent classes best represent trauma survivors' experiences of posttraumatic stress symptoms, in which each latent class represents a different level of overall symptom severity (Ayer et al., 2012; Breslau et al., 2005; Contractor et al., 2015; Steenkamp, Nickerson, et al., 2012). These three latent classes have been described as: (1) no/low/mild disturbance, (2) intermediate/moderate disturbance, and (3) pervasive/severe disturbance. The plurality of participants in these studies (43%-62%) were most likely to belong to the lowest severity group, with moderate severity as the next largest group (26%-43%), and the smallest proportion of participants in the high severity group (9%-14%). These three-class solutions have been crucial to advancing clinical understandings of posttraumatic stress, particularly in pushing clinical conceptualizations beyond a binary categorical system with evidence of an intermediate symptom severity class (Friedman et al., 2011; Steenkamp, Nickerson, et al., 2012).

Other analyses, particularly those that have found four- or even five-class solutions, have drawn attention to a different issue, namely that posttraumatic stress experiences may be defined by *symptom cluster* severity, instead of or in addition to *overall* severity. Two trauma survivors may both have a PTSD diagnosis or identical symptom severity scores, for example, but one individual's experience may be dominated by intrusion symptoms and the other's dominated by symptoms of hyperarousal. Latent class and latent profile analyses conducted with *DSM-III-R* and *DSM-IV* measures have found evidence of such differentiation, with both emotional

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numbing (Hebenstreit, Madden, & Maguen, 2014; Maguen et al., 2013) and hyperarousal (Hebenstreit, Maguen, Koo, & DePrince, 2015) symptoms differentiating classes with otherwise similar levels of severity. The needs of these trauma survivors may be profoundly different, and mixture models are uniquely situated to highlight these varied experiences.

Longitudinal person-oriented analyses. Growth Mixture Modeling (GMM) and Latent Transition Analysis (LTA) are two longitudinal mixture models that have also been used to study posttraumatic stress. GMM departs from traditional growth modeling in that it allows differences in growth parameters by latent class. These different growth parameters result in separate growth models for each latent class (Jung & Wickrama, 2007). In the case of posttraumatic stress research, GMM can be used to identify the varied symptom trajectories that best represent a sample over time (e.g., resilience, recovery, delayed onset, chronicity). Multiple studies have suggested that a resilience trajectory, which shows little evidence of emotional disruption, is the most common response to trauma (see Bonanno, 2004 and Galatzer-Levy, Huang, & Bonanno, 2018, for reviews). Researchers focused on sexual assault, however, have warned that this conclusion does not appear to apply to sexually victimized samples who often have a particularly severe posttraumatic stress response (Steenkamp, Dickstein, et al. 2012).

LTA is another longitudinal mixture modeling approach that models change in latent class membership over time. Chen and Wu (2017) used a *DSM-IV* measure of posttraumatic stress as well as a measure of posttraumatic growth to identify three latent classes among Chinese children and adolescents eight months after an earthquake: resilient (low posttraumatic stress and posttraumatic growth), thriving (mild posttraumatic stress and moderate posttraumatic growth), and struggling (high posttraumatic stress and moderate posttraumatic growth). They then modeled the likelihood of latent class membership twenty months after the earthquake and

found that participants had relatively high probabilities of remaining in the same class over time, with participants most likely to transition into the resilient class when change in class membership did occur. Boasso and colleagues (2016) used a *DSM-III* measure of posttraumatic stress to conduct an LTA that modeled symptom changes across the deployment cycle of U.S. Marines. They found a higher probability of class transition than what was found by Chen and Wu (2017) but, consistent with Chen and Wu's findings, they found that class transitions most often showed a decrease in symptom severity. Boasso et al. (2016) identified combat exposure and post-deployment stressors as particularly impactful in class transitions, highlighting the potential for LTA to identify how changes in class membership over time relate to other theoretically meaningful variables.

CURRENT STUDY

Recent years have seen increased calls for a more holistic and culturally-grounded approach to trauma. Such an approach would move beyond a binary understanding of PTSD and acknowledge that a disorder developed around the experiences of Western, white men who underwent a discrete traumatic period during war is unlikely to fully represent the experiences of diverse communities who have experienced different types of traumas, often across multiple contexts and periods of time. The desire to contribute to this expanded understanding of posttraumatic stress among sexual assault survivors is what motivated this current study. Specifically, this study utilized analytic methods that explored, rather than controlled for, heterogeneity in the data and identified naturally-occurring patterns of posttraumatic stress as they exist among survivors. The study's first research question was: *What latent subgroups best represent sexual assault survivors' experiences of posttraumatic stress symptoms?*

The next step in understanding emergent profiles of posttraumatic stress involved determining whether the latent classes were stable across time. In latent transition analysis, it is possible for substantively similar classes to emerge at each time point, but it is also possible that the structure or number of classes could change. For example, whereas one measurement occasion may be best represented by a three class solution in which classes differ primarily by symptom severity, a second measurement occasion may be best represented by a four class solution in which symptom *cluster* severity, rather than overall severity, differentiates the classes. The study's second research question used measurement invariance testing to answer the question: *Is the latent class measurement model stable over time?*

After identifying the best-fitting latent class model at each time point, it was possible to specify a longitudinal model and measure the probability of participants transitioning into a

different latent class over time. Transition probabilities can help clarify the permanence of posttraumatic stress symptom profiles, as well as the likelihood of transitioning into higher or lower symptom severity classes. A general trend of participants transitioning into lower severity classes over time, for example, would indicate that symptoms tend to resolve. If, on the other hand, a substantial proportion of participants transfer into higher severity classes, posttraumatic stress treatments may benefit from exploring precursors to transition as opportunities for intervention. To answer this question, the third research question asked: *What is the probability of transition between latent classes?*

Finally, once a longitudinal model was fit that communicated the proportion of participants in each latent class and the probability of transitioning between them, auxiliary variables were added to the model. Based on extant literature indicating the relevance of social support to sexual assault survivors' posttraumatic stress symptoms, social support measures were incorporated into the model as auxiliary variables. Specifically, measures of structural social support (i.e., participants' frequency of social contact), global functional social support (i.e., the degree to which participants perceive support and validation through general social contact) and assault-specific functional social support (i.e., the degree to which participants are satisfied with the support they have received specific to the sexual assault) were included. These additions addressed the fourth research question: *What is the relationship between social support, latent class membership, and latent class transitions?* All four research questions were answered using Latent Transition Analysis (LTA), a technique that was described briefly in the literature review and will be described in greater detail below.

METHOD

Participants

Participants were recruited using online and printed advertisements from community, college, and agency settings in a large, Midwestern city. The advertisements described a study open to women age 18 or older who had experienced an unwanted sexual event when they were 14 years or older and had told at least one person about the experience. Full study participation spanned three years, with three mailed surveys completed approximately one year apart; only the first two surveys are utilized in this analysis. N = 1,863 women completed the first survey, but n = 182 of them did not meet study criteria of having told someone about an unwanted sexual experience captured by the sexual victimization measure. These participants were excluded from the sample, leaving a final Wave 1 sample of n = 1,681 participants; 75.6% of these participants (n = 1,271) completed the second survey.

Demographic data were collected in the Wave 1 survey (see Table 1). The sample was relatively representative of the city in which data were collected, though the proportion of individuals who identified as Black or African American was greater in the study sample compared to U.S. census data (43.5% vs. 32.9%) and the proportion of individuals who identified as white was smaller in the study sample compared to census data (37.2% vs. 45.0%). There were also fewer participants in the study sample who identified as Hispanic or Latina than what would be expected (13.1% vs. 28.9%). Additional demographic data are presented in Table 1. Participants who attritted after the first survey were compared to those who completed both the first and second surveys and no demographic differences were found based on participant race, ethnicity, sexual identity, or level of formal education. However, participants who

completed both surveys did have a significantly higher mean age ($M = 37.10$, $SD = 0.36$) than those who discontinued participation ($M = 34.36$, $SD = 0.60$) ($t(1646) = -3.83$, $p < .001$).

Table 1: *Demographic characteristics of wave 1 and wave 2 samples*

	Wave 1 Sample (N = 1,681)		Wave 2 Sample (N = 1,271)	
Variable	**M (SD)**	**Median**	**M (SD)**	**Median**
Age	36.43 (12.56)	35	37.10 (12.67)	36
Variable	**n**	**%**	**n**	**%**
Race				
Black/African American	723	43.0%	561	44.1%
White	625	37.2%	465	36.6%
Multiracial	120	7.1%	89	7.0%
Asian	38	2.3%	26	2.0%
American Indian	13	0.8%	10	0.8%
Native Hawaiian/Pacific Islander	4	0.2%	3	0.2%
Other/Missing	158	9.4%	117	9.2%
Ethnicity				
Not Hispanic/Latina	1,391	82.7%	1,053	82.8%
Hispanic/Latina	220	13.1%	166	13.1%
Missing	70	4.2%	52	4.1%
Sexual Identity				
Heterosexual/Straight	1,319	78.5%	1,007	79.2%
Bisexual	174	10.4%	124	9.8%
Lesbian/gay	89	5.3%	63	5.0%
Other	59	3.5%	44	3.6%
Missing	40	2.4%	33	2.6%
Education Level				
Less than 12th grade	151	9.0%	110	8.7%
High school graduate/GED	245	14.6%	178	14.0%
Some college	710	42.2%	543	42.7%
College graduate or beyond	547	32.5%	417	32.8%
Missing	28	1.7%	23	1.8%
Previous Year Household Income				
$10,000 or less	635	37.8%	481	37.8%
$10,001 - $20,000	310	18.4%	227	17.9%
$20,001 - $30,000	184	10.9%	144	11.3%
$30,001 - $40,000	161	9.6%	118	9.3%
$40,001 - $50,000	98	5.8%	77	6.1%
Over $50,000	221	13.1%	170	13.4%
Missing	72	4.3%	54	4.2%

Participants were asked about unwanted sexual experiences that had occurred when they were 14 years or older. If they had more than one unwanted sexual experience, they were instructed to think about the most serious experience when answering questions about the

assault. Based on this prompt, 86.0% of participants reported unwanted oral (8.0%), anal (2.7%), or vaginal (75.1%) sex, with the remaining participants (14.0%) reporting unwanted fondling or kissing. Nearly three-quarters (72.2%) reported some amount of physical force, and over 80% of participants reported being "very" or "extremely" upset immediately after the unwanted experience. Most participants (81.1%) were assaulted by a single perpetrator and most (78.1%) knew at least one of their perpetrators. The amount of time between the focal assault and participants' completion of the Time 1 survey varied widely ($M = 14.91$ years, $SD = 11.00$) with 7.6% of participants referencing an assault that occurred within the previous two years.

Procedures

The data analyzed in this study were collected by Dr. Sarah E. Ullman through a National Institute on Alcohol Abuse and Alcoholism grant (R01 #17429). Women who called the phone number listed on the recruitment flyer to express interest in participating were mailed a hard copy of the survey. If a survey was not returned within 4-6 weeks, a research assistant called to confirm receipt of the survey and answer any questions the participant may have had. If the survey had not been received or had been lost, a research assistant sent an additional survey. If the individual stated that they no longer wished to participate, they were thanked for their time and not contacted again. Participants who returned the survey were paid US$25 and were given space to indicate on the survey whether they wished to receive the next survey in one year. All data were collected with Institutional Review Board oversight and approval through the University of Illinois at Chicago. Dr. Ullman provided a de-identified, labeled, and cleaned data set with previously agreed upon variables to the current author. Because the data were de-identified when it was provided to the current author, Michigan State University IRB deemed the study not human subjects research (see IRB designation for STUDY00002737).

Measures

The variables utilized in the analysis were posttraumatic stress symptoms, social support, and the number of years between the focal assault and survey participation.

Posttraumatic stress symptoms. Posttraumatic stress symptoms were assessed using the 17-item standardized Posttraumatic Stress Diagnostic Scale (PDS; Foa, 1995). The PDS lists PTSD symptoms and asks respondents to report whether they experienced the symptom: (0) *never or only one time*, (1) *once in a while*, (2) *half the time*, or (3) *almost always* over the last 12 months. The PDS was designed based on the symptoms and symptom cluster framework of the *DSM-IV*. Recently, an updated version of the PDS (PDS-5, Foa et al. 2016) was developed to be consistent with the *DSM-5*. The present study discusses symptoms and symptom clusters through the framework laid out in this updated measure to increase the relevance of study findings to current understandings of PTSD. Table 2 presents the 17 items that were used in data collection as they correspond to the *DSM-5* symptom clusters and the updated PDS-5.

Table 2: *PTS items used in data collection and associated symptom clusters*

Intrusion
1. Having upsetting thoughts or images about this experience that came into your head when you didn't want them to
2. Having bad dreams or nightmares about the experience
3. Reliving the experience, acting or feeling as if it were happening again
4. Feeling emotionally upset when you were reminded of this experience (for example, feeling scared, angry, sad, guilty, etc.)
5. Experiencing physical reactions when you were reminded of the experience (for example, breaking out in a sweat, heart beating fast)

Avoidance
6. Trying not to think about, talk about, or have feelings about the experience
7. Trying to avoid activities, people, or places that remind you of the experience

Negative Alterations in Cognition and Mood
8. Not being able to remember an important piece of the experience
9. Having much less interest or participating much less often in important activities
10. Feeling distant or cut off from people around you
11. Feeling emotionally numb (like being unable to cry or unable to have loving feelings)
12. Feeling as if your future plans or hopes will not come true (for example, you will not have a career, marriage, children, or a long life)†

Alterations in Arousal and Reactivity
13. Having trouble falling or staying asleep
14. Feeling irritable or having fits of anger
15. Having trouble concentrating (for example, drifting in and out of conversations, losing track of a story on television, forgetting what you read)
16. Being overly alert (for example, checking to see who is around you, being uncomfortable with your back to a door)
17. Being jumpy or easily startled (for example, when someone walks up behind you)

Note: The items used in data collection are based on the PDS (Foa, 1995) and the associated symptom clusters are based on the *DSM-5* (APA, 2013) †This symptom was not retained in the *DSM-5* but based on theoretical similarity it is categorized with the *Negative Alterations in Cognition and Mood* symptom cluster.

Psychometric testing has indicated that the PDS has high reliability and validity. In a sample of individuals reporting various types of traumatic stressors, the PDS demonstrated excellent internal consistency (α = .92) and good test-retest reliability of severity scores when the PDS was administered over a 2 – 3 week period (κ = .83) (Foa et al., 1997). The PDS showed excellent internal consistency in the current sample, as well (α = .93).

Overall mean PTSD scores at Time 1 were 21.06 (*SD* = 12.92), with individual item

scores ranging from a low of 0.78 (feeling as though one was reliving the experience) to a high

of 1.77 (trying not to think about, talk about, or have feelings about the experience). Overall

mean scores were somewhat lower at Time 2 (*M* = 16.77, *SD* = 12.03), with individual item

scores ranging from a low of 0.55 (feeling as though one was reliving the experience) to a high

of 1.41 (trying not to think about, talk about, or have feelings about the experience). Most of the

PDS items ranged from fairly symmetrical to moderately positively skewed (Keppel & Wickens,

2004) and none diverged to the point that the data cannot be treated as normal (Rubin, 2004). For

analysis, symptom scores were dichotomized such that experiencing a symptom "never or only

one time" or "only once in a while" was coded as "0" and experiencing a symptom "at least half

the time" or "almost always" was coded as "1." This approach is consistent with previous

research on posttraumatic stress (e.g., Maguen et al., 2013; Wu & Cheung, 2006; Solomon,

Horesh, Ein-Dor, & Ohry, 2012) and can facilitate substantively meaningful comparisons

between respondents who experienced relatively consistent distress from a symptom and those

who did not.

Social support. Three types of social support were utilized as auxiliary variables:

structural social support, global functional social support, and assault-specific functional social

support. Each type of social support is described below.

Structural social support. Structural social support was operationalized as the frequency

of social contact using five items from the Social Activities Questionnaire of the Research and

Development Health Insurance Experiment (Donald & Ware, 1984). Participants' level of social

contact included in-person and virtual contact with friends and relatives, as well as attendance at

religious services, and was measured on a scale ranging from 1 (every day) to 7 (less than 5

times during the past 12 months). Mean scores on individual items at Time 1 ranged from 2.35 (between *several days a week* and *once a week*) for how often participants talked on the phone, online, or via video chat with friends or relatives to 5.53 (between *about once a month* to *5 to 10 times during the past 12 months*) for how often they attended religious services. The mean score of the scale was 3.75 (*SD* = 1.17), indicating that the mean frequency of social contact was between *once a week* and *2 to 3 times a month*. Time 2 data were relatively similar, with an overall mean score of 3.70 (*SD* = 1.16). Mean scores on the scale were recoded such that higher values indicated higher levels of social support.

Global functional social support. Global functional social support was measured using the Social Support Questionnaire Short Form (Sarason, Sarason, Shearin, & Pierce, 1987). This measure asks participants to respond yes (1) or no (0) to whether they currently have someone in their life that they can count on to be there for them in six different emotionally supportive ways (e.g., someone you can really count on to be dependable when you need help, someone who accepts you totally including both your worst and best points). Overall scores were fairly high, (Time 1: *M* = 5.32, *SD* = 1.39; Time 2: *M* = 5.41, *SD* = 1.37), indicating relatively high levels of global functional social support. Despite the high mean scores, 20-25% of the sample at each time period indicated that there was at least one type of emotional support or validation that they lacked.

Assault-specific functional social support. Assault-specific functional social support was measured by asking participants how satisfied they were with the support provided by various people in their lives when they talked with them about their unwanted sexual experience. Responses ranged from "Very Unsatisfied" (1) to "Very Satisfied" (4). The mean satisfaction across support providers (e.g., friends, family, medical personnel, law enforcement personnel)

was used as an indicator of assault-specific functional social support. At Time 1, scores ranged from 1 – 4 with a mean of 2.71 ($SD = 0.87$). At Time 2, respondents were asked about their overall satisfaction with people they received assault-related support from since the last survey. Scores at Time 2 ranged from 1 – 4 with a mean of 2.99 ($SD = 0.82$).

Years since assault. Years since the focal assault was also included in the analysis in order to control for how the recency of the assault may impact participants' posttraumatic stress symptoms and social support needs. There was a large range in the amount of time that had passed since the focal assault occurred ($M = 14.91$ years, $SD = 12.21$). It should be noted that participants were instructed to reference their most serious assault when responding to the survey, and it is therefore possible that some participants had experienced additional assaults either before or after the focal assault referred to throughout the survey.

Missing data analysis. There were minimal missing data on posttraumatic stress symptoms at Time 1 (0.4% - 1.7% missing) and Time 2 (0.4% - 1.3% missing). Tabachnick and Fidel (2013) recommend conducting a formal missing variables analysis if there is more than 5% missing data, therefore no formal missing variables analysis was needed. Despite the small number of participants who did not answer questions related to posttraumatic stress when filling out the survey, differential study attrition based on posttraumatic stress severity could still have impacted the analysis in undesirable ways. To determine whether there was any relationship between participants' posttraumatic stress symptoms and their likelihood of disengaging from the study, an independent samples t-test was run to compare the Time 1 total PTSD score of participants who completed both surveys to those who discontinued participation after the Time 1 survey. No significant difference was identified ($t(1565) = 0.55$, $p = .58$).

The extent of missing data was also examined for the covariates included in the analysis. There was minimal missing data on structural social support (1.4% at Time 1, 1.6% at Time 2), and higher but still relatively low levels of missing data on global functional social support (6.3% at Time 1, 6.7% at Time 2). There were no significant differences on structural social support ($t(1655) = -0.48$, p = .63) or global functional social support ($t(1573) = -0.49$, p = .63) at Time 1 based on whether or not participants completed the survey at Time 2.

There was substantially more missing data on assault-specific social support than what was seen with other covariates (20.8% at Time 1, 13.9% at Time 2) but missingness was not related to study attrition ($t(1330) = -1.39$, $p = .17$). Due to the conceptual importance of assault-specific social support and the value in testing the relative impact of global and assault-specific functional social support on posttraumatic stress symptoms, assault-specific social support was moved forward into the next stage of the analysis despite the large amount of missing data. However, after running a model with all three social support covariates included, it became clear that missing data on the assault-specific social support measure reduced the final sample by approximately 30% (n = 1,048 without assault-specific support variable, n = 734 with assault-specific support variable). Such a substantial reduction in sample size would have not only reduced statistical power but also introduced concerns about the generalizability of the conditional results to the full sample. Based on these concerns, assault-specific functional social support was not included in the final model. For brevity, subsequent references to what has previously been termed "global functional social support" are shortened to "functional social support."

Data Analytic Plan

Latent class analysis (LCA) is frequently used in social science research to identify unobserved groups, called latent classes, within a larger population. These latent classes are formed by using an observed set of indicators (e.g., items on a survey) to group people with others who are similar to them. LCA are visually depicted through path diagrams, in which each path indicates a relationship between two variables. Figure 1 illustrates a generic path diagram for a latent class analysis, in which the circle represents the categorical latent variable (i.e., the latent class variable). Observed variables are denoted with rectangles and indicators with '*u*'s, such that the rectangles with '*u*'s inside of them in Figure 1 represent the first, second, through the Nth observed indicator. Observed covariates and distal outcomes can also be included in latent class models as predictors of or outcomes associated with class membership. These auxiliary variables are labeled with *x*'s, thus the rectangle with the *x* in Figure 1 signifies that the model includes one observed covariate. The arrows between each part of the diagram denote direct relationships. Figure 1, therefore, displays a latent class model in which one categorical latent variable is based on N observed indicators and one observed covariate is included as a predictor of latent class membership. In this study, LCA was used to identify latent classes of participants based on their responses to Foa et al.'s (1995) Posttraumatic Stress Diagnostic Scale (PDS). The resulting classes communicate categorically different posttraumatic stress symptom profiles, which can vary according to symptom severity, overall severity, or a combination thereof.

Figure 1: *Generic LCA with N observed indicators (u), a categorical latent variable (c), and one covariate (x)*
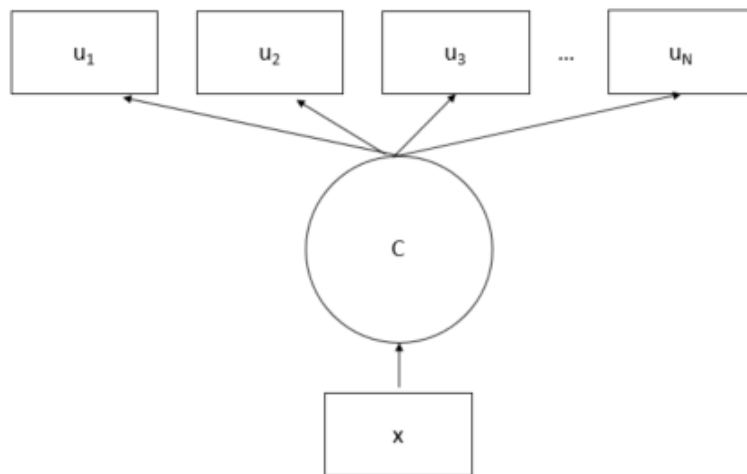
Parameters estimated as part of an LCA include conditional item probabilities and posterior probabilities of class membership. Conditional item probabilities communicate the probability of endorsing a specific item given membership in a particular latent class. The conditional item probabilities from an LCA conducted on the PDS therefore reflect the probability of endorsing specific posttraumatic stress symptoms given latent class membership. Conditional item probabilities may indicate that individuals in one class have a high likelihood of endorsing a specific symptom whereas individuals in another class have a low likelihood of endorsing that same symptom. Taken together, these conditional item probabilities contribute to the substantive interpretation of the latent classes. Posterior probabilities of class membership indicate the probability that an individual belongs to a specific latent class. Each individual in the analysis has an estimated posterior probability for each latent class. The highest posterior probability is used to assign individuals to their most likely latent class. These posterior probabilities can be used to examine whether scores on a predictor variable are equally distributed across classes (i.e., whether some classes have higher or lower values of a predictor variable than others).

LCA is a cross-sectional statistical technique, but there may be research questions that require a longitudinal application of LCA. A longitudinal application of LCA could explore changes in latent class membership over time, such as whether experiences of peer victimization evolve throughout adolescence (Nylund, Muthén, Nishina, Bellmore, & Graham, 2006) or how patterns of substance use develop over students' first year in college (Cho et al., 2015). These research questions can be explored using Latent Transition Analysis (LTA). In carrying out an LTA, latent class analyses are first conducted separately at each time point, after which the latent class models are evaluated for equivalence over time, and finally a joint model is run that includes structural paths between the latent class models from multiple time points. Observed covariates can be included in LTA similarly to how they are included in LCA, with the additional possibility that in LTA they can also be used to study changes in the probability of transitioning between classes at different values of the covariate. An example path diagram of an LTA is shown in Figure 2.
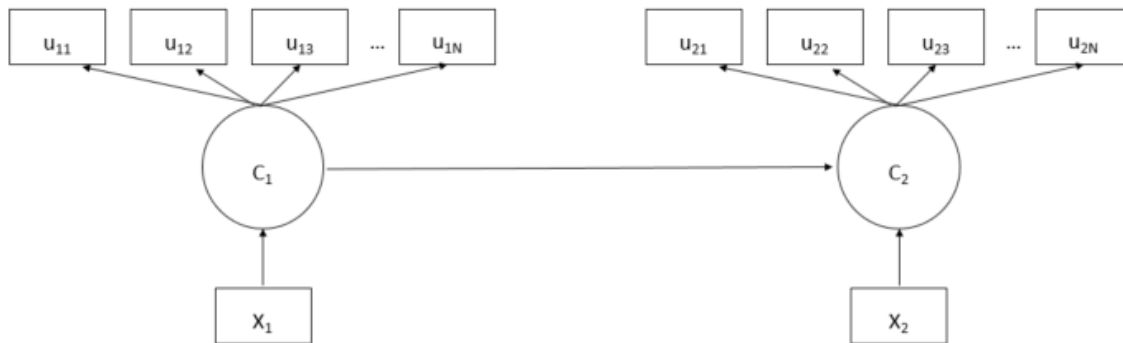
Figure 2: *Generic LTA with N observed indicators (u), a categorical latent variable (c), and one covariate (x) at two time points*

The additional subscript notation ascribed to the observed indicators in Figure 2 denotes the measurement occasion, such that u_{13} represents the first measurement occasion and the third indicator variable and u_{21} represents the second measurement occasion and the first indicator variable. Figure 2 presents an LTA in which one latent class variable is based on N observed indicators at each of two measurement occasions with a covariate predicting latent class membership at each time point. Latent transition models are autoregressive, meaning that class membership at each time point is regressed onto latent class membership at the previous time point. An LTA that models two time points would therefore model the transition from latent class membership at Time 1 to latent class membership at Time 2. In Figure 2, this autoregressive relationship is represented by the arrow connecting C_1 to C_2.

In the current study, LTA was used to examine the frequency with which participants transitioned between latent classes, with years since the assault, structural support and functional support included as observed covariates. Model diagrams for each step of the analytic process, including notation of which research questions are addressed at each step, are presented in Figure 3.

Figure 3: *Model diagrams corresponding to each step in the analysis*

3.1) LCA fitted separately at each time point (Research Question 1)
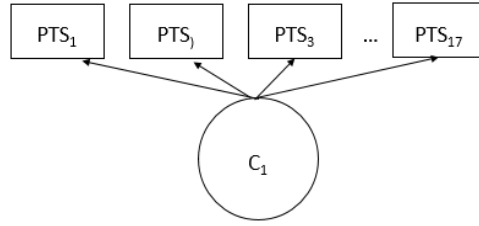
3.2) Joint LCA models for longitudinal measurement invariance testing
(Research Question 2)
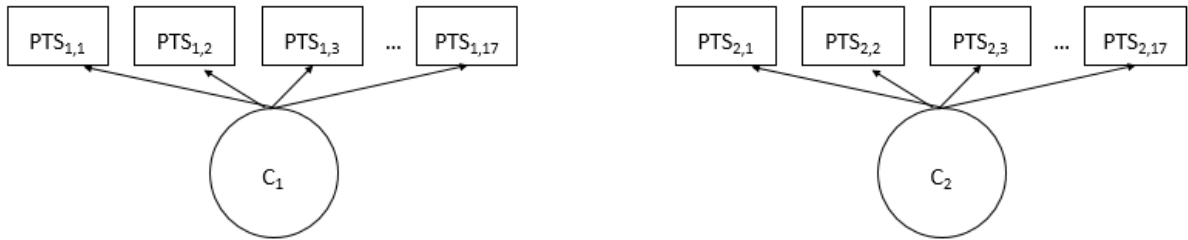
3.3) Addition of structural paths to establish the probability of transition between classes over time
(Research Question 3)
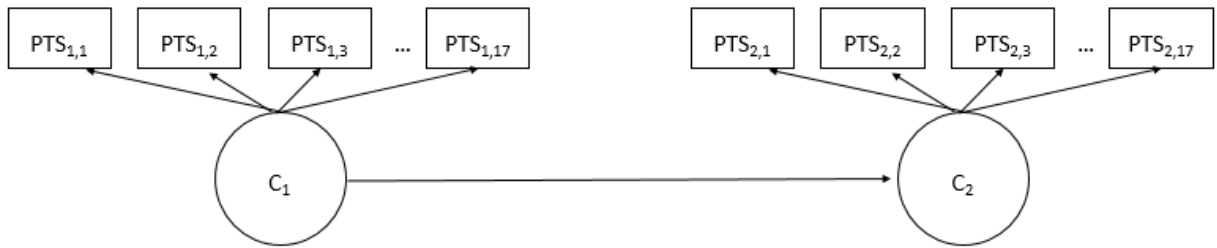
3.4) Addition of structural social support and functional social support auxiliary variables predicting latent
class membership and describing class transition patterns (Research Question 4)
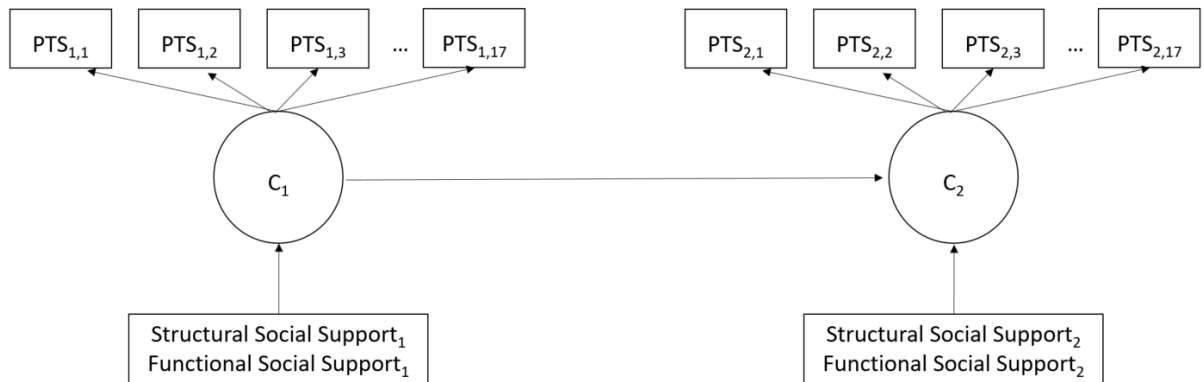
Latent class analysis at Time 1 and Time 2. The study's first research question, what latent subgroups best represent sexual assault survivors' experiences of posttraumatic stress symptoms, was explored through an LCA conducted separately at each of the two time points (i.e., the initial survey and the first follow-up survey given one year later). This research question is depicted in Figure 3 – panel 1. The goal of LCA is to identify the most parsimonious model (i.e., the model with the smallest number of classes) that adequately describes the data, where adequacy is understood in both statistical and substantive terms (Nylund-Gibson & Choi, 2018). The number of latent classes present at each time point was determined through a process known as class enumeration, which begins by specifying an LCA model with only one class and compares statistical and substantive fit as each additional class is added.

The following model fit indices were used in the class enumeration process: the Akaike information criterion (AIC) (Akaike, 1974), Bayesian information criterion (BIC) (Schwartz, 1978), and sample-size adjusted Bayesian information criterion (aBIC) (Sclove, 1987). Lower values on each of these information criteria indices indicated superior model fit, with points of diminishing returns used for model fit interpretation in the event that the information criteria decreased with each successive model. Likelihood-based tests were also used as model fit indicators, specifically the Vuong-Lo-Mendell-Rubin adjusted likelihood ratio test (VLMR-LRT) (Lo, Mendell, & Rubin, 2001) and the bootstrapped likelihood ratio test (BLRT) (McLachlan & Peel, 2000). These likelihood-based tests indicated whether there was statistically significant improvement in model fit when an additional class was added to the model. Substantive criteria in class enumeration included interpretability and uniqueness of the latent classes, as well as the size of the latent classes, with very small classes (<5%) typically avoided

as they often indicate local solutions that are difficult to replicate. Small classes were retained if they had very strong theoretical meaning.

Model equivalency testing. After selecting the final measurement model at each time point (i.e., selecting the appropriate number of classes at each time point), the similarity of the class solutions was visually and statistically evaluated with the goal of determining invariance parameters for the subsequent longitudinal model (Research Question 2). This process involved estimating a joint measurement model that included the latent class solution from Time 1 and Time 2 without the autoregressive relationship characteristic of an LTA (See Figure 3 – panel 2). Measurement invariance testing was conducted, and the model fit statistics generated by a full invariance and full non-invariance model were compared using information criteria indicators and a likelihood ratio test (LRT). Final determination regarding measurement invariance was based on statistical fit as determined by the information criteria statistics and LRT, visual examination of the item probability plots, and substantive theory.

Addition of structural paths. The best fitting model from the previous step was moved forward for use in subsequent analyses and a structural path regressing the latent variable at Time 1 onto the latent variable at Time 2 was added. This addition is reflected in Figure 3 – panel 3 with a direct path between the latent variable at Time 1 and the latent variable at Time 2. This step addressed Research Question 3 by providing the information necessary to interpret the proportion of the sample in each class at Time 1 compared to Time 2, as well as the probability of transitioning between classes over time.

Addition of auxiliary variables. The final step in the LTA was to include measures of social support, which were explored as predictors of latent class membership at Time 1 and Time 2 (see Figure 3 – panel 4). Consistent with the methods literature, these covariates were not added to the model until latent classes were enumerated (Nylund-Gibson & Masyn, 2016). This ordering, known as the "3-step method," ensures that latent classes were able to emerge without being impacted by auxiliary variables (Asparouhov & Muthén, 2013; Vermunt, 2010). Though on the surface it may seem advantageous to incorporate relevant covariates into latent class formation, Nylund-Gibson and Choi (2018) point out that such a method would not identify latent classes that reflect heterogeneity in sexual assault survivors' posttraumatic stress experiences, but rather latent classes that reflect heterogeneity in sexual assault survivors' combined experiences of posttraumatic stress and social support. By adding auxiliary variables after classes have been enumerated, it is possible to evaluate how social support is related to the previously identified latent class solution. Both forms of social support were conceptualized as time varying-covariates (i.e., they were measured repeatedly at the same time as the outcome variable) and were allowed to have time varying effects (i.e., they were allowed to impact latent class membership differently at different measurement occasions). After the relationship between class membership and the covariates was estimated, covariates were set at predetermined levels to indicate "low," "moderate," and "high" social support (values set at the 20th percentile, mean, and 80th percentile, respectively) and the covariates' impact on transition probabilities was examined. It should be noted that transition probabilities are descriptive statistics only and there is not a test for determining when transition probabilities are statistically significantly different from one another (Muthén, 2014).

Software and model estimator. Data management and descriptive analysis took place in SPSS. All latent class and latent transition analyses took place in Mplus version 8.1 (Muthén & Muthén, 1998-2017) using the robust maximum Likelihood (MLR) estimator, which is robust to non-normality. Based on the results of the missing data analysis (described in the *Method* section, above) missing data was handled with Full Information Maximum Likelihood (FIML) estimation, which retains participants who lack complete data in the model.

RESULTS

Presentation of the results begins with descriptive statistics to ground the reader in the overall frequency with which posttraumatic stress symptoms were endorsed at each time point. After the presentation of descriptive statistics, results are organized by each of the four primary research questions.

Descriptive Statistics for Posttraumatic Stress Indicators

Table 3 presents a summary of participants' posttraumatic stress symptoms, dichotomized based on the rationale described in the *Method* section. As can be seen in Table 3, endorsement at Time 1 ranged from 18 – 55%. The five most-commonly endorsed symptoms at Time 1 were: (1) avoiding thoughts of, talking about, or feelings about the experience (55%), (2) being jumpy or easily startled (51%), (3) avoiding activities, people, or places related to the experience (50%), (4) being overly alert (50%), and (5) feeling emotionally upset when reminded of the experience (45%). At Time 2, symptom endorsement ranged from 9 – 40%, with the five most commonly endorsed items being: (1) avoiding thoughts of, talking about, or feelings about the experience (40%), (2) being overly alert (38%), (3) trouble sleeping (38%), (4) being jumpy or easily startled (37%), and (5) avoiding activities, people, or places related to the experience (34%). The data in Table 3 indicate that posttraumatic stress symptoms decreased over time. Reductions ranged from a 6% decrease in "trouble sleeping" to a 19% decrease in "feeling emotionally upset at reminders."

Table 3: *Proportion of time 1 and time 2 sample endorsing PTSD symptoms as occurring 'half the time' or 'almost always'*

	Time 1		Time 2	
	N	Prop.	N	Prop.
Intrusion				
(1) Upsetting thoughts/images	1,675	0.26	1,264	0.14
(2) Bad dreams/nightmares	1,673	0.20	1,264	0.11
(3) Reliving the experience	1,663	0.18	1,256	0.09
(4) Emotionally upset at reminders	1,675	0.45	1,265	0.26
(5) Physical reaction at reminders	1,669	0.28	1,263	0.16
Avoidance				
(6) Avoid thoughts/talking/feelings	1,669	0.55	1,263	0.40
(7) Avoid activities/people/places	1,681	0.50	1,263	0.34
Negative Alterations in Cognition & Mood				
(8) Unable to remember	1,652	0.29	1,254	0.21
(9) Less engaged	1,667	0.28	1,258	0.21
(10) Distant/cut-off	1,669	0.39	1,259	0.30
(11) Emotionally numb	1,667	0.36	1,262	0.24
(12) Foreshortened future	1,671	0.38	1,260	0.31
Alterations in Arousal & Reactivity				
(13) Trouble sleeping	1,672	0.44	1,264	0.38
(14) Irritability/anger	1,664	0.38	1,259	0.29
(15) Trouble concentrating	1,673	0.38	1,260	0.31
(16) Overly alert	1,672	0.50	1,266	0.38
(17) Jumpy/easily startled	1,672	0.51	1,262	0.37

Considered in terms of symptom clusters, the *avoidance* and the *alterations in arousal and reactivity* symptom clusters were endorsed most frequently at both time points, followed by *negative alterations in cognition and mood* symptoms, with *intrusion* symptoms endorsed the least frequently. These endorsement rates, however, speak only to patterns in the sample as a whole and reveal little about subgroups that may exist within the sample. Identifying and understanding those subgroups was the aim associated with Research Question 1.

Research Question 1: What Latent Subgroups Best Represent Sexual Assault Survivors' Experiences of Posttraumatic Stress?

The study's first research question was addressed by conducting a latent class analysis for each wave of data collection. Results from the class enumeration process, in which potential

latent class solutions were generated, the best fitting model was identified, and the final solution was interpreted, are presented below. Latent class enumeration is based on the parsimony principle, which gives preference to the model that adequately captures the data with the fewest number of classes (Masyn, 2013). Within this framework, any potential solution of k classes must be demonstrably superior to the $k - 1$ class solution.

Latent class enumeration at Time 1. Time 1 latent class models were generated ranging from a 1-class to a 10-class solution and goodness of fit statistics were compared (see Table 4). As is often the case, there were conflicting model fit indicators (Nylund & Choi, 2018). The Log-Likelihood, AIC, and aBIC decreased with each successive mode, but the Lo-Mendell Rubin adjusted likelihood ratio test indicated that the adding classes past the three-class model did not significantly improve model fit. The BIC, which is considered the most robust indicator of model fit when comparing latent class models (Nylund, Asparouhov, & Muthén, 2007), continued improving through the seven-class model. Consistent with Nylund-Gibson and Choi's (2018) recommendation, information criteria were plotted with the goal of identifying a point of diminishing returns (Figure 4). The BIC began leveling off at the 6-class model, therefore the 3, 4, 5, and 6 class models were selected as candidate models for substantive interpretation.

Table 4: *Goodness of fit indicators for latent class model at time 1*

	# Free Parameters	LL	AIC	BIC	aBIC	LMR p-value	BLRT p-value	Entropy
1 Class	17	-17997.03	36028.07	36120.30	36066.29	--	--	--
2 Class	35	-14605.42	29280.85	29470.73	29359.54	< .01	0.00	0.90
3 Class	53	-13863.06	27832.12	28119.67	27951.29	**<.01**	0.00	0.88
4 Class	71	-13623.58	27289.15	27774.35	27548.80	0.15	0.00	0.88
5 Class	89	-13435.58	27049.17	27534.03	27249.28	0.07	0.00	0.83
6 Class	107	-13337.35	26888.70	27469.22	27129.29	0.57	0.00	0.82
7 Class	125	-13245.80	26741.60	**27419.77**	27022.66	0.17	0.00	0.80
8 Class	143	-13188.15	26662.30	27438.13	26983.84	0.11	0.00	0.81
9 Class	161	-13130.54	26583.08	27456.56	26945.09	0.18	0.00	0.81
10 Class	179	**-13083.68**	**26525.36**	27496.50	**26927.84**	0.37	0.00	0.82

Note: LL = Log-Likelihood, AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, aBIC = Sample-Size Adjusted Information Criterion, LMR = Lo-Mendell Rubin Adjusted Likelihood Ratio Test, BLRT = Bootstrapped Likelihood Ratio Test

Figure 4: *Information criteria for time 1 unconditional latent class models*
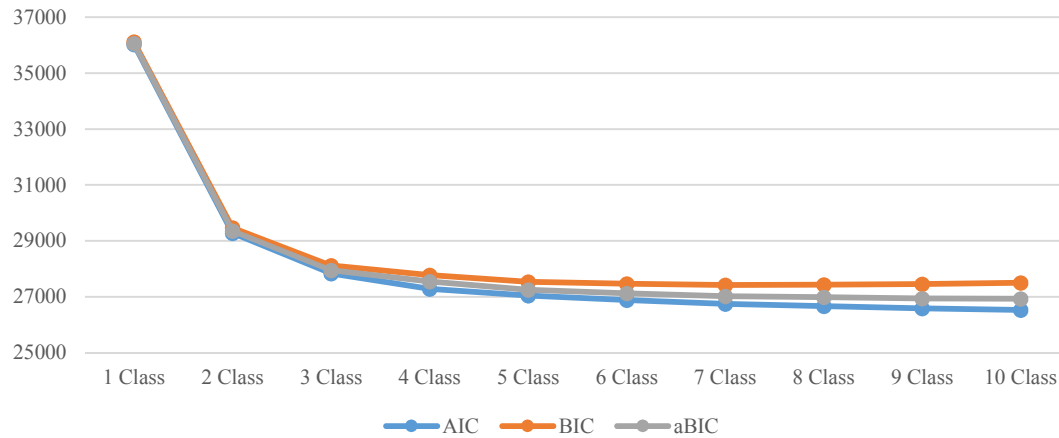
Time 1 candidate models. Item probability plots for Time 1 candidate models are presented in Figure 5. The 3-class model identified classes that differed primarily based on severity (Figure 5—panel a). The three classes can be understood as low, intermediate, and high severity subgroups in which each class's probability of item endorsement was relatively similar across symptom clusters. There was a substantial improvement in information criteria model fit indicators between the 2- and 3-class models and the Lo-Mendell Rubin test was significant (p < .01), indicating that the 3-class model fit the data significantly better than the 2-class model.

The 4-class model identified classes that differed based on both overall severity and symptom cluster severity. The 4-class model retained both low and high severity classes, and two separate intermediate classes emerged, as well. The intermediate classes showed similar levels of severity on *intrusion* and *avoidance* symptom cluster items, but they diverged on *negative alterations in cognition and mood* and *alterations in arousal and reactivity,* with one class (Class 2, Figure 5 – panel b) demonstrating substantially higher levels of endorsement on those symptoms. Interestingly, one of the two intermediate classes (Class 4, Figure 5 – panel b) showed notably different patterns within the *alterations in arousal and reactivity* symptom cluster, demonstrating markedly higher endorsement of the *reactivity* items (*PDS* items 16 and 17) than the *arousal* items (*PDS* items 13, 14, and 15). Though the five items are associated with the one symptom cluster in the *DSM-5*, they will be discussed separately as *reactivity* and *arousal* symptoms when those distinctions are warranted by the patterns that emerge in the data.

The 5-class model continued to reflect high and low severity classes. In addition to the previously identified intermediate classes, the 5-class model identified yet another intermediate class that endorsed moderate to high levels of *intrusion, avoidance,* and *reactivity* and low to moderate levels of *negative alterations in cognition and mood* and *arousal* (Class 2, Figure 5 – panel c). The 6-class model retained similar classes to what was seen in the 5-class model but with the addition of still another intermediate class, this one showing low severity of *intrusion* symptoms and moderate severity of all other symptom clusters (Class 3, Figure 5 – panel d).

Figure 5: *Item probability plots of time 1 latent class candidate models*

a) 3-Class Model

b) 4-Class Model

c) 5-Class Model

d) 6-Class Model
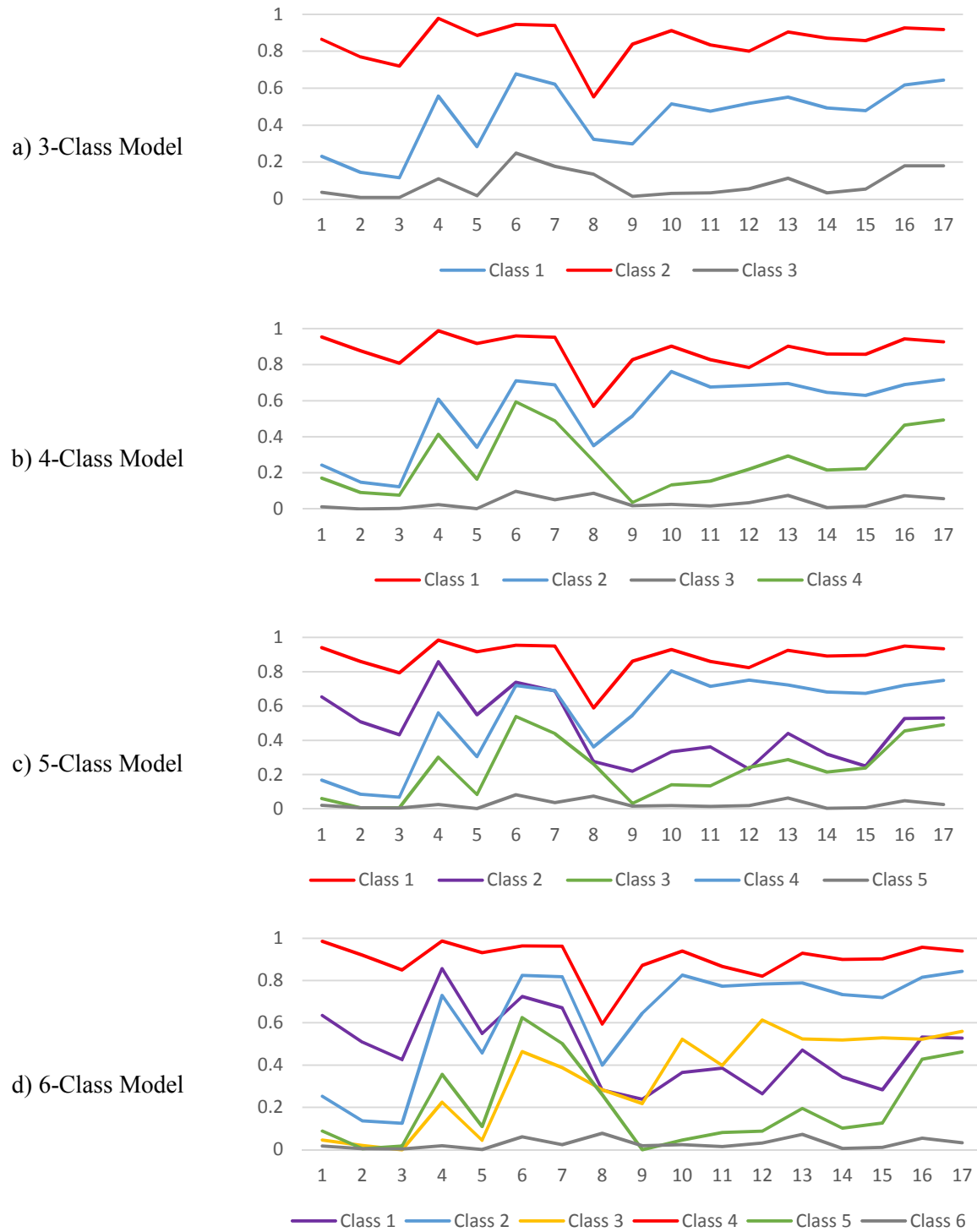
These candidate models are summarized in Table 5. With the goal of identifying the most parsimonious solution that adequately represents the data, each solution was evaluated against the solution with one fewer class to determine whether its contribution justified the loss of parsimony associated with the additional class.

Table 5: *Candidate model summary for the time 1 LCA*

3-Class Model	4-Class Model	5-Class Model	6-Class Model
Characterized by overall severity	Characterized by overall and cluster-specific severity	Characterized by overall and cluster-specific severity	Characterized by overall and cluster-specific severity
High, medium, and low severity classes	High severity, low severity, and two unique intermediate severity classes	High severity, low severity, and three intermediate classes	High severity, low severity, and four intermediate classes
		Two intermediate classes show similar patterns at different severity levels	Two sets of intermediate classes show similar patterns at different severity levels

Table 5 highlights that the primary contributions of the 5- and 6-class models were additional intermediate severity classes that showed similar patterns to those present in the 4-class model at a different level of severity. These contributions were determined to be too minor to justify the loss of parsimony associated with them and they were therefore rejected. The 4-class model, in contrast, was determined to offer unique and substantively meaningful classes. The variation in symptom cluster severity, in addition to overall severity, that was identified in the 4-class model was not represented in the 3-class model. Based on this contribution, as well as the reduction in the BIC when compared to the 3-class model, the 4-class model was selected as the final Time 1 solution.

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Interpretation of final latent class solution at Time 1. In latent class analysis,

conditional item probabilities plots, such as those presented in Figure 5, are used to interpret

latent class solutions during the model selection process. Once the final model has been selected,

those conditional item probabilities can be used to assign names to the latent classes in the same

way that factor loadings are used to name factors in factor analysis. The item probability plot for

the 4-class model is presented in Figure 6, below.

Figure 6: *Item probability plot for final latent class solution at time 1*
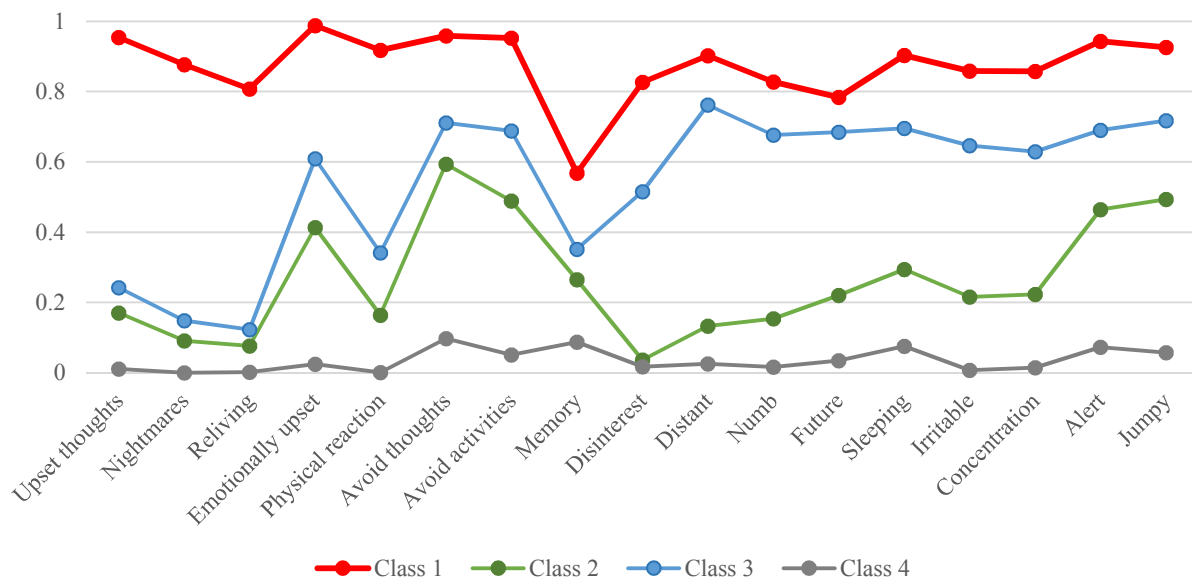
The item probability plot for the 4-class model identified a class in which there was a low

probability (<0.15) of endorsing any posttraumatic stress symptoms. Item endorsement

probabilities were low enough that the class name "Non-Symptomatic" was considered;

however, the decision to dichotomize the latent class indicators meant that low levels of

symptom severity (i.e., a symptom occurring "once in a while") were categorized as non-

endorsement of a symptom. For that reason, labeling the class "Non-Symptomatic" was

determined to go beyond the available information and the class name "Low Severity" was chosen. The 4-class solution also included a class with consistently high probabilities of item endorsement (> 0.55). The name "High Severity" was chosen for this class.

The primary distinction between the intermediate classes was that one of them (Class 3) showed substantially higher probability of endorsement on negative alterations in cognition and mood and some alterations in arousal and reactivity items. These specific items were identified as those commonly associated with depression and anxiety, and the name "Depressed & Anxious" was therefore assigned to this class. This class name is not meant to imply a depression or anxiety diagnosis, but rather is intended to indicate elevated endorsement of symptoms commonly associated with depression and anxiety (Beck & Steer, 1993; Grös, Antony, Simms, & McCabe, 2007). The other intermediate class (Class 2) was characterized by elevated endorsement of avoidance and reactivity items and was therefore named the "Avoidant & Reactive" class. The largest class in the Time 1 4-class model was the Avoidant & Reactive class (32.4%), followed by the Low Severity class (27.7%), the Depressed & Anxious class (25.3%), and the High Severity class (14.6%).

Latent class enumeration at Time 2. Time 2 LCA models with one to ten classes were generated and, as was the case at Time 1, there were conflicting model fit indicators (see Table 6). The Lo Mendel Rubin test indicated that adding classes beyond the 6-class solution did not improve model fit, but the BIC identified the 7-class solution and the aBIC identified the 9-class solution as the best fitting model. Based on these indicators, plotted in Figure 7, the 4-, 5-, 6-, and 7-class models were selected for interpretation.

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Table 6: *Goodness of fit indicators for latent class model at time 2*

	# Free Parameters	LL	AIC	BIC	aBIC	LMR p-value	BLRT p-value	Entropy
1 Class	17	-11857.42	23748.84	23836.28	23782.28	--	--	--
2 Class	35	-9454.22	18978.44	19158.47	19047.29	< .01	0.00	0.90
3 Class	53	-8958.14	18022.29	18294.90	18126.54	< .01	0.00	0.88
4 Class	71	-8793.35	17728.71	18093.90	17868.37	< .01	0.00	0.83
5 Class	89	-8649.83	17747.67	17935.45	17652.75	< .01	0.00	0.82
6 Class	107	-8555.25	17324.50	17874.89	17534.99	**<.01**	0.00	0.80
7 Class	125	-8489.64	17229.28	**17872.23**	17475.17	0.37	0.00	0.81
8 Class	143	-8443.64	17173.29	17908.82	17454.59	0.33	0.00	0.81
9 Class	161	-8402.72	17127.447	17955.57	**17444.16**	0.37	0.00	0.81
10 Class	179	**-8367.03**	**17092.62**	18012.77	17444.18	0.47	0.00	0.82

Note: LL = Log-Likelihood, AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, aBIC = Sample-Size Adjusted Information Criterion, LMR = Lo-Mendell Rubin Adjusted Likelihood Ratio Test, BLRT = Bootstrapped Likelihood Ratio Test

Figure 7: *Information criteria for time 2 unconditional latent class models*
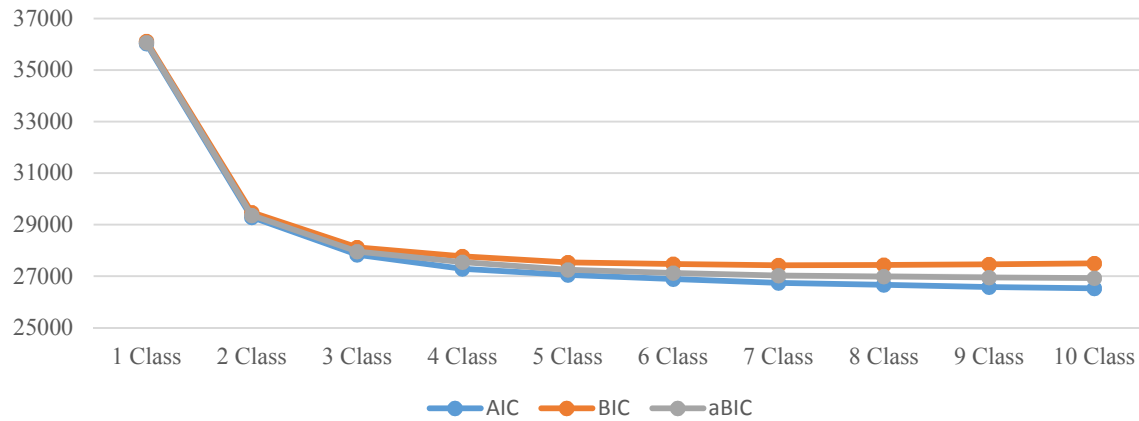
Time 2 candidate models. Time 2 candidate models are presented in Figure 8. The 4-class model identified low and high severity classes, as well as two intermediate classes. One of the intermediate classes (Class 3, Figure 8 – panel a) was characterized by symptoms of *negative alterations in cognition and mood* and *alterations in arousal/reactivity.* The other intermediate class (Class 4, Panel 8a) was characterized primarily by *avoidance* and *reactivity.*

The 5-class model retained the 4-class model categories and added an additional intermediate class (Class 4, Figure 8 – panel b). This new class showed a similar pattern of responses to Class 3, though at a lower level of severity. The level of differentiation varied across symptom clusters, but the lines graphing item endorsement remained parallel over all items, indicating a similar pattern of responses.

The 6-class model was nearly identical to the 5-class model, with the exception that the most recently added class appeared to split in two. These classes (Classes 3 and 5, Figure 8 – panel c) demonstrated very similar item endorsements for *intrusion, avoidance, negative alterations in cognition and mood,* and *arousal* symptoms but diverged sharply on the *reactivity* items, with Class 5 endorsing *reactivity* symptoms at a level nearly equal to the high severity class and Class 3 endorsing them at a level similar to the low severity class.

The 7-class model retained many of the same characteristics that were evident in previous models, though one class showed higher avoidance symptoms than it had previously (Class 3, Figure 8 – panel c, and Class 6, Figure 8 – panel d). The new class that emerged in the 7-class model was characterized by low-moderate severity with the most severe symptoms in the *negative alterations in cognition and mood* and *arousal* categories.

Figure 8: *Item probability plots of time 2 latent class candidate models*

a) 4-Class Model

b) 5-Class Model

c) 6-Class Model

d) 7-Class Model
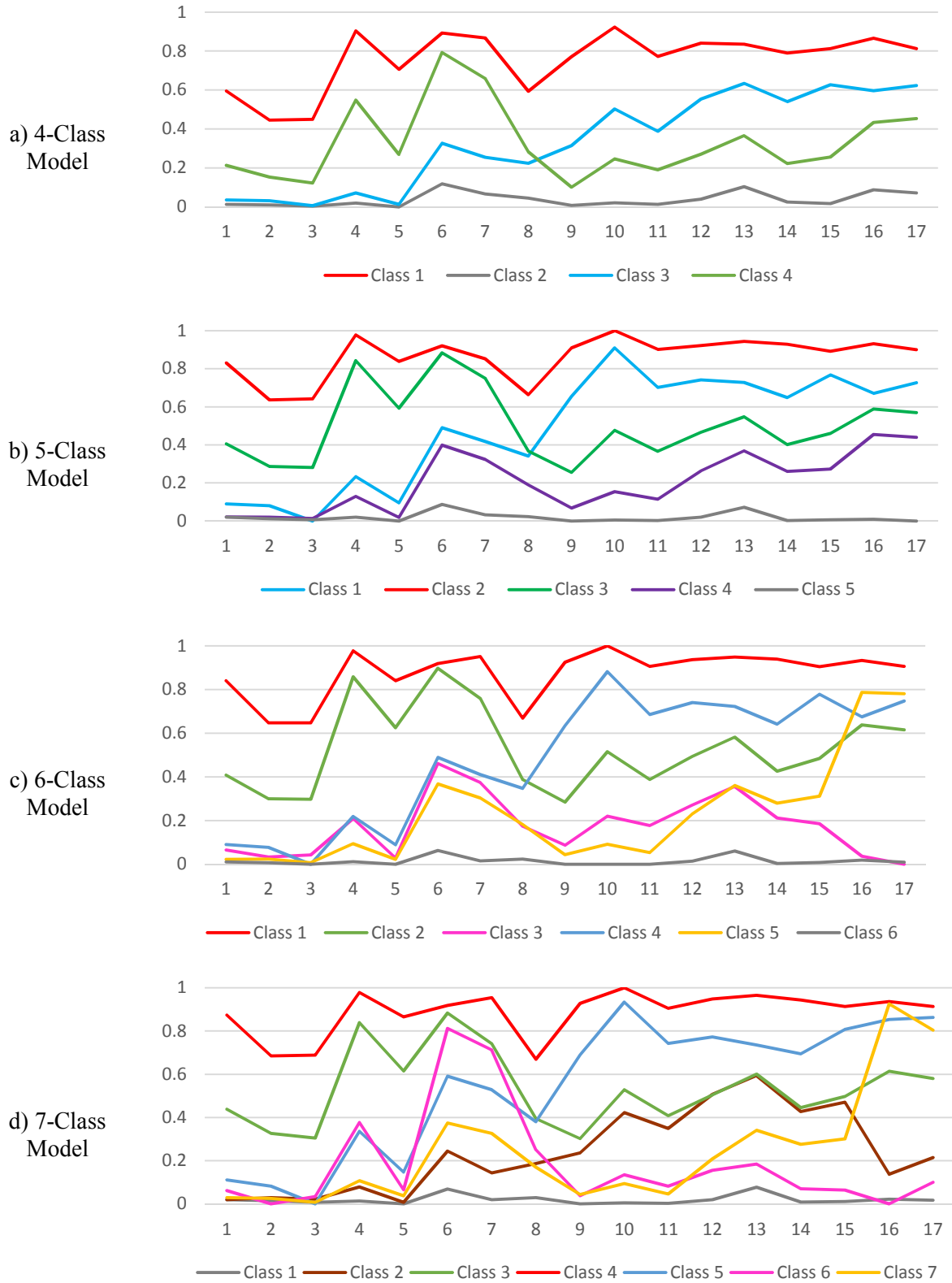
In a process similar to what was previously described for the Time 1 models, candidate models were evaluated with the goal of identifying the solution that adequately represented the data with the fewest number of classes.

Table 7: *Candidate model summary for time 2 LCA*

4-Class Model	5-Class Model	6-Class Model	7-Class Model
Characterized by overall and cluster-specific severity	Characterized by overall and cluster-specific severity	Characterized by overall and cluster-specific severity	Characterized by overall and cluster-specific severity
High severity, low severity, and two intermediate classes	High severity, low severity, and three intermediate classes	High severity, low severity, and four intermediate classes	High severity, low severity, and five intermediate classes
	Two intermediate classes show similar patterns at different severity levels	Existing class splits into two classes that diverge only on two *reactivity* items	New class emerges with similar pattern to existing class except on two *reactivity* items

As is summarized in Table 7, the 6- and 7-class solutions added classes that were substantively unique (i.e., not a replication of an existing endorsement pattern) but their primary differentiation from existing classes was on the two *reactivity* items only. Though that differentiation was theoretically interesting, there were concerns that two-item differences were not meaningful enough to justify the loss of parsimony associated with a 6- or 7-class model. The 6- and 7-class solutions were therefore rejected. In evaluating the 5-class solution, it was determined that the new class to emerge in that model could be understood as a lower severity version of an existing class in the 4-class model. The 4-class model was determined to adequately capture the data and was therefore selected as the final Time 2 model.

Interpretation of final latent class solution at Time 2. The Time 2 4-class model showed a similar class structure to what was seen in the Time 1 model. As can be seen in Figure 9, there

was a class with consistently low probabilities of item endorsement (Class 4), and this class was therefore was named the "Low Severity" class. There was also a class with generally high levels of item endorsement that were consistently higher than those of every other class (Class 3); this class was named the "High Severity" class.

Figure 9: *Item probability plot for final latent class solution at time 2*
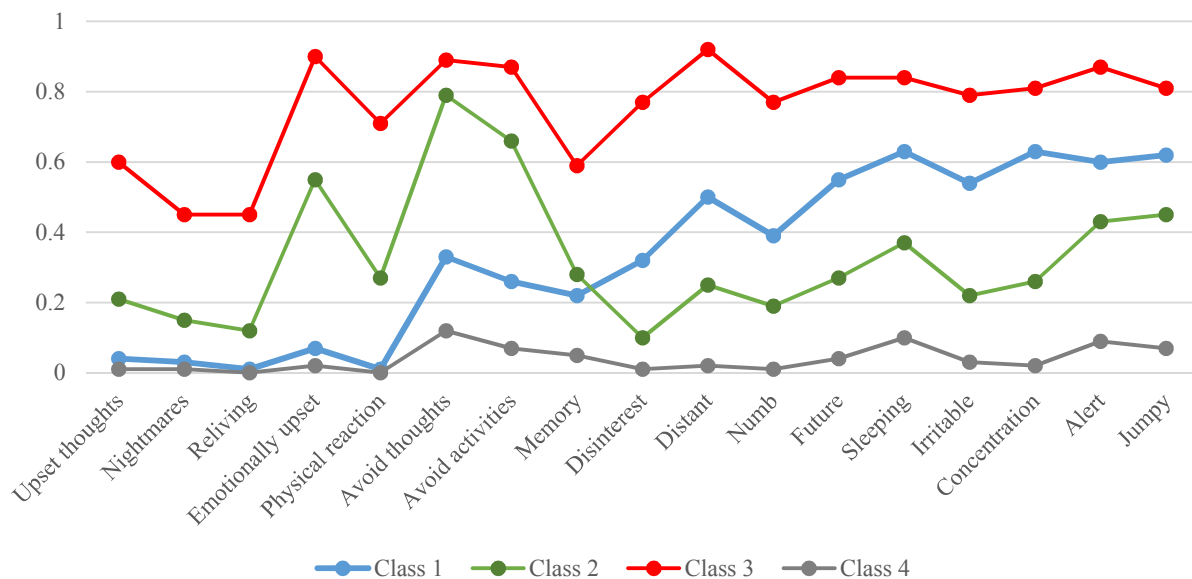
There were also two intermediate classes in the Time 2 final solution. One of these classes (Class 1) was again was characterized by items related to depression and anxiety (e.g., disinterest, numbness, foreshortened future, difficulty sleeping) and was therefore named the Depressed & Anxious class. The other intermediate class (Class 2) was characterized by items representing avoidance and reactivity and was named the Avoidant & Reactive class. At Time 2, the Low Severity class was the largest (45.6%), followed by the Depressed & Anxious class (21.1%), the Avoidant & Reactive class (17.8%) and the High Severity class (15.4%).

Summary of research question 1 results. To explore Research Question 1, LCA was used to identify latent classes representing sexual assault survivors' experiences of posttraumatic

stress symptoms. Four candidate models were evaluated for Time 1 and Time 2 data and, in both instances, the 4-class solutions were identified as the best fitting models. Also at both instances, Low Severity, High Severity, Depressed & Anxious, and Avoidant & Reactive classes were identified. The degree to which these classes can be understood as equivalent across time is addressed with results related to Research Question 2.

Research Question 2: Is the Latent Class Measurement Model Stable Over Time?

To address the study's second research question, the latent class solutions identified in the previous step were examined to determine whether they have comparable measurement characteristics across time. If similar measurement characteristics are identified, measurement invariance restrictions, which hold measurement parameters constant across time, can be imposed in longitudinal models such as an LTA. An LTA that imposes measurement invariance is more parsimonious and less likely to encounter estimation problems than one in which the measurement parameters are freely estimated across time. Imposing measurement invariance also allows for direct comparison of class membership at each time point, as latent classes would be consistently interpreted across time. For these reasons, imposing measurement invariance restrictions is recommended whenever it is statistically and substantively justifiable to do so (Collins & Lanza, 2010). Determining whether measurement invariance is justifiable requires answering two questions, the first statistical and the second substantive. Statistically, does a freely estimated (i.e., unconstrained) model fit the data better than a constrained model? Substantively, to the degree that there are changes in classes' item endorsement patterns across time, are those changes substantively meaningful or indicative of a theoretically important shift?

The statistical measurement invariance question comes with an important caveat, which is that a freely estimated model will always fit the data better than a constrained model, as free

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estimation allows modeling of all differences regardless of their importance (Nylund, 2007). In practice, then, evaluation of the model fit statistics that result from measurement invariance testing requires evaluating not just which model fits better but the magnitude of the difference in model fit indices. It should also be noted that formal measurement invariance testing is only needed when the same number of classes emerge from each measurement model, as measurement invariance assumptions would not be appropriate for a longitudinal model with a different number of classes at each time point. Because both of the final measurement solutions identified in the previous step were 4-class models, formal measurement invariance testing was appropriate for the current analysis.

Model fit indices for the fully constrained and freely estimated joint 4-class models are presented in Table 8. As would be expected, particularly with a large sample size, the log-likelihood ratio test indicates that the freely estimated model fits significantly better than the fully constrained model ($p < .001$). The AIC is superior for the freely estimated model, but the aBIC and BIC are substantially better in the constrained model. The aBIC and BIC penalize for the number of freely estimated parameters, indicating that when parsimony is considered the fully constrained model is superior to the freely estimated model.

Table 8: *Joint LCA model fit indices at different levels of measurement invariance*

	Free Parameters	Log Likelihood	TRD p-value	AIC	BIC	aBIC
Freely Estimated	142	-22416.93	**< .001**	**45117.86**	45888.43	45437.32
Fully Constrained	74	-22529.77	--	45207.55	**45609.11**	**45374.02**

Note. The TRD p-value was calculated using the Loglikelihood formulas: cd = (p0*c0 – p1*c1)/(p0 - p1); TRd = 2*(L0 – L1)/cd.

With statistical support for both the freely estimated and fully constrained models, the substantive meaning of the class changes over time takes on additional importance. Using a freely estimated model (or one with some freely estimated parameters) may be preferable if the passage of time has developmental or other theoretical significance, as it may then be meaningful to model the parameter changes. In the current data, the one-year period between measurement occasions lacked consistent theoretical meaning, as participants were instructed to complete the survey in reference to their only or most serious assault, which occurred various lengths of time in the past ($M = 14.91$ years, $SD = 12.21$). It is unlikely that the one-year period between the first and second surveys had the same meaning for a participant whose assault took place six months ago as a participant whose assault took place six years ago, and even less so for a participant whose assault took place twenty years ago. Therefore, it is difficult to assign theoretical significance to the specific measurement occasions.

If the passage of time itself does not have a consistent meaning, the substantive importance of changes in the latent classes rests on whether the changes are large enough to alter the meaning of the classes themselves. Examining the item probability plots from the freely estimated joint model presented in Figure 10, this does not appear to be the case.

Figure 10: *Item probability plots for freely estimated joint model*
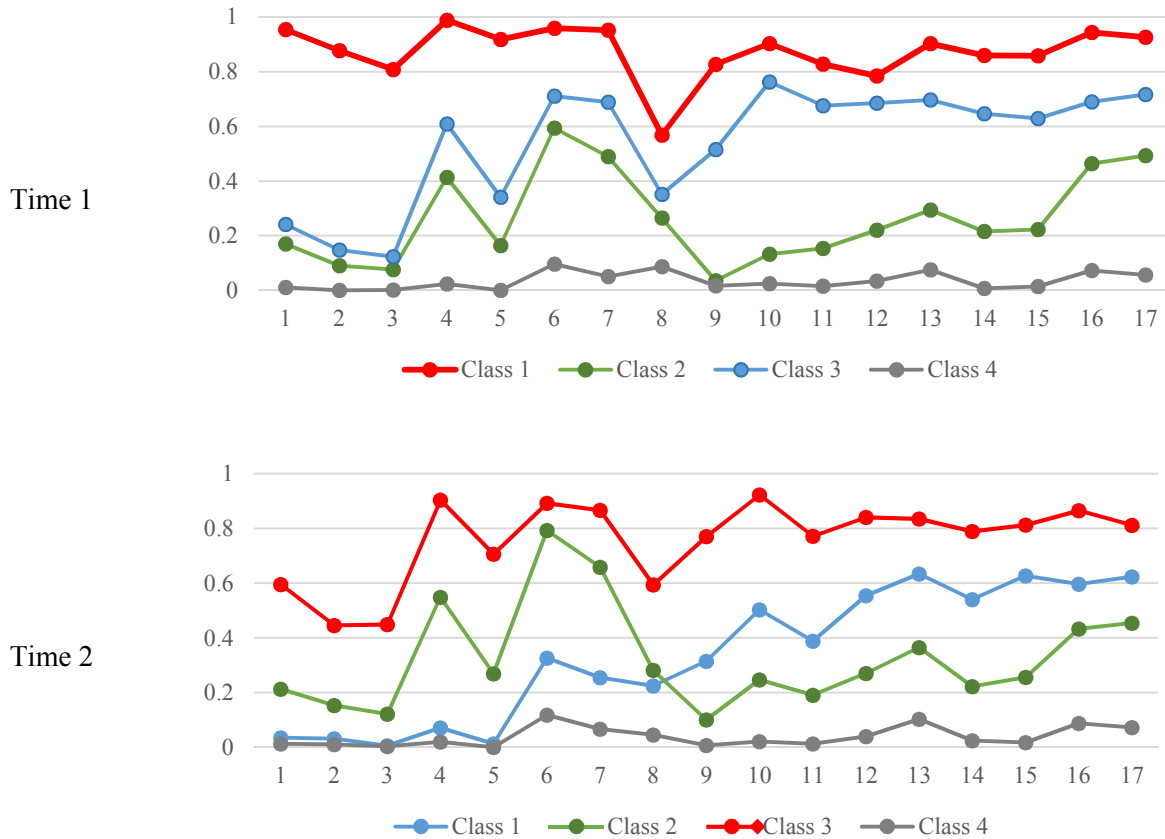
Though the High Severity class had a lower probability of endorsing *intrusion* symptoms at Time 2 than was the case at Time 1, it remained the highest severity class on all items across both time points. The *avoidance* symptoms in the Avoidant & Reactive class were higher at Time 2 compared to Time 1, but its overall pattern of symptoms was defined by *avoidance* and *reactivity* at both measurement occasions. The most substantial changes were reflected in the Depressed & Anxious class: while this group showed a high probability of endorsing *avoidance* and some *intrusion* symptoms at Time 1, the same was not true at Time 2. Ultimately, this difference was determined not to be theoretically meaningful enough to justify an unconstrained model, particularly in light of the BIC and aBIC supporting model constraints. The fully constrained model was therefore selected as the final joint LCA model. The item probability plot for this

model is presented in Figure 11; there is only one plot depicted because, with measurement invariance restrictions imposed, the conditional item probabilities are identical across measurement occasions. Although the classes produced by the fully invariant model are more similar to the freely estimated model's Time 1 rather than Time 2 LCA solution, the preference of the aBIC and BIC for the invariant model indicates that the joint model does fit the data well across time.

Figure 11: *Item probability plot for joint model with full measurement invariance*
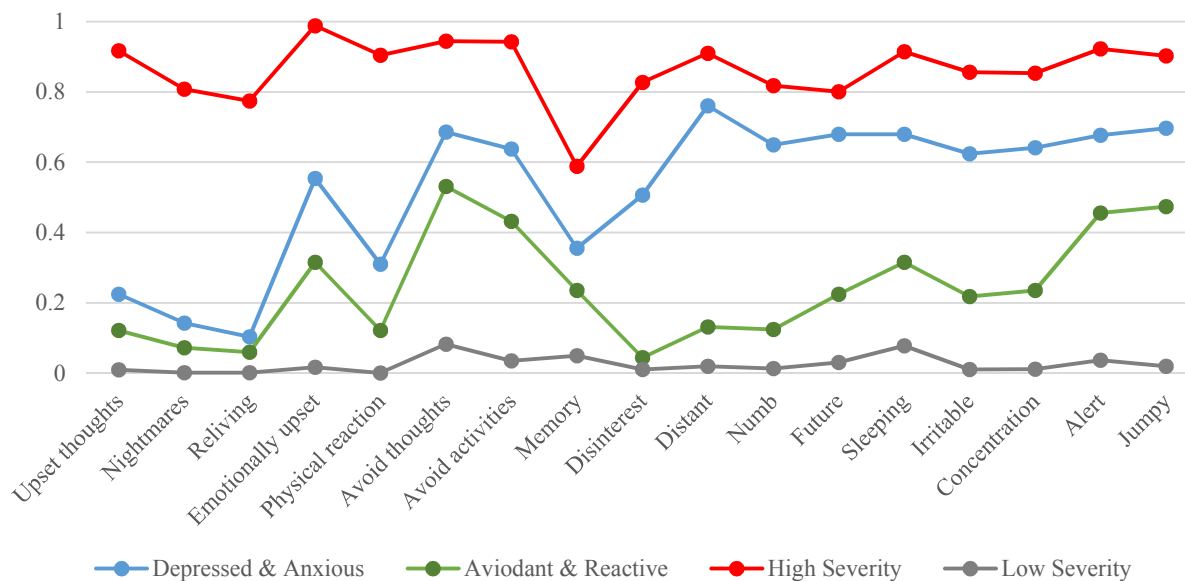
Summary of research question 2 results. Research Question 2 asked whether the measurement models identified in the previous analytic step were similar enough that they could be treated as equivalent. To answer this question, two joint models with Time 1 and Time 2 data were run, the first holding measurement parameters equal across time and the second letting those parameters be freely estimated. Indications from the goodness of fit statistics were mixed, with the Log Likelihood and AIC indicating that the freely estimated model fit the data better and the aBIC and BIC preferencing the fully constrained model. Substantive considerations also

lent support to the fully constrained model, as the one year between surveys lacked a consistent meaning for participants and the overall interpretation of the latent classes was the same at each measurement occasion. Based on these factors, the determination was made that the measurement models could be treated as equivalent and the fully constrained model was selected for use in the LTA.

Research Question 3: What is the Probability of Transition Between Latent Classes?

To explore the study's third research question, the probability of class membership at Time 2 based on class membership at Time 1 was estimated for all latent classes. This required building on the joint model developed in the previous step by adding a structural path regressing the latent class variable at Time 2 onto the latent class variable at Time 1. Because the four classes identified in the final joint model varied by overall severity in addition to symptom cluster specific severity, transitions can be discussed in terms of escalation and de-escalation, with movement from the High Severity to the Depressed & Anxious, Depressed & Anxious to the Avoidant & Reactive, and Avoidant & Reactive to the Low Severity classes indicating de-escalation and the reverse pattern indicating escalation. Discussion of escalation and de-escalation, however, is not meant to imply that the differences between levels of severity are equal and should not obscure the qualitative differences between classes.

Table 9 presents the transition probabilities from the unconditional LTA. The probability of remaining in the same latent class over time can be found in the diagonal of the transition matrix, which is bolded for interpretability. High values along diagonal indicate high levels of stability in latent class membership. The off-diagonal cells indicate the probability that someone in the corresponding row at Time 1 will transition into the corresponding column class at Time 2. Based on the structure of Table 9 and all subsequently presented transition matrices, the

probabilities to the left of the diagonal indicate escalation and the probabilities to the right of the diagonal indicate de-escalation. For someone assigned to the Avoidant & Reactive class at Time 1, for example, escalating is represented by the probability of moving into either the Depressed & Anxious Class or the High Severity class, both to the left of the diagonal. De-escalating from the Depressed & Anxious class is represented by moving into the Low Severity class one column to the right.

Table 9: *Latent transition probabilities based on the unconditional estimated latent transition model*

Time 1	Time 2			
	High Severity	Depressed & Anxious	Avoidant & Reactive	Low Severity
High Severity	**0.34**	0.26	0.23	0.18
Depressed & Anxious	0.06	**0.50**	0.30	0.14
Avoidant & Reactive	0.03	0.10	**0.46**	0.42
Low Severity	<0.01	0.03	0.17	**0.80**

The transition probabilities presented in Table 9 illustrate substantial transition between Time 1 and Time 2, with only individuals assigned to the Low Severity class at Time 1 showing a greater than 50% probability of staying in the same class at Time 2. Individuals assigned to the High Severity class at Time 1 showed a particularly low likelihood of remaining in the same class over time. The greatest stability was evidenced in the Low Severity class and the least stability was found in the High Severity class, which indicates that few participants who began the study with low severity symptoms experienced escalation and many who started with high severity symptoms de-escalated over time.

The off-diagonal cells show evidence of de-escalation, as well. Individuals who transitioned out of the Avoidant & Reactive class, for example, were more likely to transition into the Low Severity class rather than into the Depressed & Anxious or High Severity class. Similarly, individuals who transitioned out of the Depressed & Anxious class were more likely to transition into the Avoidant & Reactive or Low Severity classes rather than the High Severity class.

Table 9 also shows that movement into a higher severity class did occur, though, as discussed above, de-escalation was more typical. Six percent of those who were assigned to the Depressed & Anxious class at Time 1 moved into the High Severity class at Time 2. Similarly, 10% of participants assigned to the Avoidant & Reactive class at Time 1 moved into the Depressed & Anxious class at Time 2, and an additional 3% moved into the High Severity class. Though 80% of participants assigned to the Low Severity class at Time 1 remained in the Low Severity class at Time 2, the remaining 20% transitioned into a higher severity class.

Summary of research question 3 results. Broadly speaking, Research Question 3 asked how participants' latent class membership at Time 1 predicted their latent class membership at Time 2. The unconditional LTA estimated in response to this question indicated that transitioning between latent classes over time was common. When these transitions occurred, they generally represented moving into a lower severity class. This was not always the case, however, as some participants did escalate into higher severity classes. The next step of the analysis sought to determine whether class membership and the transition between classes was predicted by social support.

Research Question 4: What is the Relationship Between Social Support, Latent Class Membership, and Latent Class Transitions?

The study's final research question was focused on understanding the relationship between social support and the latent classes representing posttraumatic stress symptoms. Answering this question involved adding covariates to the unconditional LTA estimated in the previous step. Specifically, the latent variable based on posttraumatic stress symptoms at Time 1 was regressed onto measures of social support collected at Time 1 and the latent variable based on posttraumatic stress symptoms at Time 2 was regressed onto measures of social support collected at Time 2. The Time 1 latent variable was regressed onto a covariate representing the number of years since the focal assault, as well, in order to control for ways that time since the assault might influence posttraumatic stress, social support, or both. Years since the assault was not expected to influence class membership at Time 2 beyond any influence exerted at Time 1, therefore it was only included in the Time 1 regression statement. Logistic regression coefficients with the Low Severity class as the reference class are presented in Table 10. Relationships between each covariate and the latent variable were estimated with all other covariates held constant; the significant relationships discussed below are therefore described with the impact of other covariates accounted for.

These results indicate that at Time 1, individuals in both the High Severity and the Depressed & Anxious class were likely to have lower levels of structural support compared to the Low Severity class. Individuals in those two classes were likely to have lower levels of functional support when compared to the Low Severity class, as well. Fewer years since the focal assault increased the likelihood of being in the High Severity, Depressed & Anxious, and Avoidant & Reactive class compared to the Low Severity class.

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Table 10: *Logistic regression coefficients for the 4-class LTA with structural and functional social support included as covariates and the low severity class as the reference group*

	Effect	Coefficient	S.E.	Z	P-value	Odds Ratio
Time 1						
High Severity	Structural	-0.24*	0.10	-2.38	0.02	0.78
	Functional	-0.24*	0.10	-2.48	0.01	0.79
	Years ago	-0.04*	0.01	-4.15	<0.01	0.96
Depressed & Anxious	Structural	-0.24*	0.08	-3.01	<0.01	0.78
	Functional	-0.28*	0.09	-3.02	<0.01	0.76
	Years ago	-0.02*	0.01	-2.85	<0.01	0.98
Avoidant & Reactive	Structural	-0.07	0.09	-0.84	0.40	0.93
	Functional	-0.09	0.11	-0.85	0.39	0.91
	Years ago	-0.03*	0.01	-3.68	<0.01	0.97
Time 2						
High Severity	Structural	-0.11	0.13	-0.86	0.39	0.89
	Functional	-0.62*	0.11	-5.48	0.00	0.54
Depressed & Anxious	Structural	-0.33*	0.11	-3.06	<0.01	0.72
	Functional	-0.31*	0.10	-2.83	0.01	0.73
Avoidant & Reactive	Structural	0.01	0.09	0.11	0.91	0.99
	Functional	-0.10	0.10	-0.98	0.33	0.90

* p < .05

Patterns were similar, though not identical, at Time 2. Participants assigned to the Depressed & Anxious class remained likely to have lower structural and functional social support than those assigned to the Low Severity class. Individuals in the High Severity class continued to show lower functional support, but they no longer showed lower structural support when compared to the Low Severity class. There remained no significant differences in social support when comparing the Avoidant & Reactive and Low Severity classes.

Another way to understand the relationship between social support and class membership is to compare the probability of transitioning between latent classes at different levels of social support. The probability of transitioning between latent classes when both types of social support were low (defined as values at the 20th percentile), when both types of social support were at the

mean, and when both types of social support were high (defined as values at the 80th percentile) are presented in Table 11. Years since the focal assault was held at the mean for all comparisons.

Table 11: *Transition probabilities at different levels of structural and functional social support with years since the assault held constant at the mean*

Structural and Functional Support at 20th Percentile ("Low Social Support Model")				
		Time 2		
Time 1	High Severity	Depressed & Anxious	Avoidant & Reactive	Low Severity
High Severity	**0.38**	0.32	0.18	0.12
Depressed & Anxious	0.05	**0.57**	0.24	0.14
Avoidant & Reactive	0.04	0.15	**0.47**	0.34
Low Severity	<0.01	0.04	0.24	**0.72**

Structural and Functional Social Support at Mean ("Moderate Social Support Model")				
		Time 2		
Time 1	High Severity	Depressed & Anxious	Avoidant & Reactive	Low Severity
High Severity	**0.35**	0.26	0.23	0.16
Depressed & Anxious	0.05	**0.47**	0.30	0.18
Avoidant & Reactive	0.03	0.11	**0.49**	0.38
Low Severity	<0.01	0.02	0.24	**0.74**

Structural and Functional Social Support at 80th Percentile ("High Social Support Model")				
		Time 2		
Time 1	High Severity	Depressed & Anxious	Avoidant & Reactive	Low Severity
High Severity	**0.29**	0.20	0.29	0.22
Depressed & Anxious	0.04	**0.36**	0.37	0.24
Avoidant & Reactive	0.02	0.07	**0.50**	0.41
Low Severity	<0.01	0.01	0.23	**0.76**

Several interesting findings emerged from this comparison of transition probabilities at different levels of social support. Participants who were assigned to the High Severity or Depressed & Anxious class at Time 1 had a greater likelihood of staying in that class when social support was low. For example, someone assigned to the High Severity class at Time 1 had a 29% probability of remaining in the High Severity class at Time 2 when social support was high and, by contrast, the probability of staying in the High Severity class was 38% when social support was low. The change is even more marked for those assigned to the Depressed & Anxious class at Time 1, for whom the probability of remaining in the Depressed & Anxious class was 36% when social support was high and 57% when social support was low. Together, these stability indicators suggest that participants were more likely to stay in one of the higher severity classes over time if they had less social support.

Across all classes, the probability of escalation was highest when social support was low. Looking at the transition probabilities for individuals assigned to the Avoidant & Reactive class at Time 1, for example, a higher proportion escalate to one of the higher severity classes in the Low Social Support model (0.19) compared to the Moderate Social Support model (0.14) and the High Social Support Model (0.09). Conversely, the probability of de-escalating is highest when social support is also high. Of those assigned to the Depressed & Anxious class at Time 1, a higher proportion de-escalate in the High Social Support model (0.61) compared to the Moderate Social Support model (0.48) or the Low Social Support Model (0.38).

The transition probabilities that have been explored up to this point have been based on circumstances in which structural and functional social support vary in tandem (i.e., both structural and functional social support are low or both structural and functional social support are high). However, that need not always be the case; it is also possible that individuals may

experience high levels of structural support and low levels of functional support or the reverse. It may be helpful for survivors, practitioners, and researchers to know whether one type of support is more strongly related to symptom changes than the other. Transition matrices in which one type of social support was set at the 80th percentile and the other was set at the 20th percentile were examined to clarify these relationships (see Table 12).

Table 12: *Transition probabilities with disparate levels of structural and functional social support*

Low Structural Support (20th Percentile) and High Functional Support (80th Percentile)				
	Time 2			
Time 1	High Severity	Depressed & Anxious	Avoidant & Reactive	Low Severity
High Severity	**0.28**	0.32	0.23	0.17
Depressed & Anxious	0.04	**0.52**	0.27	0.17
Avoidant & Reactive	0.02	0.13	**0.47**	0.38
Low Severity	<0.01	0.03	0.23	**0.74**
High Structural Support (80th Percentile) and Low Functional Support (20th Percentile)				
	Time 2			
Time 1	High Severity	Depressed & Anxious	Avoidant & Reactive	Low Severity
High Severity	**0.39**	0.20	0.24	0.16
Depressed & Anxious	0.06	**0.40**	0.34	0.20
Avoidant & Reactive	0.03	0.08	**0.51**	0.38
Low Severity	<0.01	0.02	0.24	**0.74**

These transition probabilities suggest that structural and functional social support may interact with the latent classes—specifically, the High Severity and Depressed & Anxious classes—in different ways. The probability of de-escalating from the High Severity class was

greater when participants had high levels of functional support than when they had high levels of structural support, suggesting that having someone who can be counted on for emotional validation may be particularly important for transitioning out of the High Severity class. Conversely, participants had a higher probability of de-escalating from the Depressed & Anxious class when they had access to structural, rather than functional, support. In more concrete terms, lacking at least one form of emotional validation predicted continually severe symptoms for people in the High Severity class, whereas low levels of social contact predicted continually severe symptoms for people in the Depressed & Anxious class.

Summary of research question 4 results. The goal of Research Question 4 was to understand the longitudinal relationship between social support and the previously identified latent classes. A conditional LTA was estimated with the Low Severity class as the reference group, and a number of significant relationships emerged. Lower levels of functional support consistently predicted membership in the High Severity and Depressed & Anxious class. Lower levels of structural support consistently predicted membership in the Depressed & Anxious class and predicted membership in the High Severity class at Time 1. Transition tables clarified these relationships further, illustrating that de-escalation was more likely at higher levels of social support. Transition probability tables that held one type of social support high and the other low were also generated to identify ways in which structural and functional support might interact with latent classes differently. De-escalation was more probable for members of the High Severity class when functional support was high and structural support was low, but the pattern was reversed for members of the Depressed & Anxious class. These dissimilar patterns highlight the qualitative, as well as quantitative, differences between the latent classes.

DISCUSSION

The overarching goal of the current study was to explore sexual assault survivors' posttraumatic stress experiences and to identify how social support relates to those posttraumatic stress experiences over time. Utilizing the first two waves of a longitudinal study in which data were collected from an urban community sample of adult sexual assault survivors one year apart, latent class analysis (LCA) was used to identify subgroups of posttraumatic stress symptom presentations at each measurement occasion. Latent transition analysis (LTA) was then used to model the probability of transitioning between latent classes to understand how survivors' symptomology changed over a one-year period. Finally, measures of structural and functional social support were incorporated into the LTA model to explore how social support affects survivors' posttraumatic stress experiences over time.

I begin this section with a discussion of key findings and how those findings relate to existing research. Latent class and latent transition analyses are still relatively rare in trauma research and they are rarer still in studies specific to sexual assault or gender-based violence. As a result, there are few direct parallels to which this study's findings can be compared. Study results will be presented in relation to gender-based violence samples when possible and will also be discussed in comparison to posttraumatic stress research more broadly. After discussion of key findings, I will reflect on the study's limitations before turning to its implications for research and practice.

Key Findings and Implications

    Latent classes. At each measurement occasion, a 4-class model was identified with High Severity, Depressed & Anxious, Avoidant & Reactive, and Low Severity classes. As is implied by their names, the classes showed both quantitative and qualitative differences, with

quantitative distinctions indicative of differences in overall severity and qualitative distinctions indicating differences in symptom cluster severity. The qualitative differences were most visible when comparing the intermediate classes, one of which was characterized by *avoidance* and *reactivity* and the other of which was characterized by *negative alterations in cognition and mood* and *alterations in arousal and reactivity*. Measurement invariance testing and substantive interpretation of model differences led to the conclusion that the latent classes could be considered equivalent across time, and the latent class model with measurement invariance was used for all subsequent analyses.

This latent class solution joins numerous others that have identified intermediate severity classes or trajectories of posttraumatic stress symptoms in both sexual-assault specific samples (Au et al., 2013; Steenkamp, Nickerson, et al., 2012) and general trauma samples (Ayer et al., 2012; Breslau et al., 2005; Frost, Hyland, Shevlin, & Murphy, 2020). These intermediate classes highlight the limitations of the categorical understanding of posttraumatic stress in which one either has or does not have PTSD. Researchers and clinicians have encouraged recognition of "subclinical" or "subthreshold" levels of PTSD (Ayer et al., 2012; Steenkamp, Nickerson, et al., 2012), and these findings support the need for diagnostic distinctions that move beyond the current binary framing. It should be noted, however, that the differences across intermediate classes in this study encourage nuance beyond what even a subclinical designation would provide. Specifically, while a subclinical designation would reflect some amount of *quantitative* variation between the latent classes, it would be unlikely to reflect the *qualitative* differences found in the current study. If understood in purely quantitative terms, the current latent class solution might be described as having High, Intermediate-High, Intermediate-Low, and Low Severity classes. These descriptors, however, do not capture the different symptom clusters that

are elevated in each of the intermediate classes. In a previous study with motor vehicle accident survivors, Wu and Cheung (2006) posited that symptom cluster distinctions may be related to the persistence of PTSD symptoms, and those distinctions would be missed even with the addition of a subthreshold PTSD class.

Beyond the identification of intermediate severity classes, how does the latent class model identified in the current study compare to latent class solutions identified in previous posttraumatic stress research? Two primary similarities emerged. First, the current study joins multiple others that have identified a class with substantially different endorsement probabilities for items within the *alterations in arousal and reactivity* symptom cluster. This pattern has emerged among both intimate partner violence survivors (Hebenstreit, Maguen, Koo, & DePrince, 2015) and natural disaster survivors (Eisma, Lenferink, Chow, Chan, & Li, 2019), and typically separates the first three items in the symptom cluster (denoted as "sleeping," "irritable," and "concentration" in Figure 11) from the last two (denoted as "alert" and "jumpy"). I have referred to the first three items as those related to *arousal* and the last two items as those related to *reactivity.* In the current study, this pattern was reflected by the Avoidant & Reactive class, which showed a markedly higher probability of endorsing the *reactivity* items than the *arousal* items. This pattern is even more dramatically reflected by two classes in Hebenstreit and colleagues' (2015) study of intimate partner violence survivors, one of which was named the "Low Symptom with High Hypervigilance" class and the other of which was named the "Intermediate Symptom with High Hypervigilance" class. These classes represented 33% of participants in the current study and 28% of participants in the study conducted by Hebenstreit (2015), indicating that a sizeable minority of interpersonal trauma survivors display this pattern.

There are multiple potential explanations for these differential endorsement probabilities, one of which is that *arousal* and *reactivity* are unique constructs that should not be grouped into one symptom cluster. Simms and colleagues (2002) proposed a PTSD factor structure in which the three *arousal* items were grouped with those currently assigned to *negative alterations in cognition and mood* to create a broader symptom cluster known as *dysphoria.* Ullman and Long's (2008) confirmatory factor analysis research on sexual assault survivors' posttraumatic stress symptoms supported this model, as well. This conceptualization was considered and rejected in the *DSM-5* (Armour, Mullerová, & Elhai, 2016), but if studies continue to identify this pattern in latent classes, the *dysphoria* model may warrant reconsideration. Another possible explanation for this pattern is that all five symptoms do represent the same underlying construct, but the *arousal* symptoms resolve more quickly than the *reactivity* symptoms. This is an especially compelling explanation for interpersonal violence survivors, for whom the *reactivity* items could be understood as self-protective behaviors. Examples of *reactivity* symptoms include "checking to see who is around you" and "startling when someone walks up behind you." Whereas these behaviors have minimal protective value when developed in reference to a traumatic event that is unlikely to reoccur (e.g., a natural disaster), child abuse and intimate partner violence survivors often live with ongoing violence and many sexual assault survivors fear, or have experienced, revictimization. These hypervigilant behaviors may indeed have adaptive benefits for gender-based violence survivors and, to the extent that they are adopted consciously or unconsciously for protective purposes, it makes sense that they may persist longer than *arousal* symptoms (e.g., irritability, difficulty concentrating) that have less potential benefit. Measuring trauma survivors' appraisals of each posttraumatic stress symptom could help establish the validity of this explanation. Survivors could be asked, for example, how strongly

they wish each symptom would dissipate. If gender-based violence survivors express less of a desire for *reactivity* symptoms to resolve than they do other symptoms, it may indicate that *reactivity* symptoms are perceived as providing a benefit of some kind.

The second similarity identified between this study's latent class findings and others in the posttraumatic stress research literature is the identification of intermediate severity classes that differ primarily based on their endorsement of *negative alterations in cognition and mood* and *arousal* symptoms. As is illustrated in Figure 11, the two intermediate classes showed similar endorsement patterns on *intrusion, avoidance,* and *reactivity* items, but the Depressed & Anxious class showed much higher probabilities of endorsing *negative alterations in cognition and mood* and *arousal* items than what was demonstrated by the Avoidant & Anxious class. This pattern has also been identified in 4- and 5-class models based on intimate partner violence survivors (Hebenstreit et al., 2014), military veterans (Maguen et al., 2013), and general community samples (Breslau et al., 2005).

That those specific items commonly differentiate intermediate classes invites consideration of how they may be unique from other posttraumatic stress symptoms. One defining feature is that they are relatively trauma non-specific. Whereas the *intrusion* and *avoidance* items make specific reference to the traumatic event (e.g., feeling emotionally upset when reminded of the experience; trying not to think about, talk about, or have feelings about the experience), most items assigned to the *negative alterations in cognition and mood* and the *alterations in arousal and reactivity* symptom clusters do not (e.g., feeling distant or cut off from people around you; having trouble falling or staying asleep). This suggests that there may be two distinct groups of trauma survivors at an intermediate level of severity, one whose experience of

posttraumatic stress is primarily limited to reminders of the traumatic event and another whose posttraumatic stress permeates their lives more broadly.

It is not difficult to imagine these manifestations of posttraumatic stress impacting trauma survivors differently. For example, because a trauma survivor's support system is likely more able to recognize trauma-specific symptoms as a reaction to the traumatic event, they may respond in more understanding ways when those symptoms cause distress (Charuvastra & Cloitre, 2008; Punamski, Komproe, Qouta, El-Masri, & de Jong, 2005). In contrast, less trauma-specific symptoms, such as irritability or disinterest, may create additional tension in trauma survivors' personal lives (Guay et al., 2006; Nickerson et al., 2017). Difficulty concentrating and insomnia may cause problems for trauma survivors in their schools or workplaces, and even instructors or employers who would be willing to provide accommodations may not recognize the symptoms' connections to the trauma. Alternatively, if a trauma survivor has not disclosed the traumatic event to those who might offer support, the visible nature of the non-trauma-specific symptoms may encourage expressions of concern and provide opportunities for disclosure.

Despite these similarities to other posttraumatic stress latent class models in the research literature, it is important to consider ways in which the current findings depart from previous research, as well. A smaller proportion of the sample belonged to the Low Severity class at Time 1 than would be expected from previous research. Hebenstreit et al.'s (2015) study of intimate partner violence survivors reported that 46% of their sample was assigned to a "low severity" class. Breslau and colleagues' (2005) results were similar, with 43-55% of their general trauma-exposed sample belonging to a "no disturbance" class. In the current study, 24% of participants were assigned to the Low Severity class at Time 1 and 37% at Time 2. That a larger proportion

of Hebenstreit's (2015) sample was assigned to the Low Severity class than was found in the current study is particularly surprising because the participants in Hebenstreit's sample were recruited weeks or months after an incident of intimate partner violence, whereas most participants in the current study were recruited years or decades after the focal sexual assault. Sexual assault survivors have been known to report particularly high rates of posttraumatic stress (Basile & Smith, 2011; Dworkin, 2018), and it is therefore likely that at least some of the difference between the size of the current Low Severity class and those reported by Breslau (2005) and Hebenstreit (2015) stems from the different types of trauma reported by the study samples. There are additional explanations worth considering, such as the potential impact of cumulative lifetime trauma and revictimization, and proposed research to explore those relationships will be discussed in a subsequent section.

Transition between latent classes. A key strength of this study was the opportunity to explore longitudinal patterns of posttraumatic stress symptoms and identify how sexual assault survivors' symptom profiles changed over time. To pursue this issue, the current study used LTA, the results of which communicate both the probability of staying in a given class across measurement occasions and the probability of transitioning into another latent class. Because the four latent classes identified in this study represented ordinal levels of severity, transition between them could be interpreted in terms of escalation and de-escalation. Results of the LTA indicated that escalation was relatively rare, representing 6 – 20% of participants in each of the latent class. De-escalation was markedly more frequent, demonstrated by 42 – 66% of participants. Because participants assigned to the highest severity class at Time 1 had no possibility of escalation and participants assigned to the lowest severity class at Time 1 had no possibility of de-escalation, the stability of these classes also informs the interpretation of

escalation and de-escalation over time. As would be expected in an overall environment of de-escalation, the High Severity class showed the least stability and the Low Severity class showed the most stability. In other words, a majority of participants assigned to the High Severity class at Time 1 de-escalated into a lower severity class at Time 2 and a majority of participants assigned to the Low Severity class at Time 1 (i.e., participants who did not have a lower severity class to de-escalate into) stayed in the Low Severity class. Previous research has found similar patterns of de-escalation for high severity groups and stability for low severity groups among sexual assault survivors (Armour et al., 2012), natural disaster survivors (Elliot et al., 2005), and survivors of terrorist attacks (Adams, Allwood, & Bowler, 2019).

That movement between latent classes over a one-year period was common even though participants were, on average, over a decade removed from the focal assault highlights that symptom resolution may not be a linear process (Banyard & Williams, 2007). It is possible that a participant who transitioned from the Depressed & Anxious to the Avoidant & Reactive class in this study, for example, will transition back to the Depressed & Anxious class in the future. Posttraumatic stress studies based on veterans (Orcutt, Erickson, & Wolfe, 2004), terrorist attack survivors (Adams et al., 2019), and children exposed to intimate partner violence (Meijer et al., 2019) have identified a group of participants whose symptoms worsen over time and, though rare, transitioning into a higher severity latent class occurred in the current study, as well. Such escalation may be distressing above and beyond the experience of higher severity symptoms, as survivors who felt as though they were "getting better" or "recovered" may be demoralized by an increase in symptom severity. The utility of these findings for support providers will be discussed in a subsequent section on implications for practice.

Because the latent classes identified in this study vary both quantitatively and qualitatively, the LTA results can also speak to the persistence of individual symptom clusters. The High Severity and Depressed & Anxious classes show similar patterns on all symptoms except those related to *intrusion*; the difference in severity level is far greater on those symptoms than any others. This comparison suggests that *intrusion* symptoms may resolve before symptoms related to other clusters. Put differently, trauma survivors may experience relief of their *intrusion*-related symptoms while other symptoms remain relatively severe. Comparing the Depressed & Anxious and the Avoidant & Reactive classes indicates that *negative alterations in cognition and mood* and *arousal* symptoms may be the next most likely to resolve. The *Avoidant & Reactive* class shows relatively low levels of endorsing most symptoms except for *avoidance* and *reactivity*, indicating that those symptoms may be particularly persistent. Wu and Cheung (2006) reported similar findings in their study of motor vehicle accident survivors, noting that avoidance symptoms decreased more slowly than did symptoms of *intrusion* and *hyperarousal*. This hypothesized order of symptom de-escalation needs further testing, however, particularly as the current study was based on one transition point only. Growth modeling that estimates separate trajectories for each symptom cluster could clarify the relative rate of symptom cluster change. Modeling this level of detail would likely require collecting data multiple times in a single year, but other studies conducted with sexual assault survivors have shown that such a design is possible (see Armour et al., 2012).

Relationship between latent classes and social support. In addition to identifying latent classes and estimating the probability of transitioning between them, the current study also explored the relationship between the latent classes and social support. There has been a growing call for research to incorporate multiple dimensions of social support (Guay et al., 2006; Guay,

Nachar, Lavoie, Marchand, & O'Connor, 2017), and the current study answered that call by including measures of both structural and functional support. Researchers have also encouraged longitudinal analyses of social support's relationship to posttraumatic stress (Guay et al., 2017; Ullman, Townsend, Filipas, & Starzynski, 2007), and the current study responds to that need, as well. The conditional LTA contributed to the understanding of social support and posttraumatic stress in two ways: first, through a regression indicating whether each type of social support was related to latent class membership and second, through comparing transition probabilities at varied levels of social support. The number of years since the focal assault was also included in the analysis and the Low Severity class was designated as the reference group.

Consistent with studies of sexual assault survivors (Bryant-Davis et al., 2011), intimate partner violence survivors (Coker et al., 2003), and meta-analyses that have included samples reflecting many different types of trauma (Brewin, Andrews, & Valentine, 2000; Ozer et al., 2003), results of the current study indicate that lower levels of social support are related to more severe posttraumatic stress symptoms. Specifically, lower levels of functional support predicted membership in the High Severity and the Depressed & Anxious class at both measurement occasions. A similar set of relationships was observed for structural support, with less frequent social contact predicting membership in the High Severity and Depressed & Anxious class compared to the Low Severity class. Lower levels of structural support only predicted membership in the High Severity class at Time 1, however, and showed no significant relationship with the High Severity class at Time 2.

The longitudinal dynamics of these relationships were further explored by examining the probability of transitioning between latent classes at low (i.e., 20th percentile), medium (i.e., mean), and high (i.e., 80th percentile) levels of social support. Again, higher levels of social

support predicted less severe symptoms, with participants more likely to de-escalate in symptom severity when social support was high rather than low. These differential probabilities were especially noticeable for the Depressed & Anxious class, highlighting that social support may have different meanings based on the qualitative characteristics of latent classes. These patterns were further illuminated by estimating the probability of class transition when structural and functional social support were anchored in opposite directions. For participants first assigned to the High Severity class, de-escalation was more likely when functional support was high and structural support was low than when those levels were reversed. The opposite was true for participants first assigned to the Depressed & Anxious class, with de-escalation more probable when structural support was high and functional support was low.

The finding that structural and functional social support may be differently impactful depending on what symptoms characterize a trauma survivor's experience of posttraumatic stress represents a unique contribution to the literature. A review completed by the Institute of Trauma and Resilience concluded that functional support tends to exert a stronger influence on posttraumatic stress than does structural support (Charuvastra & Cloitre, 2008), and the current results suggest that this generalization may not capture ways in which social support is differently impactful based on a trauma survivor's symptom profile. Rather than conceptualizing one type of social support as more impactful, it may be more accurate to frame each type of social support as particularly meaningful in response to certain symptoms. When intrusion symptoms are high, as was the case for the High Severity class, trauma survivors may have particular need for the emotional security that functional, rather than structural, support provides. In contrast, when the intrusion symptoms that distinguish the High Severity from the Depressed & Anxious class have subsided and an individual's experience of posttraumatic stress is more

represented by feelings of isolation and detachment, frequent social contact may be what is needed most. Previous research with sexual assault survivors has identified unique outcomes associated with two different kinds of negative social responses (Relyea & Ullman, 2015), and the current study extends this literature by identifying unique outcomes associated with different types of positive social support, as well.

Limitations

This study's findings should be understood in the context of its limitations, one of which is that the PTSD measure used as the basis for the latent classes reflects the DSM-IV rather than the updated DSM-5. As such, it does not include the four new diagnostic symptoms added in the DSM-5. One of these new symptoms (taking risks) is categorized with the alterations in arousal and reactivity symptom cluster and the other three (negative worldview, blaming self or others, and intense negative feelings) are categorized with negative alterations in cognition and mood. This limitation, while noteworthy, is unlikely to substantially impact the results of the study for multiple reasons. First, although data was collected with a *DSM-IV* measure, the PTSD items were interpreted and discussed according to the *DSM*-5 symptom structure to inform current research and practice. Second, sixteen of the seventeen PTSD symptoms reflected in the *DSM-IV* remain in the revised *DSM-5,* and there is little reason to think that endorsement patterns on those items would change with the addition of the new *DSM-5* symptoms. Third, most of the new *DSM-5* symptoms were added to the *negative alterations in cognition and mood* symptom cluster, which was well differentiated between latent classes. Additionally, because the *negative alterations in cognition and mood* symptom cluster was measured by five items in the *DSM-IV*, participants' endorsement patterns on this symptom cluster would likely be less sensitive to the addition of new items than the patterns associated with a symptom cluster measured by fewer

items, such as *avoidance*. Finally, it is worth noting that the diagnostic criteria for PTSD has been updated four times since its initial inclusion in the *DSM-III* and, as a result, posttraumatic stress research has a long history of building on studies that utilized previous versions of the DSM (Armour, Mullerová, & Elhai, 2016; Dworkin et al., 2017; Relyea & Ullman, 2015; Wagner et al., 2016). The alternative of disregarding research conducted based on a previous symptom structure would essentially re-start the research literature every 10-15 years. This limitation is therefore a common one, but it will nevertheless be important to establish that similar conclusions are supported when posttraumatic stress is assessed with an updated PTSD measure.

Missing data was also a challenge in this analysis. The retention rate in the study was impressive and there was minimal missing data on the posttraumatic stress indicators, however there was substantial missingness on assault-specific functional support and, to a lesser degree, on global functional support. Including assault-specific functional support would have reduced the sample of the conditional LTA by approximately a third, and therefore assault-specific functional support was not included in the analysis. Failing to control for assault-specific functional support could have impacted the results in unknown ways, and the current results should be understood in the context of this limitation. The measures of global functional support and assault-specific functional support were both based on multi-part questions, which could explain the higher level of missingness on these items compared to the survey as a whole. The global functional support measure, for example, asked participants to endorse *whether* they had someone they could count on in a certain way and *who* that person was, and the assault-specific functional support measure asked participants *whether* they talked with a given person about the assault and *how helpful* that person was. These multi-part questions capture crucial context but

may also increase the likelihood that participants skip that section of the survey. Future survey research may benefit from testing layout, spacing, or phrasing strategies to reduce the perceived complication of these multi-part questions. There is a growing literature on trauma research methodology that studies how different data collection strategies are perceived by trauma survivors (Campbell, Adams, Wasco, Ahrens, & Sefl, 2010; Rosenbaum & Langhinrichsen-Rohling, 2006), and future research could evaluate which specific methods for presenting complex questions produce the least amount of missing data.

There are limitations associated with the sample should be considered, as well. Participants in the current study were part of a community convenience sample of sexual assault survivors who volunteered to take part in a study about their unwanted sexual experiences. The factors that led this group of survivors to volunteer for the study may differentiate them from survivors who saw study advertisements and chose not to volunteer. It is possible, for example, that more symptomatic individuals did not volunteer for the study due to the distress associated with thinking about the assault. It is also possible, however, that less symptomatic individuals did not volunteer because they perceived a study about sexual assault as less relevant to their current lives. The smaller proportion of participants assigned to the Low Severity class than what has been found in previous studies (e.g., Breslau et al., 2005) suggests that the latter explanation is more likely, but that hypothesis is speculative. Despite this limitation, there are ways in which the community nature of this study is a strength, as well. Whereas much of the previous mixture modeling research with gender-based violence survivors has been conducted with help-seeking samples (e.g., Breslau et al., 2005; Hebenstreit et al., 2015), this study helps to establish the variety of symptom experiences that emerge among survivors who are not necessarily seeking formal support.

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Finally, it is important to consider the limitations associated with analytic complexity. The dataset utilized in the current study is incredibly rich and, resultantly, there were numerous other variables that could have been included. Cumulative lifetime trauma and revictimization, in particular, may have predicted latent class membership and the probability of transitioning between latent classes over time. Previous research has found that many women experience multiple forms of violence, and these lifetime traumas play a crucial role in victimized women's post-trauma experiences (Kennedy et al., 2012). Long and colleagues (2007) found that 61% of their sample of adult sexual assault survivors had also experienced child sexual abuse, and Campbell et al. (2008) found that 28% of female military veterans had experienced both childhood and adult sexual assault. Cumulative lifetime trauma has been found to have a direct positive effect on sexual assault survivors' posttraumatic stress symptoms (Najdowski & Ullman, 2009) and having experienced multiple incidences of sexual violence was identified as playing an especially important role in understanding the relationship between women's posttraumatic stress and physical health (Campbell et al., 2008). An analysis of sexual assault survivors' posttraumatic stress symptoms that does not include cumulative lifetime trauma and sexual revictimization is therefore undoubtedly missing an important piece. However, the methodological literature related to incorporating covariates into mixture modeling is still developing (Asparouhov & Muthén, 2013; Masyn, 2017; Nylund-Gibson & Masyn, 2016) and there are limits to the number of covariates that can be feasibly estimated at one time. Because values for each covariate must be specified in order to examine the conditional probability of class transition, incorporating many covariates simultaneously could also have described covariate combinations that did not occur in the data. Whereas there were participants in the sample who had low structural support and high functional support, for example, the likelihood

of modeling combinations that were not representative of any participants would have increased as more covariates were added to the model. Revictimization, cumulative lifetime trauma, and other contextual variables are integral to understanding the progression of posttraumatic stress for sexual assault survivors (Campbell et al., 2008; Kennedy et al., 2012; Najdowski & Ullman, 2009), and opportunities for incorporating them should continue to be explored as the methods literature and software programs evolve.

Implications for Research

This study's findings suggest multiple avenues for future research. That latent classes showed symptom cluster differences, in addition to overall severity differences, highlights the nuances that are lost when symptom classifications reflect quantitative differences only. Even with the addition of a sub-threshold PTSD designation, the classification categories used for diagnosis and treatment would not differentiate between a trauma survivor whose posttraumatic stress experience was dominated by symptoms of *intrusion* and one whose experience was dominated by symptoms of *negative alterations in cognition and mood*. As was illustrated by the distinct relationships the High Severity and Depressed & Anxious classes showed to social support, these differentiations could be meaningful for meeting survivors' needs over time. Future research should explore the feasibility of symptom classifications that communicate symptom cluster severity in addition to overall severity. This type of classification could utilize weighted symptom cluster scores to communicate the cluster(s) that most strongly characterized a trauma survivor's posttraumatic stress symptoms. The progression of these classifications would be another way of modeling how symptoms change over time and could provide a useful alternative to overall symptom severity scores as a predictor variable in longitudinal research. If experiences of posttraumatic stress that are characterized by *intrusion,* for example, were found

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to predict particularly negative outcomes, those symptoms could be targeted for early intervention.

Relatedly, future research should explore the relevance of each symptom cluster to different groups of trauma survivors. Particularly given the ethnocentrism critiques of PTSD, measurement invariance work is needed to establish whether symptoms are equally likely to be endorsed across racial and ethnic groups. Research on the factor structure of PTSD has identified evidence of measurement non-invariance by race and ethnicity (Ullman & Long, 2008), and additional work is needed to determine how such non-invariance could impact PTSD diagnosis and receipt of services. Though it was outside the scope of the current study, future research could test the invariance of posttraumatic stress latent classes to identify whether symptom profiles are equally likely to occur across racial and ethnic groups.

Future research is also needed to explore variations across survivors' experiences of social support. Thus far, much of the social support research has explored quantitative differences in social support and, just as there may be meaningful distinctions within a given quantitative level of posttraumatic stress, there may be qualitative distinctions within levels of social support, as well. Lacking someone who "accepts you totally, including both your worst and best points," for example, may have different implications for posttraumatic stress than lacking someone "you can count on to console you when you are very upset." The source of the support may be impactful, as well; it is possible that feeling completely accepted by a formal support person, such as a therapist or clergy member, could hold a different meaning than feeling completely accepted by an informal support person, such as a friend or romantic partner (Guay et al., 2011). Woodward and colleagues (2015) compared the impact of support provided by friends and family of intimate partner violence survivors and motor vehicle accident survivors on their

posttraumatic stress symptoms and found no significant differences by the source of the support. However, given that sexual assault is an especially stigmatized experience and survivors often receive negative social reactions when they disclose (Ullman, 2010), the source of social support may have different implications for sexual assault survivors.

Additionally, while it is fair to assume that higher levels of functional support would be desired by most people, the same is not necessarily true of structural support (Declercq & Palmans, 2006). There have been suggestions that high levels of social support can be perceived as an unwelcome burden by some trauma survivors (Armour et al., 2012), and research conducted with widowed adults confirmed that congruence between desired and received social contact was critical to understanding participants' psychological distress (Ha & Ingersoll-Dayton, 2011). It is possible that identifying discrepancies between desired and received social support among sexual assault survivors could further refine understandings of social support's impact on posttraumatic stress, as well. Dworkin and colleagues (2017) conducted a "daily diary" study of sexual assault survivors in which they were able to model the relationship between daily social support and posttraumatic stress symptoms. Their results suggested that social support was mobilized in response to high posttraumatic stress symptoms, but the impact of not having sufficient social support to mobilize in response to posttraumatic stress symptoms is still unclear. To help clarify these relationships, future research should include measures that ask participants whether they had less social support than was desired, the amount of social support that was desired, or more social support than what was desired on a given day.

Finally, there is a need for research to continue expanding the contextual information included in studies of posttraumatic stress. Particularly in sexual assault research, which often focuses on a discrete unwanted sexual experience, there is a need for future research to situate

the assault and the survivor's post-assault needs within the overall context of their life (Cloitre et al., 2009; Kennedy et al., 2012; Wasco, 2003). The current study included social support as one such contextual variable, but there are others that would benefit from similar study. Cumulative trauma is one such contextual variable that has been found to predict posttraumatic stress among sexual assault survivors (Najdowski & Ullman, 2009; Steine et al., 2017; Ullman et al., 2007), low-income single mothers (Samuels-Dennis, Ford-Gilboe, Wilk, Avison, & Ray, 2010) and general population samples (Briere, Agee, & Dietrich, 2016). Research that applies mixture modeling techniques to cumulative trauma and posttraumatic stress could be especially useful in building an understanding of how posttraumatic stress symptoms evolve in the context of cumulative lifetime trauma. Such a study could model the probability of transitioning into lower severity classes based on history of lifetime trauma with the goal of identifying symptom clusters that are particularly intractable for survivors with high levels of lifetime victimization. The possibility that specific symptom profiles are associated with different types of lifetime trauma (e.g., childhood sexual abuse, intimate partner violence, multiple adult sexual assaults) could be explored, as well, to refine the support services offered to women who have experienced multiple victimizations throughout their lives.

It is especially crucial to increase the degree to which community trauma and experiences of marginalization are incorporated into understandings of posttraumatic stress. Long-standing concerns about ethnocentrism have been core to posttraumatic stress literature (Eagle & Kaminer, 2013; Lin, 2000; Summerfield, 2004), and both Western and non-Western practitioners have questioned the applicability of "post" traumatic stress to communities that experience ongoing trauma (Brown, 1991; Kira et al., 2014; Straker & Sanctuaries Counseling Team, 1987). In the United States, practitioners have encouraged recognition that one's experience of discrete

traumatic events may differ based on racism (Carter, 2007; Helms, Nicolas, & Green, 2010), sexism (Brown, 1991; Gilfus, 1999), and heterosexism (DiPlacido, 1998; Dworkin, Gilmore, Bedard-Gilligan, Lehavot, Guttmannova, & Kaysen, 2018). In one community study of pregnant mothers, the number of marginalized identities and the frequency of discrimination reported by participants together explained 15% of variance in posttraumatic stress symptoms (Seng, Lopez, Sperlich, Hamma, & Meldrum, 2012). Together, these strands of research emphasize that, while posttraumatic stress was primarily developed to reflect the experiences of Western, white, male veterans who experienced trauma during a time-limited war, many communities' experiences of trauma has no distinct beginning or end. Furthermore, to the extent that posttraumatic stress is applied to these experiences of ongoing trauma, it is critical that the oppressive structures perpetuating that trauma be held accountable rather than the individuals experiencing traumatic stress symptoms. When the symptoms of traumatic stress relate not only to a discrete traumatic experience but also ongoing individual- or community-level trauma, it is problematic to suggest that the goal should be resolution of the symptoms rather than dissolution of the oppressive structure causing the harm. Research that centers marginalized voices is needed to ensure that the conceptual and diagnostic construct of PTSD reflects the experiences of communities that rarely experience only one traumatic event in a lifetime.

Implications for Practice

In spite of this study's limitations and the need for additional research, the current findings can inform practitioners who provide counseling and advocacy services to sexual assault survivors. For decades, practitioners have criticized the binary framing in which one either "has" or "does not have" PTSD (Brown, 1991; Gilfus, 1999; Clark et al., 2017; Steenkamp, Nickerson, et al., 2012), and the results of this study underscore the validity of those concerns. The presence

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of multiple intermediate classes reinforces the need to recognize a wider range of posttraumatic stress symptom presentations and explore the feasibility of a sub-threshold PTSD classification (Friedman et al., 2011; Mylle & Maes, 2004; Pietrzak, Godlstein, Malley, Johnson, & Southwick, 2009). There is currently limited guidance for practitioners on treating subthreshold PTSD (APA, 2017; Friedman et al., 2011), and the current study emphasizes the need for growth in this area.

The inclusion of subthreshold PTSD in the DSM is not likely to be an imminent change, however, which raises the question of how else clinical practitioners can support sexual assault survivors, including those who have not received a PTSD diagnosis. Broadening the language used to discuss PTSD could be one such change. Kennedy and colleagues (2012) proposed a conceptual model of the help attainment process for gender-based violence survivors in which the first steps were appraising one's needs and evaluating the fit of available services. Trauma survivors who are unsure if they meet the criteria for PTSD may question the fit of services advertised for those with "Posttraumatic Stress Disorder." Expanding service descriptions such that they discuss "posttraumatic stress" or "posttraumatic distress" rather than "PTSD" may help reduce those barriers. Such a shift would not be unusual in the wider context of mental health services; websites and other materials meant to encourage help-seeking for depression, for example, typically refer to "depression" instead of or in addition to "Major Depressive Disorder" (APA, 2017, National Alliance on Mental Illness, n.d.). Making a similar transition in which services are advertised toward those experiencing symptoms rather than those with a disorder could be one way to encourage help-seeking among trauma survivors who may not qualify for a full-PTSD diagnosis.

These findings have implications for non-clinical practitioners, as well, particularly program staff in gender-based violence agencies. Rape crisis center case managers and advocates often have more frequent contact with survivors than do therapists and may interact with the survivors' friends and family in the context of service provision. These practitioners may therefore be in an ideal position to help survivors engage their support networks in the aftermath of trauma. Prior research by Sullivan and colleagues (1999; 2018; 2019) has found that advocacy services have the potential to bolster intimate partner violence survivors' access to social support, in turn improving their overall health and quality of life. Extending Sullivan's work to sexual assault survivors experiencing posttraumatic stress suggests that rape crisis center advocates should talk with survivors about different types of social support and think through how to bolster the type of support that feels most relevant to their current needs. In the event that a survivor is struggling most with *intrusion* or generally high severity symptoms, a case manager or advocate could initiate a conversation about the importance of identifying people who can be counted on no matter what. Similarly, in the event that a survivor is struggling most with posttraumatic stress symptoms related to depression and anxiety, a case manager or advocate could encourage the survivor to seek out social contact. Regardless of the types of social support identified and pursued, case managers and advocates can reassure survivors that even moderate increases in social support can facilitate de-escalation of posttraumatic stress symptoms.

Lastly, it is worth considering how these findings can be utilized more broadly to create supportive communities for survivors so that the individuals, groups, and organizations they interact with promote their wellbeing. To that end, Edwards and Ullman (2018) developed a two-hour intervention with college students that sought to increase their ability to respond to sexual assault and intimate partner violence disclosures in a trauma-informed way. They found that the

program did produce significant changes in participants' anticipated responses, and a follow-up survey found that participants reported increased confidence when responding to subsequent disclosures, as well (Waterman et al., 2020). A similar program that focused on helping participants recognize the signs of posttraumatic stress may be useful for ensuring that survivors receive needed support in the aftermath of trauma. Without such community education, survivors' posttraumatic distress may be less recognizable and available supports may not be offered. This type of program may particularly benefit trauma survivors whose posttraumatic stress experience is similar to that of the Depressed & Anxious class. This class showed especially high benefit to receiving social contact, but the symptoms that characterized the class profile have been found to discourage the provision of social support (Guay et al., 2006; Nickerson et al., 2017). Recognizing trauma non-specific symptoms, such as irritability and disinterest, as a potential reaction to trauma may encourage survivors' support systems to engage rather than withdraw, and such engagement has immense potential to benefit survivors' health and wellbeing (Beeble et al., 2009; Relyea & Ullman, 2015).

Conclusion

Sexual assault is a significant trauma that causes distress for years, sometimes decades, after an assault. The current study used latent class transition analysis to identify latent classes that represent unique subgroups of posttraumatic stress experiences. The four latent classes that were identified varied by both overall severity and symptom cluster severity, indicating substantial differences in how sexual assault survivors experience posttraumatic stress and encouraging recognition of this heterogeneity in both research and practice. The inclusion of social support in the latent transition model emphasized that while social support is valuable across symptom presentations, latent classes of sexual assault survivors have unique social

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support needs, as well. There is a need for increased focus on bolstering sexual assault survivors' interpersonal supports, as well as making formal support more accessible to survivors experiencing a range of posttraumatic stress symptoms. Increasing access to social support has immense potential to facilitate survivors' well-being, particularly in conjunction with social change efforts that seek to disrupt the multiple sources of trauma and marginalization in many sexual assault survivors' lives.

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