

EVALUATING THE RELATIONSHIP BETWEEN MINORITY STRESS AND
WORKING MEMORY: THE INFLUENCE OF PSYCHOLOGICAL
DISTRESS AND IDENTITY VALENCE

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ABSTRACT

The minority stress theory proposes that higher rates of mental illness among individuals who identify as lesbian, gay, or bisexual result from various factors that one may experience as a function of their minority status (Meyer, 1995, 2003). Such factors include internalized homophobia, concealment of one's sexual identity, and the experiences of discrimination and rejection, whether real or perceived. This study investigated the relationship between minority stress and working memory. Based on the well documented research finding of the higher prevalence of mental illness among individuals who identify as lesbian, gay, or bisexual, relative to their heterosexual counterparts (S. D. Cochran, Sullivan, & Mays, 2003; Hatzenbuehler, 2009; Mays & Cochran, 2001), it was hypothesized that higher levels of minority stress would predict higher levels of psychological distress. In addition, models of chronic stress have predicted that individuals who are under constant stress conditions are more likely to have working memory deficits (Egeland et al., 2005; Schmader & Johns, 2003). Thus, it was hypothesized that the relationship between minority stress and working memory would be mediated by psychological distress. Identity valence is the evaluation of one's identity and could be either positive or negative (Ashmore, Deaux, & McLaughlin-Volpe, 2004; Meyer, 2003). It was hypothesized that identity valence would further mediate the relationship between minority stress and working memory. Participants included 309 adults who identify as lesbian, gay, or bisexual (LGB), recruited via community-based and snowball sampling techniques (Meyer & Colten, 1999; Meyer & Wilson, 2009). Structural equation modeling (SEM) was utilized to examine direct and indirect effects of the relationship between minority stress and working memory. Results indicated that

higher levels of working memory predict higher levels of psychological distress. Further, the relationship between minority stress and working memory was mediated through psychological distress and rumination. Finally, identity valence did not have the protective factor that was hypothesized and demonstrated in previous literature (Kertzner, Meyer, Frost, & Stirratt, 2009; Meyer, 2003). Rather, higher levels of identity valence predicted higher levels of psychological distress. Implications, strengths, limitations, and directions for future research are discussed.

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CHAPTER 1

INTRODUCTION

Lesbian, gay, and bisexual (LGB) individuals suffer from greater rates of mental illness, relative to their heterosexual counterparts (Bostwick, Boyd, Hughes, & McCabe, 2010; Meyer, 2003; Oswalt & Wyatt, 2011; Ziyadeh et al., 2007). Mental illness among LGB individuals can lead to increased use of drugs and alcohol (Bostwick et al., 2010; Lehavot & Simoni, 2011; Vosburgh, Mansergh, Sullivan, & Purcell, 2012), as well as consequences as devastating as suicide (Hatzenbuehler, 2011). Factors that contribute to increased mental illness among sexual minorities are the subject of ongoing research across disciplines (e.g., S. D. Cochran, Sullivan, & Mays, 2003; Hatzenbuehler, 2009; Mays & Cochran, 2001). Further research into the outcomes related to disparities in mental illness is required.

Discrimination against LGB individuals and the larger LGB community have contributed to such disparate rates of mental illness (Mays & Cochran, 2001). Discrimination occurs in various forms, including housing discrimination (Lauster & Easterbrook, 2011), employment discrimination (Tilcsik, 2011), and violent crime motivated by hate (Federal Bureau of Investigation, 2012). Meyer (1995, 2003) suggested that chronic stress related to minority status, or minority stress, leads to increased rates of mental illness within the LGB community. Minority stress among members of the LGB community results from a combination of factors related to one's sexual identity development, and the experience of larger societal structures such as heterosexism (e.g., assumption of heterosexuality) and discrimination related to sexual identity (Hatzenbuehler, 2014; Meyer, 2003). Previous lines of research have suggested that

chronic stress can underlie psychological distress (Brady & Sinha, 2005; Coyne & Downey, 1991; Hobfoll, 2012; Mazure, 1998). The current study serves multiple purposes. First, the current study will replicate previously documented relationships between minority stress, a form of chronic stress, and internalizing problems, such as depressive and anxious symptoms. Such research has already demonstrated that such a relationship exists, and that characteristics of minority stress do indeed predict internalizing problems (e.g., Lehavot & Simoni, 2011; Mays & Cochran, 2001; Meyer, 1995).

Moreover, both chronic stress and psychological distress, specifically internalizing symptoms such as anxiety and depression, interfere with the adequate functioning of an individual's working memory system (Egeland et al., 2005; Hackman & Farah, 2009; Scott et al., 2015; Shonkoff et al., 2012). Working memory is a capacity-limited executive function that is required for maintenance and execution of goal directed behavior (Baddeley & Hitch, 1994; Diamond, 2013). Theorists suggest that for a variety of psychological and physiological reasons, chronic stress and internalizing problems place a burden on the working memory system (Egeland et al., 2005; Gotlib & Joormann, 2010). For example, cortisol, a steroid hormone secreted by the adrenal gland in response to stress, has a deleterious effect on working memory (Egeland et al., 2005; Wolf et al., 2001). Additionally, psychological factors related to depression and anxiety, such as rumination, further limit working memory capacity (Gotlib & Joormann, 2010; Snyder, 2013). The effects of minority stress on working memory have thus far not been investigated, and are a major focus of the current research.

Broadly, the current research adds to the existing literature base in that working memory has not been extensively studied within the LGB community. Working memory may be impaired by either minority stress, internalizing problems relative to rumination, or a combination of such factors. A better understanding of the factors that limit working memory are necessary, given the relationship between working memory and decision making skills (Gathmann et al., 2014; Hinson, Jameson, & Whitney, 2003). Impaired working memory may give rise to poor decision making (Hinson et al., 2003). Thus, if the current hypothesis (i.e., working memory is impaired by minority stress, internalizing problems, or both) holds true, future research should explore how intervening with individuals who have high levels of minority stress can improve working memory deficits.

CHAPTER 2

LITERATURE REVIEW

Stress and Outcomes of Stress

Lazarus and Folkman (1984) described stress as a transactional process between the environment and an individual. An anticipated threat is perceived and is then interpreted by an individual as a function of the individual's available coping strategies or resources. Stress results from inadequate resources to manage the demands of a stressor. Furthermore, the ability to cope with stress requires the ability to either regulate one's emotions (emotion-focused coping), such as reducing one's negative emotional reactions, or to manage the existing situation (problem-focused coping), such as removing a source of stress. The appraisal process is the method by which an individual interprets a situation as either stressful or not stressful. For example, an individual who is faced with the prospect of losing his or her job will interpret the experience of job loss differently if the individual has a spouse or partner who can support the individual until a new job is found. Conversely, if the individual does not have such available resources, the individual will find the experience more stressful. In the event of chronic stress, the appraisal process repeats itself until a resolution is attained (Lazarus & Folkman, 1984). Folkman (1997, 2008) adjusted the transactional stress theory following her longitudinal study of gay men who were HIV+ and their caregivers. Despite the prevalence of negative emotions following the caregiving and, ultimately, the death of a significant other, positive emotions were also associated with the coping experience of the surviving partner, giving rise to the effects of a third coping strategy, meaning-based coping. Meaning-based coping, as illustrated by Park and Folkman (1997), refers to the

attribution of positive significance to an otherwise detrimental event. For example, in the case of losing employment, an individual may look to the event as an opportunity for growth or an event that was “meant to be.” Thus, given an unfavorable outcome, or no resolution, positive, meaning-based coping, can sustain the coping process or restore coping resources in the event of chronic stressors, such as the death of a spouse or partner (Folkman, 1997, 2008). In sum, under anticipation of a threat or realization of a threat, an individual may find an experience stressful if the individual does not have appropriate strategies or resources to cope with the challenges of the threat.

A second model of stress proposed by Hobfoll (1989) similarly suggests that psychological outcomes that result from stress or trauma are related to the amount of resources one has at his or her disposal. Such resources may include personal characteristics, such as self-esteem, or more tangible articles such as employment or monetary resources. Hobfoll (1989, 2012) argued, however, that Lazarus and Folkman’s (1984) assertion regarding the perception of coping resources and the appraisal process is circular. Thus, while both Hobfoll and Lazarus and Folkman reason that stress results from the inadequacy of resources or the loss of resources available to cope with a particular demand or situation, Hobfoll (1989, 2012) stresses that the direct evaluation of resources is critical to resilience under stress conditions, versus the appraisal or perception of stress and resources (i.e., Lazarus & Folkman, 1984), characterizing an argument between environmental (e.g., Hobfoll) and cognitive (e.g., Lazarus and Folkman) theories of stress. The cognitive appraisal theory of stress proposed by Lazarus and Folkman posits that a cognitive appraisal or perception of stress also requires a cognitive appraisal or perception of one’s resources to cope with stress, rather than

relying on an evaluation of tangible resources as Hobfoll argues. Dohrenwend et al. (1984) demonstrated significant overlap between stressful events and the psychological outcomes of the experience of stressful events. This overlap suggests that the cognitive appraisal or perception of stress may be influenced by one's own psychopathology, further indicating that the experience of stress may be subjective. However, there exist objective experiences of stress, which cognitive appraisal theories do not necessarily explain (Dohrenwend, Dohrenwend, Dodson, & ShROUT, 1984). Additionally, Hobfoll (2012) maintained that resource loss is more salient than resource gain, the potency of resource loss is mediated by the amount of resources one has at their disposal, and, finally, resource investment is necessary to protect oneself from the effects of resource loss. Hobfoll and colleagues (Hobfoll, Vinokur, Pierce, & Lewandowski-Romps, 2012) evaluated this among military service men and women, finding that resource loss mediated the impact of stressors on posttraumatic stress disorder (PTSD) and depressive symptoms, which in turn was related to poorer perceived health outcomes (e.g., self-reported perception of general health and well being).

Coping with Stress

Coping with stress occurs via problem-focused coping, emotion-focused coping and meaning-based coping. Problem-focused coping involves changing something about the event or situation in order to alleviate stress (Lazarus & Folkman, 1984). For instance, working in a stressful job may prompt an individual to find a new job. Problem-focused coping is useful when the problem can be directly changed or modified. However, not all stressful events can be changed or modified, necessitating an alternative coping strategy. Emotion-focused coping emphasizes the role of regulating one's

emotions in response to a stressor. For example, in the event of an uncontrollable situation where problem-focused coping is not possible, such as chronic illness or death of a loved one, alternative strategies focus on managing an emotional response. Meaning-focused coping was conceived by Folkman (1997, 2008) to explain the role of positive emotions observed during stressful life events. This form of coping focuses on such strategies as utilizing spirituality, revising one's goals, and focusing on positive events in light of the stressful event (Park & Folkman, 1997).

Adaptive coping strategies, such as problem-focused, emotion-focused and meaning-focused strategies, would be considered approach strategies (Suls & Fletcher, 1985). Another type of coping, escape-avoidance coping, involves the individual under stress avoiding or escaping from the problem or stressor. Suls and Fletcher (1985) point out that while escape avoidance coping is an effective strategy in the short term, approach strategies are more effective over time. Avoidance coping has been associated with a number of adverse outcomes, including poor treatment adherence among HIV+ individuals resulting in increased viral loads (Weaver et al., 2005), eating disorders (Heatherton & Baumeister, 1991), and substance use (Buckner, Heimberg, Ecker, & Vinci, 2013).

In addition to coping strategies that individuals may utilize, other protective factors may buffer the effects of stress. Social support can buffer against the negative effects of stressors, as well as provide overall benefits to an individual's well-being (Cohen & Wills, 1985). For instance, Coyne and Downey (1991) highlighted the effects of depression as a stressor and the positive effect of social support on symptoms. Thoits

(1991) highlighted the importance of perceived social support that emanates from belongingness to a community.

Effects of Stress

While both acute and chronic stress may have long-term adverse physical and mental health effects, the focus of the current research is on the effects of chronic stress. Chronic stress refers to repeated and long-term exposure to stressors. Chronic stressors can lead to a number of poor outcomes. Chronic stress in early life can have a number of negative consequences in adulthood, including the development of psychopathology (Gillespie & Nemeroff, 2007). Chronic stress can also lead to drug and alcohol use (Brady & Sinha, 2005). Further, drug and alcohol use are often co-morbid with mental disorders (e.g., mood disorders, anxiety disorders and schizophrenia; Regier et al., 1990), suggesting a sensitive interlink between drug and alcohol use, mental illness, and chronic stress. Thus, it is necessary to understand the factors associated with chronic stress that contribute to poor physical and mental health outcomes, and the resulting behavioral outcomes (e.g., drug and alcohol use).

Health Effects of Stress

The effects of stress on mental and physical illness have been linked to cortisol levels (Cohen, Kessler, & Gordon, 1995). Cortisol provides a regulatory function within the human body, and is implicated in learning, memory and emotion, and in regulation of the immune system (Denson, Spanovic, & Miller, 2009; Miller, Chen, & Zhou, 2007). When the hypothalamic-pituitary adrenocortical (HPA) system is activated, the hypothalamus secretes a hormone known as corticotropin-releasing hormone (CRH). CRH exerts influence on the pituitary gland, with the pituitary gland releasing

adrenocorticotrophic hormone (ACTH). ACTH exerts influence on the adrenal gland to produce the glucocorticoid commonly referred to as cortisol. Detrimental effects of prolonged cortisol exposure have been demonstrated, particularly with respect to the hippocampus (Sapolsky, 2000). Hypercortisolism, or the increased production of cortisol, is associated with executive dysfunction (Egeland et al., 2005), and more specifically, impaired working memory (Lupien, Gillin, & Hauger, 1999; Wolf et al., 2001).

In addition to the physical effects of stress on hormone levels in the body, stress is associated with mental illness (e.g., Hobfoll et al., 2012). Anxiety, according to the Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (DSM-5; American Psychiatric Association, 2013), is characterized by excessive fear, worry about the future and related behaviors, such as avoidance. Depression is often characterized by sadness and irritability, with associated cognitive, affective and somatic complaints (American Psychiatric Association, 2013). Individual differences in the use of coping strategies have been explored as a possible link between stress and mental illness (Felton, Revenson, & Hinrichsen, 1984). Extending such findings, Brosschot, Gerin and Thayer (2006) suggested that perseverative cognitions, for example, rumination, related to anxiety and depression may be related to hypercortisolism. Rumination, then, may lead to activation of the body's physiological stress response.

In sum, exposure to chronic stress may lead to complex interaction effects between both physical and mental health. In the context of the current study, members of the LGB community may be at greater risk for suffering chronic stress, by virtue of their status as sexual minorities (Hatzenbuehler, 2009; Meyer, 2003). As a result, physical and mental health may be adversely impacted.

Minority Stress and Psychological Distress

Meyer (2003) identified both distal and proximal stressors related to the experience of being a minority, specific to LGB individuals. Distal stressors are objective events that an individual experiences, such as prejudice, discrimination, or violence. Proximal stressors are the internalized psychological processes that result from such experiences. In the case of the minority stress model, distal stressors are likely to be acts of discrimination or societal trends that promote inequality (e.g., arguments or attitudes against marriage equality or same-sex adoption rights). Meyer (2003) suggested that proximal stressors convey subjective meaning to a distal stressor. Several proximal stressor variables were identified by Meyer, including internalized homophobia, expectations of rejection and concealment. Thus, higher levels of psychological distress are associated with the appraisal of stressful events that are interpreted specifically in light of an individual's status as a minority (Meyer, 1995, 2003).

Sexual minorities are at an increased risk for experiencing chronic stressors related to minority status that result in poor mental health outcomes (S. D. Cochran, Ackerman, Mays, & Ross, 2004; Hatzenbuehler, 2009; Herek & Garnets, 2007; Huebner & Davis, 2007; Meyer, 2003). Research suggests that as compared to heterosexuals, sexual minorities have a higher prevalence of mental illness and poorer health outcomes. Prevalence rates of psychopathology are typically greater for sexual minorities, as compared to their heterosexual counterparts (Bostwick et al., 2010). The minority stress model (Meyer, 2003) and the psychological mediation framework theory (Hatzenbuehler, 2009) posit that the stigma associated with minority status may be a source of chronic stress. Emotional dysregulation has also been associated with stigma related to both

ethnic and sexual minorities, such that minority individuals who tend to ruminate on a negative characteristic of their minority identity (e.g., experience a discriminatory action) experience prolonged stigma-related psychological distress. (Hatzenbuehler, Nolen-Hoeksema, & Dovidio, 2009).

Given the research on the relationship between chronic stress and mental and physical illness reported above, a more thorough understanding of the relationship between minority stress and poor psychological and physical outcomes is warranted. A better understanding of the relationship between minority stress and psychological distress is necessary to improve mental health and physical health outcomes among the LGB community. For instance, while the effects of both stress and mental health on executive functioning have been explored among the general population, no such research exists examining similar relationships among sexual minorities as a function of stigma-related stress and psychological distress. Further, recognition of the characteristics of minority identity development may lead to better interventions to support sexual minorities in effectively coping with associated stress.

Executive Functioning and Stress

As noted previously, stress induces the production of cortisol, a glucocorticoid associated with neurotoxicity in high amounts (Uno et al., 1994). Hypercortisolism is associated with decreased hippocampal volume (Sapolsky, 2000), executive dysfunction (Egeland et al., 2005), and impairments in working memory (Lupien et al., 1999; Wolf et al., 2001). In the following discussion, more specific definitions of executive functions will be offered, as well as a discussion of the relationship between stress, executive functioning and related outcomes.

Executive Functions

Effortful behavior requires the involvement of the central executive system, also known as executive functions (EF). Although researchers have put forth slightly differing definitions of what executive functions refer to, a predominant theme in the existing EF literature examines the role of the executive system in the regulation of emotions, cognitions and behavior (Corbett, Constantine, Hendren, Rocke, & Ozonoff, 2009; Vriezen & Pigott, 2002). Other models emphasize information processing, attentional control, cognitive flexibility and goal setting (P. Anderson, 2002). Working memory may underlie the ability to control attention, as it pertains to the ability to deal with and sort through interfering and competing information (Engle, 2002).

Executive functioning is typically associated with frontal lobe functioning of the brain, although isolating EF to one specific region of the brain is misleading. As argued by Alvarez and Emory (2006), inconsistent findings regarding the relationship of executive skills with neuroanatomical function are evident, leading to a poor definition of what executive functions are and where they are localized within the structure of the brain. In their meta-analytic review, the authors further suggested that executive functions are likely not a unitary construct but incorporate various functional systems within the brain. Still others (e.g., Collins & Koechlin, 2012) propose that frontal lobe functioning is at least partially implicated in both higher and lower executive functions. For instance, Barbey, Colom and Grafman (2013) reported an integrated neural network associated with cognitive flexibility throughout the frontal, temporal and parietal lobes of the brain.

Executive functions have been dichotomized into “lower” level and “higher” level skills. One line of research has suggested three components to the executive function system that make up “lower” level cognitive functions (Diamond, 2013) in line with what is known as the unity-but-diversity view of EF (Best, Miller, & Jones, 2009; Miyake et al., 2000). That is, although the predominant features of the executive system-working memory, inhibition, and shifting (i.e., cognitive flexibility)-are largely independent of each other, there is overlap among the features. Higher-level thinking and reasoning, such as problem solving and planning are dependent on a functioning lower-level executive functioning system to guide attention and focus toward goal-directed behavior (Collins & Koechlin, 2012). A discussion of these predominant features of lower-level executive functioning follows.

Working Memory

The predominant theory of working memory was proposed by Alan Baddeley and Graham Hitch (Baddeley & Hitch, 1974, 1994). Working memory can be defined as the ability to hold information in conscious awareness and manipulate the same information. Working memory is implicated in the performance of complex cognitive tasks. As Diamond (2013) suggests, working memory is required for thinking about past and future events and for making connections between information. Further, working memory does not work in isolation. Working memory requires attentional control, which further requires cognitive inhibition. In other words, cognitive inhibition is necessary to protect one’s attention from wandering, to be able to focus on the stimuli of salient interest. Moreover, a critical feature of working memory is that its capacity to hold information at a time is limited. The limitations of one’s working memory capacity has important

implications for its concurrent functioning with other systems (Baddeley, 1996; Hofmann, Schmeichel, & Baddeley, 2012).

Inhibition

In order to maintain attention, behavioral inhibition must be intact. That is, the behavioral inhibition system allows an individual to select the stimulus he or she chooses to attend to and to inhibit attention to competing or interfering stimuli. Behavioral inhibition is necessary for both cognitive control (i.e., control over competing cognitions) and for self-control (i.e., reducing impulsive behaviors; Diamond, 2013; Miyake et al., 2000).

Cognitive Flexibility

Cognitive flexibility refers to the ability to switch one's perspective or move on from one task to another (Diamond, 2013). Cognitive flexibility works by inhibiting a prepotent response while competing information is evaluated within the working memory system. Thus, cognitive flexibility depends on functioning working memory and behavioral inhibition.

Interrelatedness of "Lower Order" Executive Functions

Clearly, working memory, behavioral inhibition, and cognitive flexibility are interrelated processes (Miyake et al., 2000). Indeed, relationships between these executive functions have been found in existing literature that suggests a unified model of executive functioning (Friedman & Miyake, 2004; Garon, Bryson, & Smith, 2008; Miyake et al., 2000), governed by a central processing unit, often referred to as attention (Engle, 2002; Engle, Tuholski, Laughlin, & Conway, 1999). Importantly, however, despite the interrelatedness of executive functions, executive functions are also believed

to be simultaneously discrete systems (Diamond, 2013; Miyake et al., 2000). The interrelatedness of executive functioning processes have profound implications for the assessment of these executive functions, as suggested by Miyake and colleagues (Miyake et al., 2000). Given the degree of interrelatedness (i.e., moderately high correlations among tasks; Miyake, et al, 2000) among various executive functions, it is likely that seemingly different tasks will to some degree tap multiple executive functions.

Assessment of Executive Function

Several well established assessment tools exist to measure executive functions, based on various theoretical models of executive functions (Chan, Shum, Toulopoulou, & Chen, 2008). Assessment tools for the measurement of EF include behavior rating scales, such as the Behavior Rating Inventory of Executive Functions (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000); computerized measures of executive function, including the Cambridge Neuropsychological Test Automated Battery (CANTAB); and paper-and-pencil measures, such as the Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001).

In sum, executive functioning is necessary for managing goal-directed behavior. Interference from both external and internal sources taxes the executive system, as the executive system must sort through incoming stimulus. Under stressful conditions, an individual must use their executive functions in order to cope. As the executive system is capacity-limited, coping with a stressor may limit the individual's ability to engage in other goal-directed behavior. Moreover, a number of measures exist to evaluate the function of the working memory system, which are useful both in research conditions and

in clinical contexts, both performance-based measures and behavior ratings of executive functioning (Strauss, Sherman, & Spreen, 2006; Toplak, West, & Stanovich, 2013).

Effects of Stress on Executive Functions

As previously noted, cortisol levels can have a neurotoxic effect during exposure to both chronic and acute forms of stress. Chronic stressors have a damaging effect on various systems within the body as a result of high levels of cortisol (Chrousos & Gold, 1998). Egeland and colleagues (2005) reported that cortisol levels were related to impairments in executive function, with gender differences in cortisol levels observed between men and women. Specifically, men who are high producers of cortisol are most at-risk for poor decision making during high stress instances.

Chronic stressors have adverse effects on executive functioning. For example, a number of chronic stressors are associated with low socioeconomic status, such as crowding and crime (Baum, Garofalo, & Yali, 1999). Hackman and Farah (2009) found low SES to significantly predict decreased cognitive functioning, especially poor executive functioning and poor language ability, relative to high SES individuals, that may be related to the chronic stressors associated with low SES. Calvo and Bialystok (2014) demonstrated similar effects of socioeconomic status on neurocognitive functioning, finding that SES was predictive of children's development. A meta-analytic study conducted by Scott et al (2015) suggested that neurocognitive functioning is impaired in prolonged exposure to stress, as is the case in posttraumatic stress disorder (PTSD).

As expected, the neurobiological effects of high stress (i.e., increased cortisol levels) have behavioral correlates. Steele and Aronson (1995) demonstrated the effect of

racial stereotypes on performance of African Americans on intelligence tests, suggesting that even when matched with White peers in terms of academic ability, African Americans underperform on tests of intellectual ability. A racial stereotype exists by which African Americans intellectual ability is stigmatized. By priming African Americans to prepare to take a difficult ability assessment, fear of fulfilling the racial stereotype is stoked, impairing performance. Thus, stereotype threat refers to the stress associated with potentially confirming an existing stereotype under certain conditions.

Stereotype threat has further been associated with social stressors related to academic achievement and gender. Women experience poorer academic outcomes in advanced mathematics, relative to matched male students, as the fear of fulfilling a gender stereotype regarding mathematic performance impairs achievement (Spencer, Steele, & Quinn, 1999; Steele, 1997).

The stress experienced under stereotyped conditions has a direct adverse impact on working memory (Schmader & Johns, 2003; Schmader, Johns, & Forbes, 2008). Across three experiments, Schmader and Johns (2003) demonstrated the effects of stereotype threat on working memory across gender and ethnicity, suggesting that stereotype threat reduces the cognitive capacity of individuals to perform tasks for which a negative stereotype exists. For example, in the first experiment, Schmader and Johns asked a number of men and women to complete a math-related task of working memory (i.e., operation span task). In the control condition, the task was identified by a male researcher as a working memory task. In the contrasting experimental condition, the task was identified by a male researcher as a task of “quantitative capacity”. Women for whom the task was presented as a task of mathematical ability performed less well than

men in both the experimental and control conditions and women in the control condition. Experiment two posed the working memory task as predictive of intelligence among White and Hispanic participants, with the stereotype threat salient for the Hispanic participants in terms of general intelligence. Again, a reduction in working memory capacity was observed among the stereotype threat condition, with Hispanic participants recalling fewer items. Finally, experiment three found that working memory mediates the relationship between stereotype threat and academic test performance. In each of the three experiments, the researchers convincingly demonstrated that under stigma-related stress, such as stereotype threat, working memory capacity is reduced, limiting the cognitive resources available to complete important tasks (Schmader & Johns, 2003).

Further research suggests that individuals who lack power (i.e., social status) similarly suffer from impaired executive functioning (Smith, Jostmann, Galinsky, & van Dijk, 2008). The authors examined several aspects of executive functioning, including monitoring for new information, planning and behavioral inhibition. Participants were divided into groups of supervisors and subordinates, with the supervisor directing and providing feedback to the subordinate. In each case, participants with the assigned low power demonstrated compromised executive functions. In a subset of experiments, participants were primed (e.g., using writing tasks) as either low power or high power, and those in the low power condition demonstrated a lack of goal maintenance, which was attributable to the effects of poor working memory. In this case, among the powerless, goal neglect was observed, or the inability to maintain goal-directed behavior. Goal neglect is related to limited working memory capacity, evidence of limited cognitive resources (Kane & Engle, 2003).

With the understanding that working memory capacity is limited, competing information will strain cognitive resources. Schmader and colleagues (2008) speculate that an individual's working memory system is taxed due to the inability to suppress thoughts about one's own performance under stereotyped conditions as a result of stress. Within Schmader's own body of research (Schmader & Johns, 2003), women under stereotype threat conditions must not only complete test of math achievement, but also suppress unwanted thoughts about socially-influenced, gender-based stereotypes of women's math ability. Thus, stigma-related stressors burden a capacity-limited working memory system.

Other stressors may also burden the working memory system, such as internalizing disorders. Gotlib and Joorman (2010) argue that there is little evidence to suggest that depressed individuals inherently have poor working memory; however, depression does negatively impact an individual's working memory. That is to say, cognitions affect emotional regulation, and depressive cognitions likely act to maintain a negative affect by way of the working memory system. As a result, maintenance of the depressive thoughts through working memory activation will compete with incoming information. Similarly, other researchers have found that rumination induction in depressed individuals impairs working memory function (E. Watkins & Brown, 2002) and executive processes (Philippot & Brutoux, 2008). In contrast, Snyder (2013), acknowledging that individual studies have often found no link between impairment in executive function and major depressive disorder, reported in a meta-analytic report that such a link does indeed exist. Realistically, however, an individual who is depressed may require extensive intervention in order to diminish such ruminative thoughts to truly

gauge working memory abilities. Working memory, otherwise, appears to be broadly impaired in depression, as a function of the working memory system being taxed due to ruminative thoughts (Snyder, 2013).

The role of working memory in behavioral and emotional self-regulation has been established (Diamond, 2013; Hofmann et al., 2012). Hinson, Jameson and Whitney (2003) suggested that broad impairments in executive functioning were observed in impulsive decision makers, specifically, diminished working memory capacity was predictive of impulsivity. Thus, in consideration of the adverse effects of impaired working memory system, understanding of working memory impairments that result from chronic stress among members of the LGB community may contribute to a better understanding of risky decision making among LGB individuals (Matthews et al., 2013).

In sum, exposure to chronic and acute stressors can result in dysfunction of the working memory system. Depression similarly results in working memory deficits as a result of rumination. Further, stress can result in depression due to a lack of coping resources. Thus, research across disciplines has documented various factors that impair working memory both in combination and independently. Existing research, however, has not explicitly examined the effects of chronic stress and internalizing disorders as factors that may contribute to impairments in working memory among LGB individuals. Sexual minorities are at risk for psychological distress as a result of chronic stress due to status as members of a minority group. As noted by both Hatzenbuehler (2009) and Meyer (2003), sexual minorities develop psychological distress at greater rates relative to heterosexuals as a result of social stress associated with the stigma of being a sexual minority. Such chronic stress may contribute to both depressive symptoms and deficits in

working memory. Chronic stress associated with sexual minority stress may also contribute to working memory deficits independently of depression. In understanding how being a minority can result in chronic stress and how minority stress is associated with mental illness, one must understand the process by which an individual comes to identify as a sexual minority.

Identity Development

Identity development of sexual minorities is necessary to understanding the effects of minority stress, as positive identity may buffer the effects of chronic minority stress (Meyer, 1995, 2003). Recent literature in sociology and social psychology has largely examined the influence of social processes in the development of identity (Cerulo, 1997; Hogg, Terry, & White, 1995; Stets & Burke, 2000; Tajfel, 1974). Much of the contemporary research in identity development has increasingly accounted for marginalized identities, such as racial identity development (Phinney, 1990) and sexual minority identity development (Cass, 1984; McCarn & Fassinger, 1996), as well as the dynamic between stigmatized groups and superordinate societal structures (Steele, 1997; Tyler & Blader, 2003) because individuals subscribe to multiple identities (James, 1950). Moreover, social identification is the result of socialized motivations for belongingness to a particular group, which further explains negative and positive group relations. The following section describes identity development, and in particular social identity development, as well as a discussion of associated identity characteristics and sexual identity development.

Two Bases for Determining Identity

Theories of identity development have largely evolved from interpersonal relationship processes to processes involving interactions of the individual with the larger societal institutions such as race, ethnicity and gender (Cerulo, 1997). Identity theory was founded on the basis that identity is composed of a number of different identities of varying levels of salience that are differentially expressed based on a particular situation or context (Burke, 1980; Stryker, 1968; Stryker & Burke, 2000). Tajfel (1974) proposed social identity theory, which postulated that social identity is dependent on the group that an individual self-categorizes membership to. Attempts have been made to both differentiate between identity theory and social identity theory and to merge the two theories as a single notion of overlapping ideas of identity development. Hogg, Terry and White (1995) for instance argued that although the theories have a number of overlapping ideas and constructs, the nature of the two theories should remain distinct. In contrast, Stets and Burke (2000) reason that in combination, both identity theory and social identity theory make important contributions to advance a comprehensive model of identity development. Importantly, individuals may have a number of identities with differing levels of importance or value (James, 1950).

Interestingly, both Hogg and colleagues (1995) and Stets and Burke (2000) in some ways argue similar points in their respective arguments. Hogg and colleagues, for instance, concede that a model of social identity development includes important factors that are necessary for understanding intergroup processes, particularly from an intrapsychic perspective. However, in emphasizing what sets the theories apart, the researchers suggest that the interpersonal interactions rest more on the sociological

perspective of identity development. As such, while the sociocognitive processes are proposed within social identity theory, Hogg et al. (1995) argue that the associated theoretical psychological constructs are not as readily and empirically evident within the conceptualization of social identity theory.

Characteristics of Identity

Identity Prominence. Identity prominence (or salience) is the position of one's identity within the identity hierarchy (McCall & Simmons, 1978). As previously noted, according to James (1950), multiple identities exist for any particular individual. Based on the relative importance attributed to a particular identity within a particular situation, identity prominence can shift and change (Thoits, 1991). For instance, one's sexual orientation may be more prominent in his or her identity hierarchy when doing so is socially appropriate, such as engaging within the LGB community. However, when not socially appropriate, however, sexual orientation loses its position within the hierarchy, such as interacting with heterosexual colleagues in a business meeting where one's sexual orientation may not be approved of by others. Thoits further argues that repression of most salient identities may be harmful to psychological well-being.

Identity Valence. Identity can be evaluated for its positive or negative qualities (Ashmore et al., 2004). This particular area is associated with the evaluation made not only by oneself, but also on the social valuation placed on a particular identity (Spencer et al., 1999; Steele, 1997; Steele & Aronson, 1995). Further, Ashmore and colleagues (2004) describe two components to this process, one in which the individual judges him or herself and one in which the individual values his or her identity based on the perceptions of others, possibly including society at large.

Social Embeddedness and Behavioral Involvement. Ashmore and colleagues (2004) identified social embeddedness and behavioral involvement as distinct but related constructs. Social embeddedness (also called commitment; Stryker & Serpe, 1994) is related to the connectedness an individual feels to a particular group, as evidenced by the engagement with other members of the collective identity (Ashmore et al., 2004). Similarly, behavioral involvement involves the actual participation in the broader community (Ashmore et al., 2004). Group engagement is determined by identity motivations (Tyler & Blader, 2003). Identity, pride, and respect are key factors that determine level of group engagement. Specifically, a high level of group engagement presupposes strong identification with the group as a result of the status that is ascribed to the group and the valuation of one's involvement in the group (Tyler & Blader, 2003). While positive valuations of one's group may lead to increased engagement, negative valuations of marginalized groups by the larger societal group can have deleterious effects, such that status in the larger group is questioned (Spencer et al., 1999; Steele & Aronson, 1995; Tyler & Blader, 2003).

The minority stress includes characteristics of minority identity as a component to understanding stigma-related stressors (Meyer, 2003). Positive group identity is associated with positive psychological outcomes (Haslam, Jetten, Postmes, & Haslam, 2009) and increased self-worth (Brewer, 1991). Characteristics of minority identity, however, according to Meyer (2003), vary based on the social context, including identity valence and identity prominence. In the process of coming out (i.e., sexual identity development), issues of the valuation of one's sexual identity must be addressed.

Sexual Identity Development

Sexual minorities include those individuals who do not conform to typical standards of romantic and sexual relationships, identifying often as Lesbian, Gay, Bisexual, Transgender, or other qualifying identifiers (including, but not limited to, Queer, Questioning, or Intersex). Consistent with the research listed above, we should assume that an individual's perception of the intrinsic and extrinsic value of one's social group influences membership in that social group (Tajfel, 1974). The effects of stigmatization of sexual minorities are evident, given the acts of violence perpetrated against sexual minorities (Federal Bureau of Investigation, 2012; Herek, 2009), and suicides among lesbian, gay and bisexual individuals (Hatzenbuehler, 2011). Understandably, one's sexual identity may be viewed as a source of stress that leads to poor mental health outcomes (Hatzenbuehler, 2009; Meyer, 2003). The following discussion describes the importance of understanding sexual identity development in the context of societal structures and normative value systems.

Social norms in their very essence are restricted to what is collectively deemed normal or typical behavior by a majority group (Cialdini & Trost, 1998). Sexual minorities, on the other hand, are forced to live with the ongoing conflict between living up to the expectations of their society or following their own motivations. The inner conflict between what is perceived as normal and what is perceived as not normal is dangerous for individuals, but gives rise to a new developmental trajectory in an effort to reconcile the conflict for themselves (Savin-Williams & Diamond, 2000). Sexual minority individuals undergo identity development that is different from that of the sexual majority in that it focuses largely on overcoming the obstacles of a heterosexist society (Flowers & Buston, 2001; Gonsiorek & Rudolph, 1991). Defined explicitly,

Herek (1990) states that heterosexism is “an ideological system that denies, denigrates and stigmatizes any non-heterosexual behavior, identity, relationship or community” (p.316).

Recognizing heterosexism is an important construct in sexual identity development. A historically broader term, homophobia, was coined by Weinberg (1972) as a definition of the fear that an individual may be perceived as gay as a result of association with gay men. Rich (1980), writing on a related term, argued that heteronormativity promotes the notion that heterosexuality is required, rewarded and normal. The implications of heterosexism are far reaching. For instance, in a study of the effects of heterosexism, Lesbian, Gay and Bisexual (LGB) participants suggested that perceived offensiveness of heterosexist comments is likely to influence an individual’s coming out (Burn, Kadlec, & Rexer, 2005). Sexual minorities, then, may feel pressure to maintain pursuit of romantic and sexual relationships with the opposite sex (Whitley, 2001).

Tharinger (2008) points out that during the school years, bullying has become the means of an individual to establish dominance over another individual or group. Especially among adolescent boys, the bullying often relies on derogatory terms associated with being gay. As a primary form of bullying among adolescent boys, the use of such derogatory terms merely perpetuates the stigma associated with sexual minorities among individuals who are out, individuals who are questioning and individuals who are straight. Political affiliation and religiosity are strong predictors of the lack of support for broad gay rights and negative attitudes towards sexual minorities (Herek, 1988; Morrison & Morrison, 2002; Schwartz, 2010).

Coming out, a process described by McCarn and Fassinger (1996) is undertaken by sexual minorities in response to the overwhelming pressure to be straight, exerted by the social environment on the individual. Indeed, coming out has been identified as an essential stage of development in sexual identity formation (Cass, 1984; McCarn & Fassinger, 1996). However, coming out for many individuals is not undertaken lightly. D'Augelli, Grossman and Starks (2005) suggest that many sexual minorities (both men and women with same-sex attraction) put off coming out to parents and family members out of fear of how loved ones will react to the announcement. As noted by Thoits (1991), ignoring the salience of one's identity may result in psychological distress. Concealment of one's sexual identity is implicated in poor mental health outcomes (Cole, Kemeny, Taylor, & Visscher, 1996; Hatzenbuehler, 2011; Meyer, 1995, 2003).

According to Willoughby, Malik and Lindahl (2006), coming out to family members places strain on both the individual and the family. However, the extent to which coming out creates such a stressful environment depends much on the individual family. The researchers have identified factors that are predictive of parental reactions. Parents who are described as more authoritative are less likely to respond negatively to a family member who comes out, relative to more authoritarian parents. Similarly, families who have resources in place, such as cohesion, warmth and adaptability are less likely to respond negatively (Willoughby et al., 2006).

As noted above, heterosexism carries great influence in the identity formation of sexual minorities. Many models of sexual identity formation have been developed so as to incorporate the feelings of confusion, fear and anxiety brought about by the normative assumptions of heterosexuality (e.g., Cass, 1984; McCarn & Fassinger, 1996). Models of

sexual identity ultimately include a supposition of integration of the sexual identity with an individual's other identities (e.g., Cass, 1984; McCarn & Fassinger, 1996). Meyer (2003) suggested identity prominence and identity valence as characteristics of minority identity within the minority stress model that moderate the subjective appraisal of proximal minority stress processes. Meyer additionally proposed integration as a third characteristic of minority identity, defining integration as the degree to which an individual's minority identity is incorporated into one's overall identity. Integration will not be discussed in terms of the current study. Rather, in addition to identity valence and identity prominence, social embeddedness and behavioral involvement will be discussed, as identity integration is a broad term for the end result of identity development (Eliason, 1996). Rather, the focus of this research is on the characteristics of identity.

According to Tajfel (1974) social identity is acknowledgment of membership within a group, including the emotions and self-concept associated with group membership. From the perspective of James (1950) individuals hold multiple identities. Identity prominence, identity valence, and social embeddedness and behavioral involvement characterize the valuation and assimilation of various social identities (e.g., Ashmore, Deaux, & McLaughlin-Volpe, 2004; Tajfel, 1974). Given what is known about the multiple identity perspective of James (1950), and identity prominence and identity valence summarized by Ashmore and colleagues (Ashmore et al., 2004), the valuation of one's sexual identity has several consequences, established by Tajfel (1974). If membership in a particular group offers growth for an individual, the individual is more likely to accept membership within that group. For instance, in the process of coming out, an individual will be more likely to identify as a sexual minority (e.g., lesbian, gay, or

bisexual) if such a label conveys meaningful growth to their self-concept. If, however, the self-concept of the individual in question is challenged by the acknowledgement of group membership, then the individual may refuse to acknowledge the social identity.

Subsequently, the valence remains negative and the prominence of the identity remains low, despite the possible salience of the identity. The same may be true for an individual who is in the coming out process who finds that his or her own values are inconsistent with a heterosexual identity and therefore heterosexual group membership. Thus, the individual “leaves” the heterosexual group, identifying with the attitudes and beliefs of another social group (i.e., the LGB community).

Moreover, Tajfel (1974) discusses social mobility, or the ability to move between social groups. A number of researchers have explored the possibility of concealing one’s sexual minority status as a means to reduce social stigma (Hatzenbuehler, 2009; Meyer, 2003; Pachankis, 2007; Weinberg, 1972). By virtue of the possibility of concealing one’s sexual minority status, the opportunity for social mobility changes. Social mobility is not always a possibility for other stigmatized groups (e.g., African Americans). As noted previously, concealment, however, has serious implications for the development of physical and mental health concerns (Cole et al., 1996; Hatzenbuehler, 2011; Meyer, 1995, 2003).

Social embeddedness and behavioral involvement in the gay community may have protective factors. Gay communities are important to individuals because of the support, acceptance and safety that they offer (Harper & Schneider, 2003). Riggle and colleagues (2008) point out that gay communities are significant sources of resiliency among lesbians and gay men. They provide an arena for sexual minorities to redirect

perceived stress. Indeed, Russel and Richards (2003) suggest that gay communities act as a buffer against stress. McLaren, Jude and McLachlan (2008) argue that a sense of belonging to a gay community influences a sense of belonging to the larger general community as well as acts as a protective barrier against depression.

Social identity development is important to understanding how identities are formed and maintained over time, based on such factors as valence and prominence. Among stigmatized groups, social identity development occurs in the context of the larger majority group (Tajfel, 1974). More specifically, sexual minority identity development occurs in the context of a heterosexist society, which influences sexual minorities to devalue their group identification with the gay community and conceal their sexual identity from others. The minority stress model attempts to address the mental health disparity observed between heterosexual society and sexual minorities, while the psychological mediation framework extends the minority stress model to include psychological factors that mediate the relationship between stress and mental health outcomes (Hatzenbuehler, 2009; Meyer, 2003). Group engagement with the gay community may serve as a protective buffer from stress, and also encourage dialogue with the larger heterosexual society and protect against psychopathology (McLaren et al., 2008).

Cognitive Vulnerability-Stress Models

A number of psychological factors have been proposed as mediators of the relationship between distal events and psychological distress among sexual minorities (Hatzenbuehler, 2009). Hatzenbuehler (2009) suggested the psychological mediation framework to address shortcomings in the minority stress theory. Specifically, the model

proposed by Meyer (2003) does not include general psychological variables that may mediate the effects of minority stress. As a result of stressors related to minority status, a series of variables adversely impact the appraisal of a distal event. A lack of social support, coping skills and cognitive factors (e.g., hopelessness, negative self-schemas) may better account for how a distal event, such as the experience of an act of discrimination, is appraised.

Cognitive vulnerabilities are individual differences that put an individual at risk for developing psychological distress. That is, such proximal factors as faulty beliefs and cognitive biases, influence the interpretation of specific events or experiences, that in turn lead to psychological distress (Riskind & Black, 2005). Cognitive models of depression (e.g., Abramson, Metalsky, & Alloy, 1989; Beck, 2002; Nolen-Hoeksema, 1991) attribute depressive thoughts to the appraisal of an event or problem by an individual, although individual differences exist as to the effect such appraisals have in the experience of depression. Cognitive vulnerabilities are those factors that explain the individual differences in the experience of depression (Alloy, Abramson, Walshaw, & Neeren, 2006).

Alloy and colleagues (2006) identified three potential cognitive vulnerabilities in depression, including negative cognitive styles, information processing and rumination. Largely based on a body of research on hopelessness depression, individuals with negative cognitive styles are more likely to suffer from depression due to the attributions applied to negative life events (Abramson et al., 1989; Alloy et al., 2006). Negative cognitive styles are dysfunctional, focusing on negative valuations of the self and of the consequences of an event, which are attributable to extrinsic, constant factors. Further,

according to Alloy and colleagues (2006), individuals with negative cognitive styles are more likely to appraise negative life events in terms of their own negative self-concept. Alloy, Lipman and Abramson (1992) demonstrated that among individuals with no current depressive symptoms, those with a negative cognitive style were more likely to have experienced major depressive disorder, relative to individuals without such negative cognitive styles. While specific negative cognitive styles may contribute to the experience of psychological distress that results from distal stressors related to stigma, the focus in the current research is the impairment that a specific cognitive style may have on working memory.

Nolen-Hoeksema (1991) proposed a particular “response style” that can prolong the effects of depression. A response style is the mode in which an individual responds to his or her depressed mood. For instance, rumination has been identified as a response to depressive moods that is implicated in the maintenance of depression over time (Nolen-Hoeksema, 1991; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Rumination is a specific mode of responding to stress, where an individual perseverates on a particular problem or distressing event, but does not come to a clear solution or a means to cope (Nolen-Hoeksema et al., 2008). Davis and Nolen-Hoeksema (2000) suggested that depressive rumination leads to cognitive inflexibility, or the inability to shift one’s attention in light of new information, an executive skill previously discussed above. As noted by others (Gotlib & Joormann, 2010; Philippot & Brutoux, 2008; E. Watkins & Brown, 2002), rumination associated with depressive symptoms impairs working memory. As such, a ruminative response style has adverse implications for the functioning of the executive system.

Nolen-Hoeksema (1991) originally proposed that depression could be combated by distracting the depressed individual away from such ruminative thoughts that contribute to the depression long enough for the depression to allay. In a later reconceptualization of rumination, Nolen-Hoeksema and colleagues (2008) suggested, however, that existing research on distractions has been largely inconclusive, calling for better measures of assessing the distractions that may be effective from distractions that are ineffective.

The ruminative response style cognitive vulnerability is consistent with the minority stress model (Meyer, 2003) and the psychological mediation framework (Hatzenbuehler, 2009). The minority stress model and the psychological mediation framework both describe the effects of stigma on psychological distress. Hatzenbuehler and Nolen-Hoeksema (2009) argued that rumination predicts stigma-related psychological distress. Consideration of the cognitions associated with minority stress is critical for the hypothesis that sexual minorities are at greater risk for developing psychological distress. Therefore, it is reasonable to expect that the ruminative cognitions associated with both psychopathology and sexual minority identity impairs an individual's limited-capacity working memory and executive system.

Purpose of the Current Study

The purpose of the current study is to examine factors that negatively impact working memory among a group of sexual minorities. Stress can cause depression and other forms of psychological distress (Mazure, 1998). The minority stress model posits that stigma related to minority status is a form of chronic stress (Meyer, 2003). More specifically, the current study seeks to examine the extent to which characteristics of

minority status (i.e., experiences of discrimination, expectations of rejection, concealment and internalized homophobia) predict psychological distress. Sexual minorities are more likely than their heterosexual counterparts to experience psychological distress (Bostwick et al., 2010; Hatzenbuehler, 2009; Meyer, 2003). Ruminative response styles that are associated with internalizing disorders also predict impaired working memory (Gotlib & Joormann, 2010). Thus, it would be expected that a sexual minority who has high degree of minority stress would experience psychological distress. Those individuals who are experiencing high levels of psychological distress would, in turn, exhibit impaired working memory if they also exhibited high ruminative response styles.

Independent of psychological distress, however, working memory can also be impaired by chronic stress (Calvo & Bialystok, 2014; Scott et al., 2015). Therefore, sexual minorities may additionally experience working memory impairments as a result of chronic stress related to sexual identity. As demonstrated in the stereotype threat literature (i.e., Schmader et al., 2008; Schmader & Johns, 2003), stress may have an adverse impact on working memory without symptoms of psychological distress.

No line of previous research has established the relationship between minority stress, psychological distress and working memory. Hofmann and colleagues (2012) highlight the influence of working memory on behavioral regulation. Additionally, Hinson and colleagues (2003) further demonstrated that participants are likely to make more impulsive decisions under diminished working memory conditions. Sexual minorities engage in riskier health and sexual behaviors relative to heterosexual individuals (Klitzman, Pope, & Hudson, 2000; Matthews et al., 2013). Thus, individuals

who experience increased minority stress may engage in risky behaviors, secondary to diminished working memory associated with chronic stress and/or psychopathology.

Within the broad LGB community, an understanding of the relationship between minority stress and psychopathology and working memory is an important first step in determining what, if any, effect working memory has on risky and impulsive behaviors among sexual minorities. A stronger understanding of the relationship between chronic stress, psychopathology and working memory is necessary to develop interventions to alleviate stress and symptoms of psychological distress to improve physical and mental health outcomes.

Research Questions

Question 1: Do the characteristics of minority stress (i.e., experience of discrimination, expectations of rejection, concealment and internalized homophobia) predict psychological distress, specifically internalizing symptoms?

Hypothesis 1: Sexual minorities with high minority stress will have higher levels of internalizing symptoms.

Rationale for hypothesis 1: Positive group identity promotes psychological well-being (Haslam et al., 2009). Further, Thoits (1991) suggested that repression of a salient identity may be psychologically harmful. Various researchers have additionally looked at concealment as a source of psychological distress, including Schrimshaw and colleagues (2013), Lehavot and Simoni (2011) and Cochran and colleagues (2013). Increased rates of mental illness among sexual minorities are well established (Bostwick et al., 2010; S. D. Cochran et al., 2004; Herek & Garnets, 2007; Huebner & Davis, 2007). Mays and Cochran (2001) suggested that disparate rates of mental illness were related to the stigma

of minority status. Meyer (1995, 2003) proposed the minority stress model, which was further expanded on by Hatzenbuehler (2009), proposing that psychological distress among sexual minorities results from minority status. The effects of positive identity valuation, however, will mediate the effects of minority stress on internalizing problems (e.g., Thoits, 1991). The current project extends the existing research with regard to the effects of specific characteristics of minority stress. Moreover, levels of minority stress will more strongly predict psychological distress as compared to general perceived stress.

Question 2: Does rumination moderate the effects of psychological distress on working memory?

Hypothesis 2: Working memory impairments will be more salient for individuals with increased levels of rumination, than individuals without ruminative symptoms.

Rationale for hypothesis 2: Several studies have examined the relationship between rumination and depression (Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008), and the relationship has been further explored among sexual minorities (Borders, Guillen, & Meyer, 2014; Hatzenbuehler, Nolen-Hoeksema, et al., 2009). The effects of rumination impair working memory ability (Hofmann et al., 2012). The relationship between rumination and working memory, however, has not been directly explored in sexual minorities. Such a relationship between working memory and rumination needs to be established to better explain the disparate rates of psychological distress among sexual minorities.

Question 3: Do the characteristics of minority stress predict working memory impairment, and is that relationship mediated by self-reported depressive symptoms?

Hypothesis 3: Sexual minorities with high levels of minority stress will have increased working memory impairments as a result of psychological distress.

Rationale for hypothesis 3: Working memory capacity is limited (Baddeley, 1996; Baddeley & Hitch, 1974; Diamond, 2013; Hofmann et al., 2012). Chronic stress impairs working memory (Brady & Sinha, 2005; Brosschot et al., 2006; Gathmann et al., 2014; Hackman & Farah, 2009; Miller et al., 2007). Further, research into stereotype threat suggests that under stressful situations, working memory is impaired as a result of one's stigma-related stressors (Schmader & Johns, 2003; Schmader et al., 2008). The working memory system is taxed, and therefore cannot incorporate new or additional information or mental processes.

CHAPTER 3

METHODOLOGY

Participants

Participants ($N = 353$) were recruited utilizing several strategies, including community-based sampling and snowball method sampling. All individuals participating in the survey were over the age of 18 ($M = 33.3$ years; $SD = 12.9$) and self-identified as lesbian, gay, or bisexual. Individuals who identified as “heterosexual” or “other” were not included in this sample. Notably, there were a small number of participants who identified as transgender and lesbian, gay, or bisexual. As this project primarily focused on sexual orientation, individuals who identified as transgender, but not lesbian, gay, or bisexual, were not included in this study. The online survey was distributed to local social groups and health centers in a major metropolitan area, national LGBT advocacy organizations, LGBT resource centers at public universities across the Eastern half of the United States, social media sites, including Facebook and Twitter, and via Craigslist ads in major metropolitan areas across the United States. Additionally, individuals completing the survey were encouraged at the end of the survey to share the survey via social media venues, including Facebook and Twitter. Demographic information, including racial/ethnic background, level of education and other non-identifying information was collected and reported. The survey took, on average 17 minutes to complete (range 2-121 minutes). There were several participants for whom the length was listed as days, presumably due to a technical issue, such as leaving a browser window open.

Recruitment

Community-based samples can be difficult to recruit (Schoenfeld et al., 2000). Sampling from just within the gay community, however, is likely to produce a biased sample of sexual minorities with high affiliation with the gay community (Meyer & Colten, 1999; Meyer & Wilson, 2009). Recruitment utilized social media sources to access both the gay community and individuals who have not revealed their sexual identity. Snowball sampling was also employed. At the end of the questionnaire, participants had the opportunity to share a link to the survey with friends or acquaintances that might be willing to complete the survey.

Measures

Demographic Variables

Participants were asked to report several demographic variables, including: age, race/ethnicity, and level of education attained. Sexual identity and gender of participants was also collected. As the November 2016 presidential election took place during the course of data collection, a dichotomous time variable was added (i.e., pre-election vs. post-election). It was hypothesized that the presidential election had the potential to effect participant responses, given the fear that protections for lesbian, gay, and bisexual individuals would be rolled back (e.g., Stack, 2016).

Heterosexist Harassment, Rejection, and Discrimination Scale

The Heterosexist Harassment, Rejection, and Discrimination Scale (HHRDS; Szymanski, 2006) is a measure originally designed to assess the experience of discrimination against lesbian women. Szymanski's original data indicated internal consistency of .90. Further, Szymanski recommended that the scale could be adapted for assessing the experience of discrimination against members of the LGB community. In a

later study adapting the HHRDS, Szymanski (2009) obtained internal consistency value of .91 for gay and bisexual men. Items were scored on a 6-point, Likert-type scale, ranging from “never” to “almost all of the time”. The HHRDS consists of three subscales: Harassment and Rejection; Workplace and School Discrimination; and Other Discrimination. Items include: “How many times have you been treated unfairly by people in service jobs (by store clerks, waiters, bartenders, waitresses, bank tellers, mechanics, and others) because you are a lesbian?” and “How many times have you been treated unfairly by strangers because you are a lesbian?”. In the adapted version, “lesbian” was changed to “gay man” and “bisexual”. Internal consistency for the current sample was ($\alpha = .92$ for the combined sample; $\alpha = .93$ for the lesbian version; $\alpha = .91$ for the gay version; $\alpha = .92$ for the bisexual version)

Internalized Homophobia Scale

Internalized homophobia was assessed with the Internalized Homophobia Scale (IHS), a measure utilized by a number of sources (Herek, Cogan, Gillis, & Glunt, 1998; Meyer, 1995). In prior research, internal consistency of the IHS ranged from .71 for women and .83 for men (Herek et al., 1998) to .79 for men (Meyer, 1995). Items were scored on a 5-point, Likert-type scale from “disagree strongly” to “agree strongly”. Items on the IHS include “I often feel it best to avoid personal or social involvement with other lesbian/bisexual women” and “I have tried to stop being attracted to women in general.” For male participants, lesbian and women was changed to gay and men, respectively. Internal consistency for the current project was good ($\alpha = .90$ for the overall sample; $\alpha = .89$ for the lesbian version; $\alpha = .91$ for the gay version; $\alpha = .89$ for the bisexual version).

Stigma Consciousness Questionnaire for Gay Men and Lesbians

The Stigma Consciousness Questionnaire for Gay Men and Lesbians (SCQ; Pinel, 1999) was utilized to measure the perceived stigma associated with sexual identity. Items were scored on a 7-point, Likert-type scale from “strongly disagree” to “strongly agree”. Items include “Stereotypes about homosexuals have not affected me personally” and “My being homosexual does not influence how homosexuals act with me.” Pinel (1999) reported a Cronbach’s alpha of .72. The internal consistency of the SCQ for the current sample was adequate $\alpha = .78$.

Outness Inventory

The Outness Inventory (OI; Mohr & Fassinger, 2000) is a three-factor, 11-item, assessment of the degree to which an individual describes him or herself as “out” in terms of family (Out to Family), daily life (Out to World) and religion (Out to Religion). Reliability of each of the three scales ranged from $\alpha = .74$ to $\alpha = .97$. Additionally, the overall score on the OI can also be utilized as an assessment of outness, or the prominence in which an individual views his or her sexual identity. Items were scored on a 7-point, Likert-type scale, with possible responses including: (1) person definitely does not know about your sexual orientation status; (2) person might know about your sexual orientation status, but it is never talked about; (3) person probably knows about your sexual orientation status, but it is never talked about; (4) person probably knows about your sexual orientation status, but it is rarely talked about; (5) person definitely knows about your sexual orientation status, but it is rarely talked about; (6) person definitely knows about your sexual orientation status, and it is sometimes talked about; (7) person definitely knows about your sexual orientation status, and it is openly talked about. Participants were asked to indicate their level of outness to individuals such as parents,

siblings, extended family, religious leaders and work colleagues and supervisors. The internal consistency of the total score for the current sample was good, $\alpha = .87$.

Collective Self-Esteem Scale

The revised Collective Self-Esteem Scale (CSE) was originally developed as a measure to evaluate the positivity of one's own social group (Luhtanen & Crocker, 1992). As per the authors' instructions, the scale was adapted for use with sexual minorities by Herek and Glunt (1995). Four factors were identified through exploratory and confirmatory factor analysis of the original form: Membership, Private, Public and Importance to Identity. Cronbach's coefficient alpha's ranged from .73 to .80 and the total scale alpha was .85. Items were scored on a 7-point, Likert-type scale from "strongly disagree" to "strongly agree". Items include "I'm glad I belong to the gay/bisexual community" and "My membership in the gay/bisexual community is an important reflection of who I am." The CSE demonstrated good internal consistency for the current sample, $\alpha = .87$.

Ruminative Responses Scale

The Ruminative Responses Scale is a 22-item scale developed by Nolen-Hoeksema and Morrow (1991), as part of a larger Response Styles Questionnaire (RSQ). The RRS demonstrated high internal consistency, $\alpha = .89$. Further, Treynor, Gonzalez and Nolen-Hoeksema (2003) suggested a two-factor model of rumination using principal components analysis, including only 10-items of the original scale. The findings suggested a Reflective factor of rumination and a Brooding factor of rumination. Participants were asked to rate their thoughts when they feel sad, down or depressed on a 4-point Likert-type scale from "almost never" to "almost always". Rumination items

include “Analyze recent events to try to understand why you are depressed” and “Go away by yourself and think about why you feel this way”. Brooding items include “Think ‘Why do I have problems other people don’t have?’” and “Think ‘Why can’t I handle things better?’” Internal consistency for the current sample demonstrated excellent internal consistency, $\alpha = .96$.

Hopkins Symptom Checklist-58

The Hopkins Symptom Checklist-58 (HSCL-58) is a measure of internalizing problems developed by Derogatis, Lipman, Rickels, Uhlenhuth and Covi (1974). The symptom checklist covers several domains via factor analysis, including Obsessive-Compulsive, Interpersonal Sensitivity, Depression, Anxiety and Somatization. Only the Anxiety and Depression scales were utilized for this project. Respondents indicated responses on a 4-point Likert-type scale from “not at all” to “extremely.” The scales of the HSCL-58 have reliability coefficients ranging from .84 - .87 (Derogatis et al., 1974). The items of the Anxiety scale demonstrated an internal consistency of $\alpha = .89$, while the items of the Depression scale demonstrated an internal consistency of $\alpha = .91$. The total scale reliability was $\alpha = .94$.

Perceived Stress Scale

The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983; Cohen & Williamson, 1988) is a 10-item measure of general life stressors. The questionnaire includes such items as “In the last month, how often have you been upset because of something that happened unexpectedly?” and “In the last month, how often have you felt that you were unable to control the important things in your life?” Participants responded on a 5-point, Likert-type scale, ranging from “never” to “very often.” Coefficient alpha

ranged from .78-.86 across studies (Cohen et al., 1983; Cohen & Williamson, 1988). The current sample demonstrated good internal consistency, $\alpha = .89$.

Behavior Rating Inventory of Executive Function-Adult Version

The Behavior Rating Inventory of Executive Function-Adult Version (BRIEF-A; Roth, Isquith, & Gioia, 2005) is a self-report measure of executive functioning, comprised of nine subscales, including working memory. Internal consistency ranged from .73 to .90 on the self-report measure across various subscales. Only the working memory subscale was utilized for this project. Participants responded on a 3-point, Likert-type scale ranging from “never” to “often.” Internal consistency for the current sample was good $\alpha = .90$.

Procedure

Given the sensitive nature of the information being collected and the vulnerability of the population being sampled, data collection was conducted online utilizing Qualtrics. An online modality was selected as the ideal platform in which to conduct the current research as it increases anonymity and has been shown to reduce social desirability effects in response items inquiring about sensitive topics (Kreuter, Presser, & Tourangeau, 2008).

Email addresses were collected for follow up regarding a second data collection point and incentives, but no other identifying information was retained to ensure confidentiality and to promote honesty. Email addresses were stored separately from the data file containing participant responses to the survey.

Data Analysis

Demographic information and descriptive statistics were analyzed using SPSS (Version 23) and reported. Structural equation modeling (SEM) was used to determine the structure of the relationship between variables using Mplus (Version 7.3; Muthén & Muthén, 2012) statistical modeling software. Figure 1 illustrates the expected path model of analysis. Analyses for the SEM were conducted following the steps outlined by Anderson and Gerbing (1988). First, confirmatory factor analyses were conducted to assess the acceptability both of the scales being used and of the measurement model itself. Second, the structural model was specified based on the results of the measurement model. Further, an alternative model was specified, consistent with SEM practice of comparing the proposed structural model to a plausible alternative model (e.g., Kline, 2011).

Responses from the scales used in this study were treated as ordinal (i.e., categorical; Kline, 2011; Knapp, 1990)). The mean- and variance- adjusted weighted least squares (WLSMV) estimation approach was chosen over other estimation methods, including the default maximum likelihood (ML) estimator in Mplus, as WLSMV has been recommended for categorical data by a number of researchers (Beauducel & Herzberg, 2006; Flora & Curran, 2004; Pendergast, von der Embse, Kilgus, & Eklund, 2017). In WLSMV, polychoric correlations are used to estimate the relationships between categorical data points (Flora & Curran, 2004). The WLSMV approach for categorical data has several advantages over other estimation methods, such that WLSMV performs as well as ML, provides accurate model fit information and estimates robust parameter

estimates and standard errors, and is not adversely impacted by moderate violations of the normality assumption (Beauducel & Herzberg, 2006; Flora & Curran, 2004).

Fit statistics were evaluated for goodness of fit based on multiple criteria (Tanaka, 1993). The following fit statistics were utilized for each instrument: chi square test of model fit (χ^2) non-significant, root mean square error of approximation (RMSEA; Steiger, 1990) less than .08 (Browne & Cudeck, 1993), comparative fit index (CFI) greater than .90 (Hu & Bentler, 1990), and Tucker Lewis Index (TLI) greater than .90 (Bentler, 1990).

Consistent with current practice, multiple criteria were evaluated, and no single fit statistic was utilized in determining goodness of fit (Tanaka, 1993; Kline, 2011). As noted by McDonald (2010), sole reliance on goodness of fit (i.e., “goodness of approximation”) statistics without also reviewing the correlation of residuals is ill-advised. Above and beyond the goodness of fit statistics, the pattern of residual correlations should be examined for values greater than .1 to evaluate model fit (Kline, 2011; McDonald, 2010). In addition, multiple models were evaluated, including the measurement model, the structural model, and a plausible alternative model for comparison.

Measurement Model

Confirmatory factor analysis (CFA) of each scale was first analyzed following procedures outlined in Brown (2015). Correlations between factors of multidimensional scales were then reviewed. Based on those correlations, a decision to analyze those scales using higher-order and bifactor models was made. That is, correlations between factors of multidimensional scales were reviewed for magnitude based on recommendations by

Brown (2015). Factors within scales that were highly correlated were subject to further analysis to determine the exact nature of the relationship between variables, including both higher-order and bifactor models. Further, omega-hierarchical and omega-subscale values were calculated for bifactor models to determine reliability of the scales in relation to the general construct (Zinbarg, Yovel, Revelle, & McDonald, 2006). The omega coefficients were calculated utilizing the Omega computer software program (M. W. Watkins, 2013). Following preliminary CFA, the measurement model was evaluated as a whole using item-level raw data.

Hierarchical Factor Analysis. Factors that are highly correlated suggest that the multidimensional construct may be best explained by a unidimensional, general construct factor. From here, two options are empirically supported, including a higher-order (or second-order) model or a bifactor model (Canivez, 2016). Higher-order models suggest that the relationship between indicators and the general factor is fully mediated by the first-order latent factors, while a bifactor model supposes that the indicators directly effect the general construct and domain-specific constructs and the relationship between the general factor and the domain specific constructs are orthogonal (Yung, Thissen, & McLeod, 1999). Although some have argued that higher-order and bifactor models are mathematically equivalent (e.g., Mulaik & Quartetti, 1997), Yung et al. have demonstrated that the two are only mathematically equivalent if direct effects are added to a higher-order model. Importantly, the higher-order and bifactor models have similar interpretations in that the general factor of a well-fitted bifactor model is the primary construct of interest (Chen, West, & Sousa, 2006).

There are several important considerations when applying and interpreting a bifactor model, as outlined by Reise (2012). Specifically, the bifactor model allows a researcher to separate the variance associated with the general factor from the variance associated with the domain-specific factors. Further, the construct can then be evaluated as either a unidimensional construct, a multidimensional construct, or the domain-specific factors can also be utilized as predictors of a particular outcome once the variance of the general factor has been controlled for.

Structural Model

The structural model (Figure 1) was specified following the measurement model. Raw item-level data were used in the analysis of the structural model. Fit statistics were examined according to the aforementioned criteria. Following specification of the proposed structural model, an alternative plausible model was specified for comparison. Comparison to an alternative model is necessary as part of the model evaluation, as it is possible that any number of alternative models may exist (e.g., Kline, 2011). Alternative models are suggestive of the likelihood of other possible outcomes and may be problematic for interpretation.

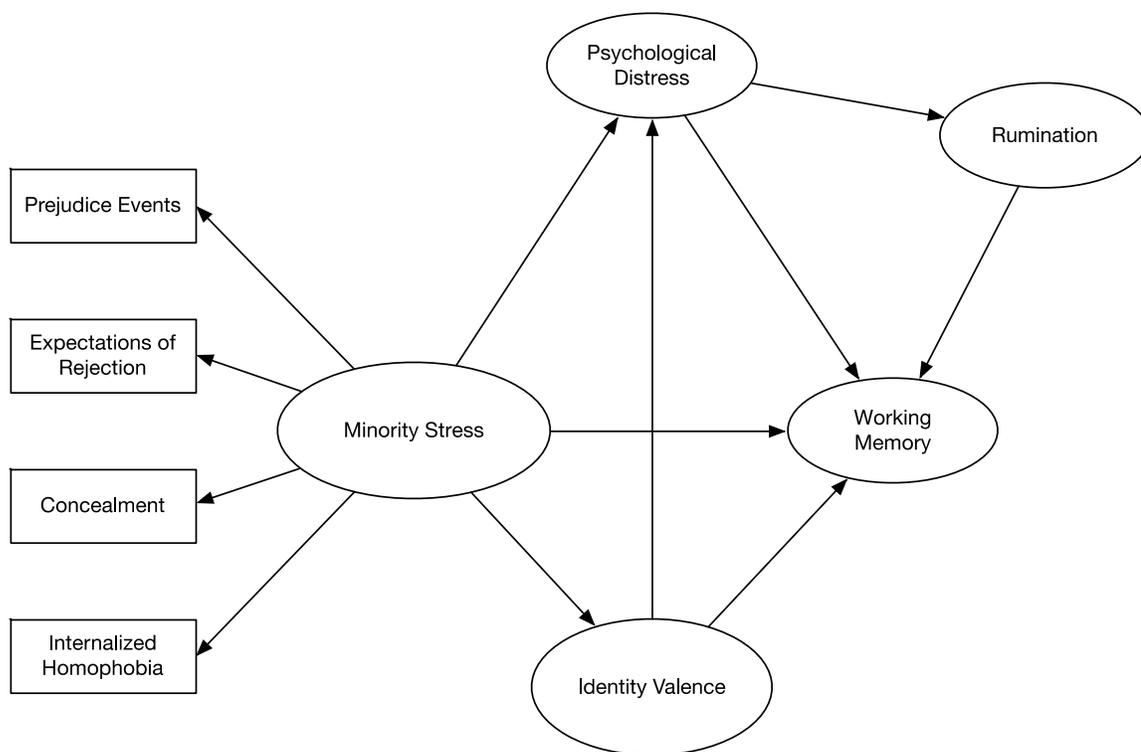


Figure 1. Proposed structural equation model of working memory predicting minority stress, with identity valence, psychological distress, and rumination added as mediators.

CHAPTER 4

RESULTS

Descriptive Statistics

Three hundred fifty-three individuals self-identified as lesbian, gay, or bisexual. Of the 353 respondents, 44 (12.4%) were deleted listwise due to missing responses for most items (>75% of items). No pattern of missing data was observed to suggest systematic missing data among these participants. Participants included in the data analysis ($N = 309$) ranged in age from 18 years to 70 years ($M = 30.6$, $SD = 12.9$). Of those participants who self-selected their ethnicity, 30 participants (9.7%) identified as Hispanic/Latino(a), while 254 participants (82.2%) identified as Non-Hispanic/Latino(a). Sample demographics, including gender identity, race, and ethnicity can be found in Table 1.

Sexual identity was reported as lesbian ($N = 96$), gay ($N = 89$), or bisexual ($N = 124$). In addition to sexual identity, respondents were asked to report sexual attraction on a categorical continuum of only attracted to females ($N = 58$), mostly attracted to females ($N = 59$), equally attracted to females and males ($N = 70$), mostly attracted to males ($N = 58$), only attracted to males ($N = 58$), and not sure ($N = 2$).

Variable means and standard deviations are reported in Table 2, indexed by reported sexual identity. A breakdown of statistically significant mean group differences will be described in the following paragraphs for the following measures: Heterosexist Harassment, Rejection, and Discrimination Scale (HHRDS); Stigma Consciousness Questionnaire (SCQ); Outness Inventory (OI); Internalized Homophobia Scale (IHS);

Table 1
Demographics for the Study Sample (N = 309)

	Total Sample	Lesbian	Gay	Bisexual
Total	309	96	89	124
Gender				
Female	184	91	0	93
Female to Male Transgender	2	0	2	0
Male	112	1	85	26
Male to Female Transgender	4	0	1	3
Not Sure	1	0	0	1
Other	6	4	1	1
Race				
American Indian/Native American	4	2	1	1
Asian American/Pacific Islander	15	4	5	6
Black/African American	27	7	7	13
White/European American	237	75	71	91
Other	15	7	4	4
Prefer not to Respond	8	1	0	6
Ethnicity				
Hispanic/Latino(a)	30	6	11	13
Non-Hispanic/Latino(a)	254	84	67	103

Hopkins Symptom Checklist (HSC); Behavior Rating Inventory of Executive Function-Adult Version (BRIEF-A); Ruminative Response Scale (RRS); Collective Self-Esteem Scale (CSE); and Perceived Stress Scale (PSS).

Multiple comparisons were conducted across groups to determine significant differences. Across several scales, mean scores differed significantly between groups. As multiple comparisons were being conducted, the Bonferroni correction was utilized throughout to reduce the possibility of type I errors. There is some controversy regarding the Bonferroni correction and post-hoc significance testing in general (Perneger, 1998). However, Perneger suggests the use of Bonferroni when group comparisons are not driven by a specific hypothesis is acceptable. As no specific hypothesis was driving these group comparisons, rather the purpose was descriptive, Bonferroni correction was utilized.

Table 2
Descriptive Statistics for Main Study Variables

Measure	Lesbian		Gay		Bisexual	
	Mean	SD	Mean	SD	Mean	SD
HHRDS	25.43	12.02	26.08	10.98	22.52	9.93
SCQ	42.05	9.34	45.01	9.83	39.14	9.60
OI	49.92	14.20	49.18	14.86	34.79	15.59
IHS	13.62	6.69	15.12	7.89	17.27	7.60
HSC	31.56	10.46	31.11	12.17	34.28	11.71
BRIEF-A	14.34	4.27	14.07	4.62	13.94	4.13
RRS	45.14	16.30	43.76	17.24	47.78	15.58
CSE	78.02	12.94	72.67	15.83	69.58	13.60
PSS	28.72	7.64	26.97	8.28	29.60	7.79

Note. HHRDS = Heterosexist Harassment, Rejection, and Discrimination Scale; SCQ = Stigma Consciousness Questionnaire; OI = Outness Inventory; IHS = Internalized Homophobia Scale; HSC = Hopkins Symptom Checklist; BRIEF-A = Behavior Rating Inventory of Executive Function-Adult Version; RRS = Ruminative Response Scale; CSE = Collective Self-Esteem Scale; PSS = Perceived Stress Scale.

Scores on the Heterosexist Harassment, Rejection, and Discrimination Scale were significantly different across groups $F(303) = 3.256, p = .040$. Bonferroni post-hoc analyses revealed, however, no significant difference between individual groups. Although Bonferroni correction is successful at reducing type I errors, a downside to this correction procedure is an increase in type II errors. Thus, with multiple pairwise comparisons, the chance of rejecting statistically significant differences increases (Perneger, 1998).

The Stigma Consciousness Questionnaire scores were significantly different across groups $F(302) = 9.633, p < .000$. Mean scores among gay men ($M = 45.01, SD = 9.83$) were significantly greater than mean scores among bisexual individuals ($M = 39.14, SD = 9.60$), based on Bonferroni post-hoc analyses. Mean scores among lesbian participants did not differ significantly from either gay men or bisexual participants.

Mean scores across the Internalized Homophobia Scale differed significantly across groups $F(303) = 6.592, p = .002$. Significant differences were observed among mean scores between lesbians ($M = 78.02, SD = 12.94$) and bisexual participants ($M = 69.58, SD = 13.60$). Lesbian participants had significantly higher scores relative to bisexual participants in this study. No other significant differences in mean scores were observed.

The Collective Self-Esteem scale scores were also significantly different across groups $F(301) = 9.455, p < .000$. Bonferroni post-hoc analyses indicated significant differences between gay men ($M = 72.67, SD = 15.83$) and lesbian individuals ($M = 78.02, SD = 12.94$), and bisexual participants ($M = 69.58, SD = 13.60$) and lesbian individuals. Lesbian participants had significantly higher scores than both gay men and

bisexual individuals. Mean scores among gay men and bisexual individuals did not differ significantly.

Mean scores on the Perceived Stress Scale were significantly different across groups, $F(308) = 3.277, p = .039$. Post-hoc analyses (Bonferroni) indicated significantly different scores between gay men ($M = 26.93, SD = 8.94$) and bisexual individuals ($M = 29.71, SD = 7.75$), with the scores of bisexual individuals being significantly greater than gay men. Mean scores reported by lesbian participants did not differ significantly from either gay men or bisexual individuals.

Group differences on the Hopkins Symptom Checklist, Rumination Scale, and Behavior Rating Inventory of Executive Function-Adult were also evaluated. No significant group differences between groups were observed. Bivariate correlations between variables are listed in Table 3.

Table 3
Bivariate Correlations among Total Scale Scores

	1	2	3	4	5	6	7	8	9
1. HHRDS	--								
2. SCQ	.401**	--							
3. OI	.073	.038	--						
4. IHS	.280**	.102	-.268**	--					
5. HSC	.308**	.172**	-.082	.393**	--				
6. BRIEF-A	.244**	.175**	.090	.274**	.558**	--			
7. RRS	.296**	.141*	-.018	.359**	.812**	.516**	--		
8. CSE	-.065	-.015	.361**	-.434**	-.168**	-.130*	-.103	--	
9. PSS	.233**	.219**	-.074	.280**	.760**	.522**	.687**	-.132*	--

Note. HHRDS = Heterosexist Harassment, Rejection, and Discrimination Scale; SCQ = Stigma Consciousness Questionnaire; OI = Outness Inventory; IHS = Internalized Homophobia Scale; HSC = Hopkins Symptom Checklist; BRIEF-A = Behavior Rating Inventory of Executive Function-Adult Version; RRS = Ruminative Response Scale; CSE = Collective Self-Esteem Scale; PSS = Perceived Stress Scale.

* $p < .05$. ** $p < .01$.

Measurement Model

Confirmatory Factor Analysis

Heterosexist Harassment, Rejection, and Discrimination Scale

The HHRDS (Szymanski, 2006) is a proposed model of three factors, including Harassment and Rejection (items 8, 9, 10, 11, 12, 13, 14), Workplace and School Discrimination (items 1, 2, 3, 7), and Other Discrimination (items 4, 5, 6). Review of descriptive statistics (see Table 4) suggested that several items demonstrated severe non-normality.

The three-factor model proposed by Szymanski (2006) was evaluated first. Each factor was allowed to correlate with each of the other factors. Model fit for the three-factor model overall was mixed based on goodness of fit statistics, $\chi^2(74) = 460.210$, $p < .000$; RMSEA = .131 (90% CI .120 - .143); CFI = .944; and TLI = .931. Correlations between factors ranged from .741 to .847, suggesting a possible higher-order or bifactor model may provide better fit.

Next, a higher-order CFA was conducted. Fit statistics for the higher-order solution were identical to the original three-factor CFA model, but resulted in a negative residual variance on Factor 2. Factor variances were constrained to equality (Brown, 2015). Model fit statistics of the higher-order model demonstrated slight improvement over the three-factor model $\chi^2(76) = 434.238$, $p < .000$; RMSEA = .125 (90% CI 113 - .136); CFI = .948; and TLI = .938. A number of residual correlations greater than .1 were observed on the residual correlation matrix, suggesting areas of misspecification.

A bifactor model was specified as well. Fit statistics improved dramatically between the higher-order CFA and the bifactor model, $\chi^2(63) = 189.964$, $p < .000$;

RMSEA = .081 (90% CI .068 - .095); CFI = .982; and TLI = .973. The RMSEA was just over the criteria set *a priori* (i.e., > .08), although the CFI and TLI were well within criteria. There were three residual correlations greater than .1 on visual inspection of the residual correlation matrix. As Kline (2011) notes, there is no standard for how many residual correlations greater than .1 is problematic. Still, multiple indices were considered in determining the best model fit, as noted previously (e.g., McDonald, 2010; Tanaka, 1993), including fit indexes and the residual correlation matrix.

In addition, consistent with others (Canivez, 2016; Reise, 2012), omega hierarchical reliability estimates were calculated to ensure that the general factor of discrimination was suitable for interpretation. Utilizing the Omega program (M. W. Watkins, 2013), the general heterosexist discrimination factor was characterized by strong reliability ($\omega_h = .896$). Omega subscale coefficients were much weaker, ranging from .154 to .212. Thus, the bifactor model provides the best fit for the data, suggesting that, rather than interpreting the three factors associated with discrimination as three discrete but related constructs, responses from the HHRDS should be interpreted as one, general construct of heterosexist discrimination and rejection. The bifactor model with standardized pattern coefficients is depicted in Figure 2.

Table 4
Means, Standard Deviations, Skewness, and Kurtosis for Items from the Heterosexist Harassment, Rejection, and Discrimination Scale

	Items	Mean (SD)	Skew	Kurtosis
HHRDS1	How many times have you been treated unfairly by teachers or professors because you are a lesbian?	1.36 (0.78)	2.51	7.03
HHRDS2	How many times have you been treated unfairly by your employer, boss, or supervisors because you are a lesbian?	1.49 (0.93)	2.20	4.84
HHRDS3	How many times have you been treated unfairly by your co-workers, fellow students, or colleagues because you are a lesbian?	1.79 (1.03)	1.28	1.20
HHRDS4	How many times have you been treated unfairly by people in service jobs (by store clerks, waiters, bartenders, waitresses, bank tellers, mechanics, and others) because you are a lesbian?	1.54 (0.87)	1.89	3.98
HHRDS5	How many times have you been treated unfairly by strangers because you are a lesbian?	1.96 (1.12)	1.24	1.26
HHRDS6	How many times have you been treated unfairly by people in helping jobs (by doctors, nurses, psychiatrists, caseworkers, dentists, school counselors, therapists, pediatricians, school principals, gynecologists, and others) because you are a lesbian?	1.41 (0.83)	2.41	6.43
HHRDS7	How many times were you denied a raise, a promotion, tenure, a good assignment, a job, or other such thing at work that you deserved because you are a lesbian?	1.23 (0.69)	3.59	13.73
HHRDS8	How many times have you been treated unfairly by your family because you are a lesbian?	2.13 (1.42)	1.18	.52
HHRDS9	How many times have you been called a heterosexist name like dyke, lezzie, or other names?	2.02 (1.20)	1.18	.93
HHRDS10	How many times have you been made fun of, picked on, pushed, shoved, hit, or threatened with harm because you are a lesbian?	1.61 (1.07)	1.96	3.49
HHRDS11	How many times have you been rejected by family members because you are a lesbian?	1.93 (1.47)	1.57	1.38

Table 4

Means, Standard Deviations, Skewness, and Kurtosis for Items from the Heterosexist Harassment, Rejection, and Discrimination Scale

	Items	Mean (SD)	Skew	Kurtosis
HHRDS12	How many times have you been rejected by friends because you are a lesbian?	1.62 (1.07)	2.06	4.27
HHRDS13	How many times have you heard anti-lesbian/anti-gay remarks from family members?	2.46 (1.52)	.87	-.21
HHRDS14	How many times have you been verbally insulted because you are a lesbian?	1.92 (1.23)	1.50	1.78

Note. “Lesbian” was exchanged with “gay men” or “bisexual” based on the self-reported identity of respondents during administration of the online survey.

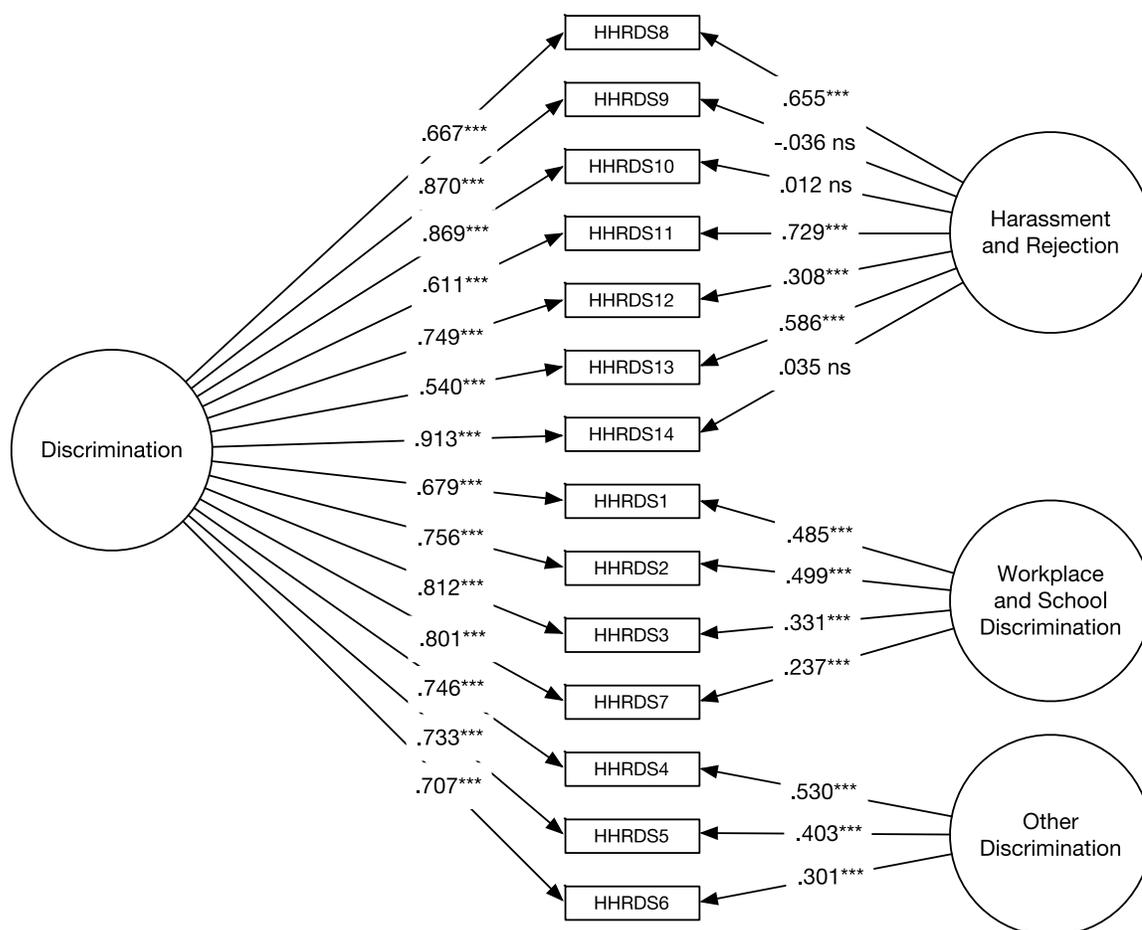


Figure 2. Proposed bifactor structure for the Heterosexist Harassment, Rejection, and Discrimination Scale (HHRDS; Szymanski, 2006). Standardized pattern coefficients (WLSMV estimation) are presented.

*** $p < .000$. ns = nonsignificant.

Stigma Consciousness Questionnaire for Gay Men and Lesbians

The SCQ (Pinel, 1999) was submitted for confirmatory factor analysis. Based on the original research conducted by Pinel, the SCQ is comprised of one factor. Review of descriptive data indicated that skewness and kurtosis were within limits to assume normality (see Table 5). Review of fit statistics indicated a poor fit of the data to the established one-factor structure identified in existing literature, $\chi^2(35) = 446.783$, $p <$

.000; RMSEA = .197 (90% CI .181 - .214); CFI = .770, TLI = .704. Due to poor fit statistics, the SCQ was not included in the measurement model.

Outness Inventory

Mohr and Fassinger (2000) identified a three-factor structure of the Outness Inventory (OI), including how “out” an individual is in terms of one’s family, interactions in daily life, and religion. Consistent with the original psychometric evaluation of the OI, item 11 (“my old heterosexual friends”) was not included in the CFA. Identified factors from the original scale development include: Out to World (items 5, 6, 7, 10), Out to Family (items 1, 2, 3, 4), Out to Religion (items 8, 9). Review of skewness and kurtosis statistics suggested that items were normally distributed, as noted in Table 6. The three-factor CFA was specified, and each of the factors were allowed to correlate with one another. The initial CFA provided the following results with regards to the goodness of fit to the data, $\chi^2(32) = 145.932, p < .000$; RMSEA = .109 (90% CI .091 - .127); CFI = .989; and TLI = .985. Review of residual correlation matrix revealed four values greater than .1. While the Out to World and Out to Family factors were strongly correlated ($r = .665$), Out to Religion factor was only weakly correlated with the other factors.

Table 5
Means, Standard Deviations, Skewness, and Kurtosis for Items from the Stigma Consciousness Questionnaire

	Items	Mean (SD)	Skew	Kurtosis
SCQ1R	Stereotypes about homosexuals have not affected me personally.	4.51 (1.86)	-0.51	-1.03
SCQ2R	I never worry that my behaviors will be viewed as stereotypical of homosexuals.	3.81 (1.94)	0.12	-1.30
SCQ3	When interacting with heterosexuals who know of my sexual preference, I feel like they interpret all my behaviors in terms of the fact that I am a homosexual.	3.63 (1.79)	0.07	-1.12
SCQ4R	Most heterosexuals do not judge homosexuals on the basis of their sexual preference.	4.56 (1.55)	-0.29	-0.78
SCQ5R	My being homosexual does not influence how homosexuals act with me.	4.40 (1.67)	-0.35	-0.79
SCQ6R	I almost never think about the fact that I am homosexual when I interact with heterosexuals.	3.98 (1.92)	-0.03	-1.32
SCQ7R	My being homosexual does not influence how people act with me.	3.99 (1.73)	-0.13	-1.14
SCQ8	Most heterosexuals have a lot more homophobic thoughts than they actually express.	4.59 (1.54)	-0.47	-0.26
SCQ9R	I often think that heterosexuals are unfairly accused of being homophobic.	4.33 (1.47)	-0.01	-0.56
SCQ10	Most heterosexuals have a problem viewing homosexuals as equals.	3.97 (1.56)	0.01	-0.75

Note. R = Item is reverse scored.

Nevertheless, a higher-order CFA and bifactor CFA were analyzed to determine best fit of the data. The higher-order CFA produced goodness of fit statistics equal to that of the original CFA suggesting a just-identified model of two statistically indistinguishable models. Mohr and Fassinger (2007) identified a similar pattern on a higher-order CFA produced as part of their original factor analysis. In order to further distinguish the models, Mohr and Fassinger added equality constraints between the three first order factors in the original psychometric evaluation of the OI to ensure that the model was overidentified. Similarly, in the current study the three first-order factors were constrained to be equal. In addition, equality constraints were added between the two indicators comprising the Out to Religion factor. Model fit statistics improved marginally, $\chi^2(34) = 131.748, p < .000$; RMSEA = .098 (90% CI .080 - .116); CFI = .991; and TLI = .988. Review of the residual correlation matrix revealed three values greater than .1.

Table 6
Means, Standard Deviations, Skewness, and Kurtosis for Items from the Outness Inventory

	Items	Mean (SD)	Skew	Kurtosis
OI1	mother	5.43 (2.47)	-0.55	-1.14
OI2	father	4.73 (2.59)	-0.17	-1.49
OI3	siblings (sisters, brothers)	5.53 (2.49)	-0.60	-1.13
OI4	extended family/relatives	4.66 (2.30)	0.04	-1.34
OI5	my new straight friends	5.22 (2.40)	-0.39	-1.24
OI6	my work peers	4.76 (2.50)	-0.08	-1.44
OI7	my work supervisor(s)	4.51 (2.56)	0.07	-1.51
OI8	members of my religious community (e.g., church, temple)	2.50 (2.33)	1.37	0.39
OI9	leaders of my religious community (e.g., church, temple)	2.44 (2.36)	1.45	0.56
OI10	strangers, new acquaintances	3.87 (2.18)	0.47	-0.97
OI11 ^a	my old heterosexual friends	5.62 (2.21)	0.54	-0.99

Note. ^aItem was not included in the CFA based on Mohr and Fassinger (2000).

The bifactor model, however, was not identified, possibly owing to only two indicator variables on the Out to Religion factor (e.g., Reise, 2012). Thus, the higher-order model was retained for further analyses in the measurement model and structural model, based on multiple criteria including fit statistics and multiple criteria (McDonald, 2010; Tanaka, 1993). The hierarchical factor structure and standardized pattern coefficients are noted in Figure 3.

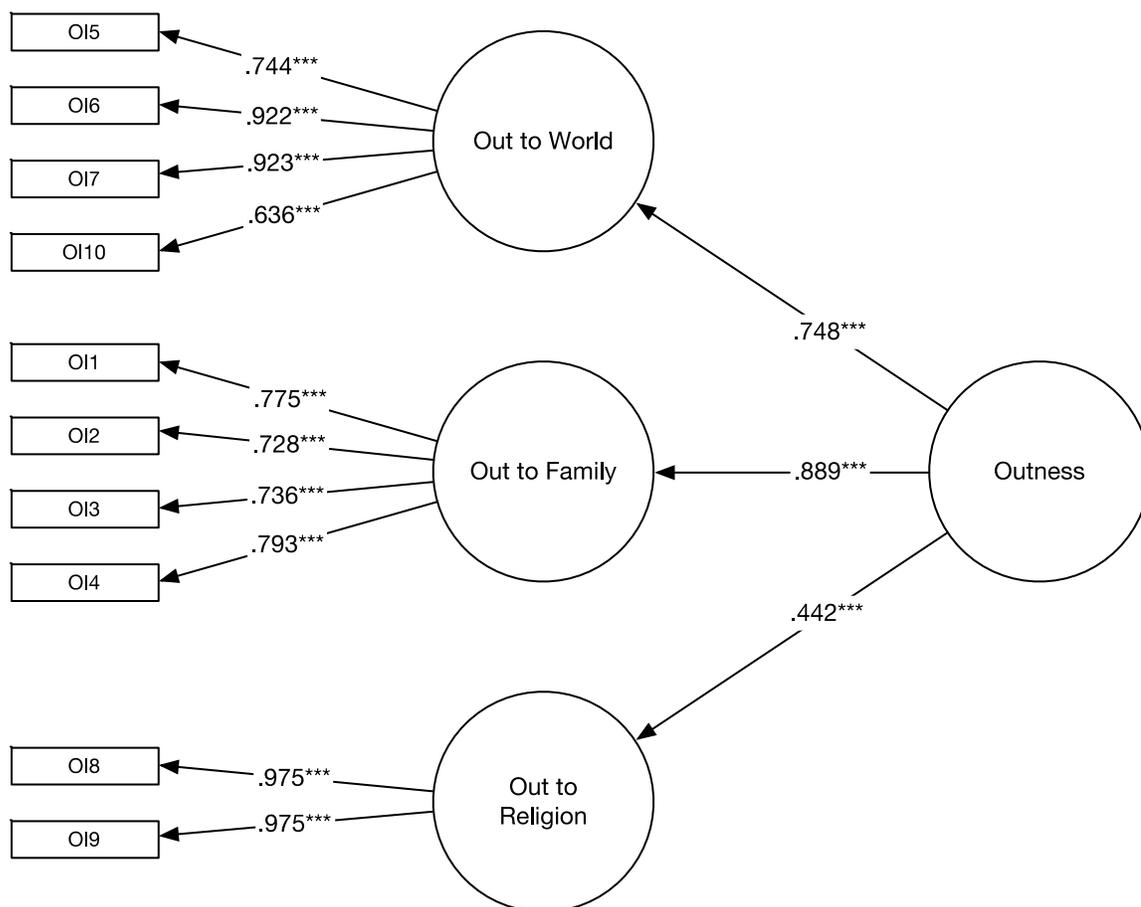


Figure 3. Proposed hierarchical factor structure for the Outness Inventory (OI; Mohr & Fassinger, 2000). Standardized pattern coefficients (WLSMV estimation) are presented. *** $p < .000$

Internalized Homophobia Scale

The IHS was developed as a unidimensional model of internalized homophobia (e.g., Herek et al., 1998; Meyer, 1995). Review of descriptive data indicate that one item

(item 8) does not meet the assumption of normality. Means, standard deviations, skewness, and kurtosis are summarized in Table 7. The fit statistics for the IHS suggested that a one-factor model represented the data adequately based on CFI and TLI, however RMSEA was above criteria: $\chi^2(27) = 116.732, p < .000$; RMSEA = .105 (90% CI .086 - .124); CFI = .985; and TLI = .981. Three values greater than .1 were identified on the residual correlation matrix. Standardized pattern coefficients are depicted in Figure 4. The one factor solution, consistent with Herek and colleagues (1998), was utilized for the measurement model.

Table 7
Means, Standard Deviations, Skewness, and Kurtosis for Items from the Internalized Homophobia Scale

	Items	Mean (SD)	Skew	Kurtosis
IHS1	I often feel it best to avoid personal or social involvement with other gay or bisexual men.	1.67 (1.00)	1.37	0.95
IHS2	I have tried to stop being attracted to men in general.	1.85 (1.22)	1.13	-0.18
IHS3	If someone offered me the chance to be completely heterosexual, I would accept the chance.	1.82 (1.21)	1.37	0.75
IHS4	I wish I weren't gay.	1.71 (1.10)	1.51	1.38
IHS5	I feel alienated from myself because of being gay.	1.76 (1.12)	1.37	0.86
IHS6	I wish that I could develop more erotic feelings about women.	1.85 (1.23)	1.24	0.25
IHS7	I feel that being a lesbian is a personal shortcoming for me.	1.63 (1.08)	1.70	1.94
IHS8	I would like to get professional help in order to change my sexual orientation from gay to straight.	1.26 (0.75)	3.60	13.40
IHS9	I have tried to become more sexually attracted to women.	1.95 (1.33)	1.02	-0.51

Note. "Gay men" was exchanged with "Lesbian" and gendered language based on the self-reported identity of respondents during administration of the online survey.

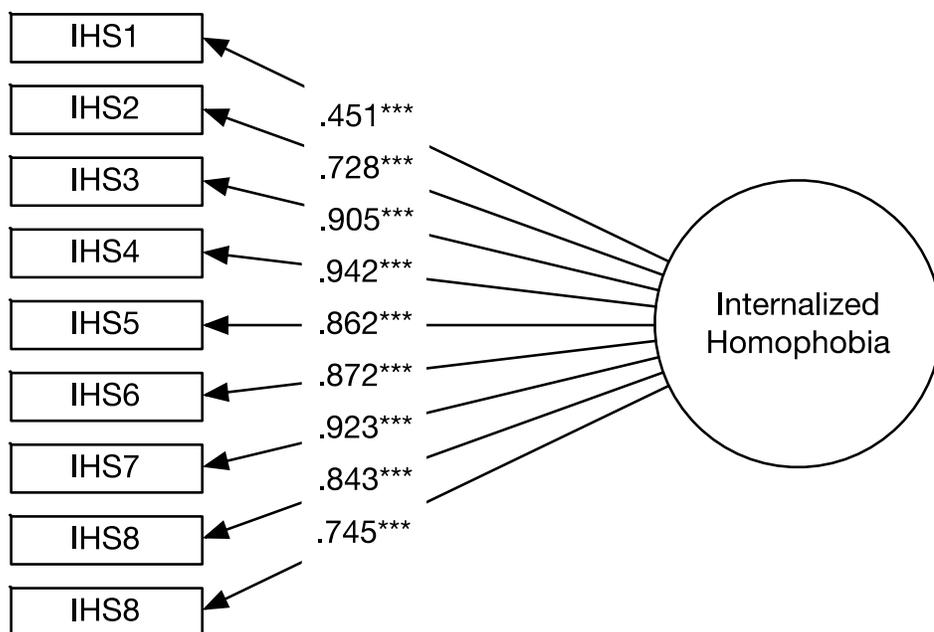


Figure 4. Proposed one factor structure for the Internalized Homophobia Scale (IHS; Herek, et al., 1998). Standardized pattern coefficients (WLSMV estimation) are presented.

*** $p < .000$

Hopkins Symptom Checklist-58

Two subscales from the HSC-58 were utilized for the purposes of this study, the depression subscale and the anxiety subscale. Means, standard deviations, skewness, and kurtosis are summarized in Table 8. A two-factor model was first specified. The depression and anxiety factors were allowed to correlate. The HSC demonstrated strong model fit, with $\chi^2(118) = 245.995$, $p < .000$; RMSEA = .059 (90% CI .049 - .070); CFI = .983; and TLI = .980, well within the *a priori* criteria. A number of residual correlations greater than .1 were observed on the residual correlation matrix. Analysis of the factor correlations suggested a strong positive correlation between the two factors ($r = .872$), leading to suspicion of a higher-order or bifactor model.

A higher-order model was specified first. The higher-order factor solution resulted in a negative residual variance. By adding equality constraints between the two

factors, the model fit was just-identified and equivalent to the two-factor model. A bifactor model was specified next. The bifactor model was slightly better fit than the two-factor model specified earlier, with $\chi^2(102) = 185.088, p < .000$; RMSEA = .051 (90% CI .039 - .063); CFI = .989; and TLI = .985. Visual inspection of the residual correlation matrix revealed several values greater than .1.

Table 8
Means, Standard Deviations, Skewness, and Kurtosis for Items from the Hopkins Symptom Checklist

	Items	Mean (SD)	Skew	Kurtosis
HSC2A	Nervousness or shakiness inside	2.02 (0.95)	.57	-.66
HSC5D	Loss of sexual interest or pleasure	1.96 (0.98)	.71	-.57
HSC15D	Thoughts of ending your life	1.52 (0.88)	1.63	1.59
HSC17A	Trembling	1.41 (0.72)	1.91	3.34
HSC19D	Poor appetite	1.54 (0.81)	1.50	1.59
HSC20D	Crying easily	1.83 (0.98)	.90	-.34
HSC22D	A feeling of being trapped or caught	2.02 (1.01)	.61	-.78
HSC23A	Suddenly scared for no reason	1.66 (0.87)	1.16	.41
HSC26D	Blaming yourself for things	2.19 (1.06)	.42	-1.05
HSC29D	Feeling lonely	2.32 (1.09)	.25	-1.23
HSC30D	Feeling blue	2.23 (1.02)	.41	-.92
HSC31D	Worrying too much about things	2.61 (1.03)	-.13	-1.13
HSC32D	Feeling no interest in things	1.99 (1.01)	.66	-.74
HSC33A	Feeling fearful	1.85 (0.93)	.83	-.28
HSC39A	Heart pounding or racing	1.73 (0.94)	1.07	.40
HSC50A	Having to avoid certain things, places or activities because they frighten you	1.71 (0.99)	1.18	.13
HSC54D	Feeling hopeless about the future	2.01 (1.03)	.67	-.73

Note. A = Anxiety item. D = Depression Item.

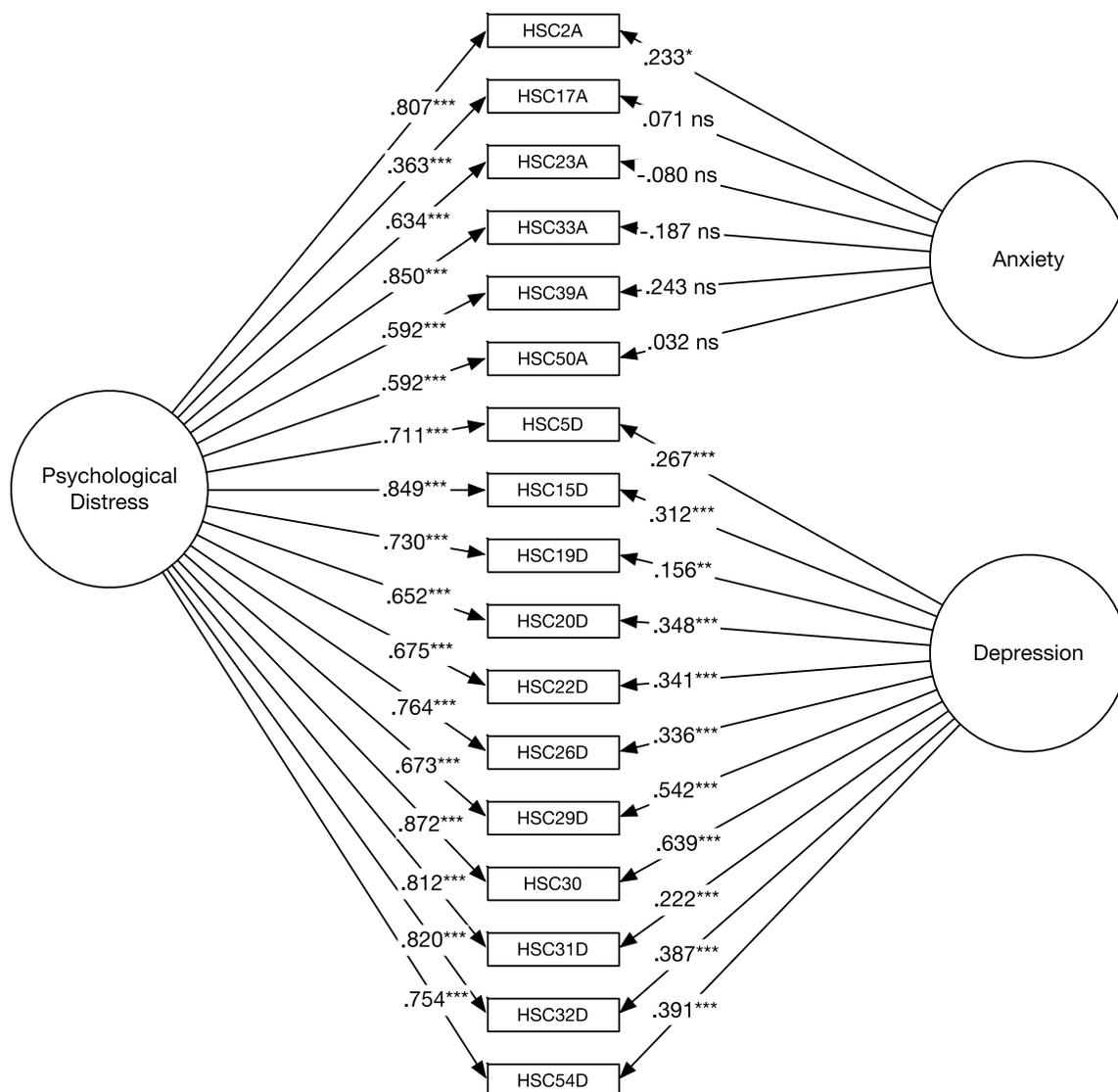


Figure 5. Proposed bifactor structure for the Hopkins Symptom Checklist subscales (HSC; Derogatis et al., 1974). Standardized pattern coefficients (WLSMV estimation) are presented.

*** $p < .000$. * $p < .05$. ns = not significant.

Further, omega hierarchical reliability estimates were calculated to ensure that the general factor of psychological distress (i.e., internalizing symptoms) was suitable for interpretation (Canivez, 2016; Reise, 2012). Utilizing the Omega program (M. W. Watkins, 2013), the general psychological distress factor was characterized by strong reliability ($\omega_h = .871$). Omega subscale coefficients were much weaker, ranging from

.004 (Anxiety) to .218 (Depression). Given the improved model fit and reduced number of residual correlations greater than .1, as well as the reliability coefficients, the bifactor model was retained. Standardized pattern coefficients are modeled in Figure 5.

Behavior Rating Inventory of Executive Function-Adult Version

The BRIEF-A (Roth et al., 2005) working memory subscale, a unidimensional measure of working memory, was submitted for CFA. Review of descriptive data indicated that skewness and kurtosis were within limits to assume normality of the sample. Means, standard deviations, skewness, and kurtosis are summarized in Table 9. Initial CFA indicated mixed goodness of fit, $\chi^2(20) = 87.551$; $p < .000$; RMSEA = .105 (90% CI .083 - .127); CFI = .981; and TLI = .973, as the RMSEA was well above the *a priori* criteria. Standardized pattern coefficients are depicted in Figure 6.

Table 9
Means, Standard Deviations, Skewness, and Kurtosis for Items from the Behavior Rating Inventory of Executive Function-Adult Version

	Items	Mean (SD)	Skew	Kurtosis
BRIEF1	Difficulty concentrating on tasks	2.01 (.64)	-.01	-.52
BRIEF2	Difficulty with multiple step tasks	1.60 (.70)	.74	-.68
BRIEF3	Forgetting steps of a problem	1.80 (.67)	.26	-.81
BRIEF4	Difficulty staying on topic	1.70 (.69)	.48	-.83
BRIEF5	Short attention span	1.81 (.70)	.28	-.95
BRIEF6	Forget instruction	1.67 (.70)	.57	-.82
BRIEF7	Difficulty remembering things	1.77 (.73)	.38	-1.05
BRIEF8	Difficulty doing more than one thing at a time	1.75 (.73)	.42	-1.03

Note. Due to copyright issues, all items have been reworded here from their original form. Original wording was used for this dissertation. For original items, see Roth et al., (2005).

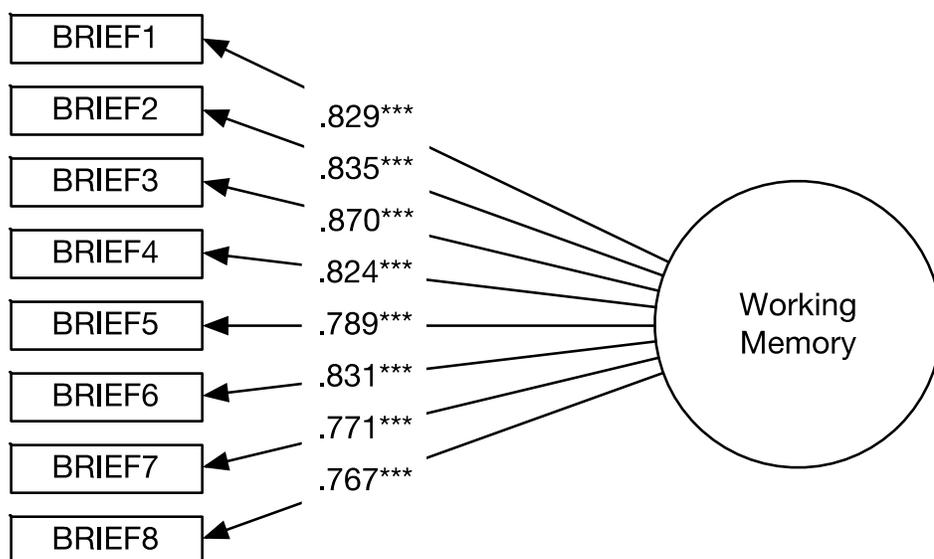


Figure 6. Proposed one factor structure for the Behavior Rating Inventory of Executive Function-Adult Version (BRIEF-A; Roth, et al., 2005) working memory subscale. Standardized pattern coefficients (WLSMV estimation) are presented. *** $p < .000$.

Ruminative Responses Scale

The 10 items identified by Treynor, Gonzalez, and Nolen-Hoeksema (2003) from the Ruminative Responses Scale were subjected to CFA, comprised of two factors, Reflection (Items 5, 10, 13, 15, & 16) and Brooding (Items 7, 11, 12, 20, & 21). Review of skewness and kurtosis statistics did not reveal concerns with non-normality. Means, standard deviations, skewness, and kurtosis are summarized in Table 10 for the 10 items from the Ruminative Responses Scale.

An initial two-factor model was specified. Goodness of fit statistics were mixed, with $\chi^2(34) = 229.959$, $p < .000$; RMSEA = .137 (90% CI .120 - .154); CFI = .961; and TLI = .948. The Brooding and Reflection factors were strongly correlated ($r = .811$), suggesting either a higher-order factor or bifactor model may have better fit. The higher-order factor was just-identified, having identical fit statistics to the two-factor model.

The bifactor model, however, was significantly improved over both the two-factor model and the higher-order model, with fit statistics indicating adequate fit to the data, $\chi^2(25) = 75.317$; $p < .000$; RMSEA = .077 (90% CI .057 - .099); CFI = .991; and TLI = .983. Omega hierarchical reliability estimates were calculated to ensure that the general factor of Rumination was suitable for interpretation (Canivez, 2016; Reise, 2012). Utilizing the Omega program (M. W. Watkins, 2013), the general Rumination factor was characterized by strong reliability ($\omega_h = .859$). Omega subscale coefficients were much weaker, ranging from .087 (Brooding) to .248 (Reflection). Thus, the unidimensional general factor structure of the 10-item Ruminative Responses Scale was utilized. The bifactor model is illustrated in Figure 7, with standardized pattern coefficients.

Table 10
Means, Standard Deviations, Skewness, and Kurtosis for Items from the Ruminative Response Scale

	Items	Mean (SD)	Skew	Kurtosis
RS5	...think "What am I doing to deserve this?"	1.83 (1.03)	0.92	-0.45
RS7	...analyze recent events to try to understand why you are depressed	2.31 (1.08)	0.24	-1.21
RS10	...think "Why do I always react this way?"	2.01 (0.99)	0.56	-0.83
RS11	...go away by yourself and think about why you feel this way	2.04 (1.00)	0.60	-0.74
RS12	...write down what you are thinking about and analyze it	1.60 (0.86)	1.30	0.74
RS13	...think about a recent situation, wishing it had gone better	2.46 (0.94)	0.14	-0.86
RS15	...think "Why do I have problems other people don't have?"	1.97 (1.10)	0.72	-0.90
RS16	...think "Why can't I handle things better?"	2.13 (1.03)	0.42	-1.03
RS20	...analyze your personality to try to understand why you are depressed	2.12 (1.08)	0.48	-1.09
RS21	...go someplace alone to think about your feelings	2.09 (1.01)	0.53	-0.83

Note. Participants were instructed to indicate how often each action was completed (e.g., "I *never* think 'What am I doing to deserve this'").

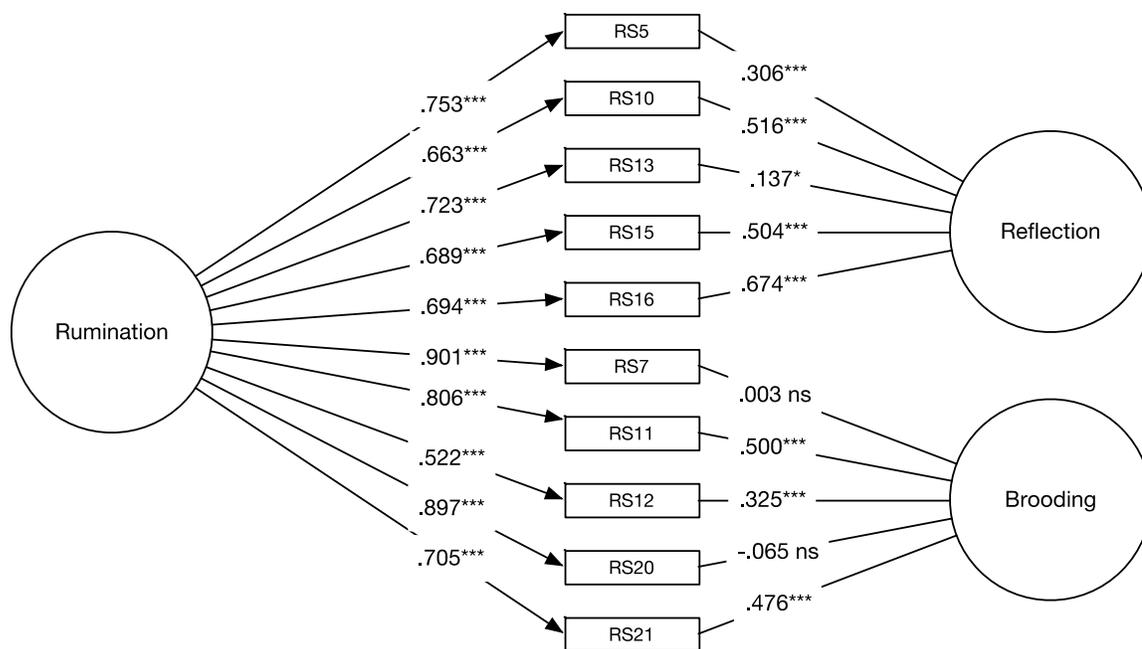


Figure 7. Proposed bifactor structure for the Ruminative Response Scale (RRS; Nolen-Hoeksema & Morrow, 1991; Treynor et al., 2003). Standardized pattern coefficients (WLSMV estimation) are presented.

*** $p < .000$. * $p < .05$. ns = not significant.

Collective Self-Esteem

The CSE was submitted for confirmatory factor analysis, based on a four factor structure originally identified by Luhtanen and Crocker (1992). The four factors identified by the authors included: Membership (items 1, 5, 9, and 13); Private (items 2, 6, 10, 14); Public (items 3, 7, 11, 15); and Identity (items 4, 8, 12, 16). Review of descriptive data indicated that skewness and kurtosis were within limits to assume normality. Means, standard deviations, skewness, and kurtosis are summarized in Table 11. Initial CFA indicated mixed goodness of fit, $\chi^2(98) = 469.712$, $p < .000$; RMSEA = .112 (90% CI .102 - .122); CFI = .929, TLI = .913. Modification indices suggested allowing a number of items to correlate; however, there did not appear any theoretical

justification for most. However, one item, item 9 (I am a cooperative participant in the activities of the lesbian, gay and bisexual community), was allowed to correlate additionally with the Identity factor. This modification was consistent with cross-loadings noted during the original factor analysis completed by Luhtanen and Crocker (1992). Fit statistics improved slightly, with $\chi^2(97) = 388.835, p < .000$; RMSEA = .100 (90% CI .090 - .110); CFI = .944; and TLI = .931.

Correlations between factors varied significantly, ranging from .099 to .829, with notably weaker correlations between Factor 3 (“Public”) and each of the other factors. Despite the range of correlations, both higher-order and bifactor models were reviewed, as the original research on the CSE by Luhtanen and Crocker suggested that a higher order model was better fit than a four-factor model. Initial analysis resulted in a negative residual variance (i.e., Heywood case). Accordingly, the residual variance of Factor 2 was set to zero (e.g., Dillon, Kumar, & Mulani, 1987). With regard to the higher-order model, visual review of the higher-order fit statistics suggested the following fit, $\chi^2(100) = 423.516, p < .000$, RMSEA = .104 (90% CI .093 - .114); CFI = .938; and TLI = .926. A bifactor model was also attempted, but resulted in a Heywood case that could not be resolved. For example, an incomplete bifactor model was specified, not including Factor 2 (e.g., Chen, West, & Sousa, 2006). However, this specification resulted in additional Heywood cases. Thus, the model could not be identified.

A number of factors were considered in choosing the appropriate CFA model for the CSE. First, model fit statistics were reviewed, consistent with *a priori* criteria set forth, relying on multiple indexes (Tanaka, 1993). However, the RMSEA was well above the criteria set forth (i.e., $> .080$) for both the four-factor model and the higher-order

model. In addition, review of the residual correlation matrix of the four-factor model revealed a number of values greater than .1 on both the four-factor model and the higher-order model. As the two models were so similar, a decision to choose the higher-order model was made, as this model was consistent with previous research completed by Luhtanen and Crocker (1992). Given the difficulties with identifying the exact structure of the CSE, this is likely to be a significant limitation in the course of this study. Future directions should explore the factor structure of the CSE with this population using EFA. A limited sample size, however, prevented this in the current study. The higher-order model is depicted in Figure 8 with standardized pattern coefficients.

Table 11

Means, Standard Deviations, Skewness, and Kurtosis for Items from the Collective Self-Esteem Scale

	Item	Mean (SD)	Skew	Kurtosis
CSE1	I am a worthy member of the lesbian, gay and bisexual community.	5.35 (1.69)	-0.90	-0.14
CSE2R	I often regret that I belong to the lesbian, gay and bisexual community.	6.06 (1.41)	-1.52	1.39
CSE3	Overall, the lesbian, gay and bisexual community group is considered good by others.	4.47 (1.41)	-0.27	-0.34
CSE4R	Overall, the lesbian, gay and bisexual community has very little to do with how I feel about myself.	3.56 (1.84)	0.27	-1.07
CSE5R	I feel I don't have much to offer to the lesbian, gay and bisexual community.	4.61 (1.88)	-0.36	-1.08
CSE6	In general, I'm glad to be a member of the lesbian, gay and bisexual community.	5.36 (1.47)	-0.84	0.30
CSE7	Most people consider the lesbian, gay and bisexual community, on the average, to be more ineffective than other groups.	3.34 (1.47)	0.31	-0.49
CSE8	The lesbian, gay and bisexual community I belong to is an important reflection of who I am.	4.14 (1.77)	-0.22	-0.89
CSE9	I am a cooperative participant in the activities of the lesbian, gay and bisexual community.	4.09 (0.80)	-0.16	-1.09
CSE10R	Overall, I often feel that the lesbian, gay and bisexual community is not worthwhile.	5.51 (1.55)	-0.96	0.09
CSE11	In general, others respect the lesbian, gay and bisexual community.	4.15 (1.46)	-0.22	-0.55
CSE12R	The lesbian, gay and bisexual community is unimportant to my sense of what kind of a person I am.	4.20 (1.91)	-0.07	-1.17
CSE13R	I often feel I'm a useless member of the lesbian, gay and bisexual community.	4.84 (1.80)	-0.45	-0.87
CSE14	I feel good about the lesbian, gay and bisexual community I belong to.	4.89 (1.43)	-0.40	0.13
CSE15R	In general, others think that the lesbian, gay and bisexual community is unworthy.	4.59 (1.43)	-0.08	-0.76
CSE16	In general, belonging to the lesbian, gay and bisexual community is an important part of my self-image.	3.93 (1.82)	-0.02	-1.15

Note. R = Item is reverse scored.

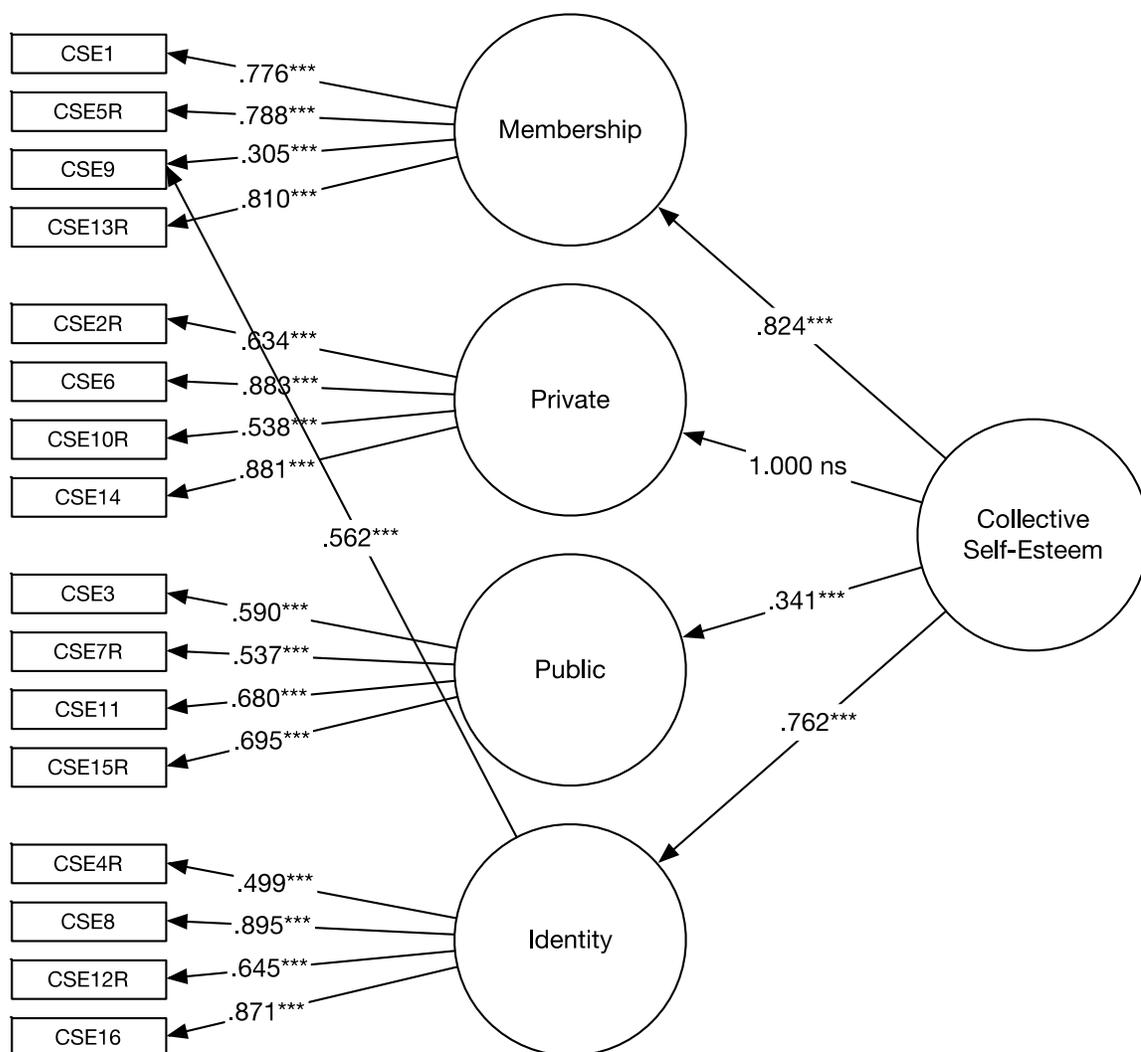


Figure 8. Proposed hierarchical factor structure for the Collective Self-Esteem Scale (CSE; Luhtanen & Crocker, 1992). Standardized pattern coefficients are presented (WLSMV estimation). Item CSE9 cross-loaded on both the Membership and Identity Factors.

*** $p < .000$. ns = nonsignificant.

Perceived Stress Scale

The 10-item PSS developed by Cohen, Kamarck, and Mermelstein (1983) is theorized to have a single factor. Means, standard deviations, skewness, and kurtosis are summarized in Table 12. When subjected to CFA, however, the hypothesized single

factor structure did not meet criteria for goodness of fit across any criteria, with $\chi^2(35) = 759.410$, $p < .000$; RMSEA = .259 (90% CI .243 - .275); CFI = .831; and TLI = .782.

Table 12
Means, Standard Deviations, Skewness, and Kurtosis for Items from the Perceived Stress Scale

	Items	Mean (SD)	Skew	Kurtosis
PSS1	In the last month, how often have you been upset because of something that happened unexpectedly?	2.88 (1.07)	-.01	-.54
PSS2	In the last month, how often have you felt that you were unable to control the important things in your life?	3.00 (1.17)	.01	-.87
PSS3	In the last month, how often have you felt nervous and stressed?	3.55 (1.13)	-.40	-.55
PSS4R	In the last month, how often have you felt confident about your ability to handle your personal problems?	2.52 (1.06)	.40	-.38
PSS5R	In the last month, how often have you felt that things were going your way?	2.80 (1.05)	.20	-.55
PSS6	In the last month, how often have you found that you could not cope with all the things that you had to do?	2.83 (1.20)	.15	-.79
PSS7R	In the last month, how often have you been able to control irritations in your life?	2.61 (1.03)	.32	-.35
PSS8R	In the last month, how often have you felt that you were on top of things?	2.84 (1.05)	.17	-.58
PSS9	In the last month, how often have you been angered because of things that were outside of your control?	2.90 (1.14)	.02	-.80
PSS10	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	2.73 (1.32)	.29	-1.06

Note. R = Item is reverse scored.

As several scales utilized for this research are unidimensional, the factor analytic structure and the interpretation of the score is clear. Moreover, previous research has not evaluated many of these scales for either a higher-order or a bifactor model, thus the current analyses contribute significantly to the existing literature base. As such, the

multidimensional scales were evaluated for either a higher-order or bifactor model, based on high factor correlations obtained during CFA (e.g., Brown, 2015). It was important for the purposes of this research to ensure that the factor analytic structure of the multidimensional scales was demonstrated adequately to ensure appropriate interpretation of scores (Canivez, 2016; Chen et al., 2006; Reise, 2012). Thus, a series of higher-order and bifactor models were evaluated. An important limitation of this confirmatory bifactor approach, however, is that exploratory bifactor models for each scale were not evaluated initially due to sample size limitations (Reise, 2012). Future research should evaluate the factor analytic structure using EFA techniques.

Rationale for Model Selection

The fit statistics for each of the CFA models are summarized on Table 13. Fit statistics for both the SCQ and PSS were inadequate for inclusion in the measurement model. Specifically, neither the SCQ nor the PSS had adequate RMSEA, CFI, or TLI values. Additionally, review of residual correlation matrices indicated poor specification (based on values greater than .1). With regard to the other scales that were analyzed, a number of comments regarding their use are necessary. First, the chi-square significance test was significant across each of the scales evaluated. As Byrne (2012) notes, a well-known disadvantage of the use of the chi-square significance test is its sensitivity to sample size. That is, as sample size increases, even minimal differences between the sample covariance matrix and the population covariance matrix may be perceived as significant. Second, RMSEA estimates were generally higher than the *a priori* stated value of .080 (Browne & Cudeck, 1993), with the notable exception of the HSC and RRS. As noted previously, a number of researchers suggest avoiding over-reliance on a

single measure of goodness of fit (Bentler, 2007; Steiger, 2007; Tanaka, 1993). Further, McDonald (2010) argues that above and beyond the fit statistics, the residual correlation matrix should be analyzed to further support the model fit. As such, multiple criteria were utilized in determining goodness of fit, including previously established theory and evidence from the existing literature on the scales being utilized as part of this measurement model. As a result, scales with significant chi-square tests and scales contributing larger RMSEA estimates were not rejected; rather, multiple criteria, including the CFI and TLI, if values were greater than .90, and the visual inspection of the residual correlation matrices were also considered in determining their use in the next step of the measurement model. Given the mixed features of the scales presented here, the limitations of the use of these scales should give caution to their immediate interpretation. Rather, future research should focus on establishing updated factor structure for those scales for which the data were only adequately modeled.

Table 13
Summary of Fit Statistics from Confirmatory Factor Analysis

	χ^2	<i>df</i>	RMSEA	RMSEA 90 % C. I.	CFI	TLI
HHRDS	189.964***	63	.081	.068 - .095	.982	.973
SCQ	446.783***	35	.197	.181 - .214	.770	.704
OI	131.748***	34	.098	.080 - .116	.991	.988
IHS	116.732***	27	.105	.086 - .124	.985	.981
HSC	185.088***	102	.051	.039 - .063	.989	.985
BRIEF-A	87.551***	20	.105	.083 - .127	.981	.973
RRS	75.317***	25	.077	.057 - .099	.991	.983
CSE	423.516***	100	.104	.093 - .114	.938	.926
PSS	759.410***	35	.259	.243 - .275	.831	.782

Note. WLSMV estimation. RMSEA = root mean square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis index; HHRDS = Heterosexist Harassment, Rejection, and Discrimination Scale; SCQ = Stigma Consciousness Questionnaire; OI = Outness Inventory; IHS = Internalized Homophobia Scale; HSC = Hopkins Symptom Checklist; BRIEF-A = Behavior Rating Inventory of Executive Function-Adult; RRS = Ruminative Responses Scale; CSE = Collective Self-Esteem Scale; PSS = Perceived Stress Scale.

*** $p < .000$.

Specification of the Measurement Model

Following individual CFAs for each of the aforementioned scales, a measurement model was specified using the information gained during the initial CFAs. The measurement model was specified in Mplus Version 7.3 utilizing WLSMV estimation. Item-level data were utilized for each scale estimated in the model.

Minority Stress

Meyer's (2003) minority stress process hypothesizes that chronic stress results from the one's status as a minority. Specifically, Meyer identifies four processes that mediate the relationship between minority status and mental health outcomes. The four processes are: expectations of rejection, concealment, internalized homophobia, and the experience of prejudice events. As such, four corresponding measures of each of these processes were included that were hypothesized to assess the broader construct of minority stress. Two other variables were to be addressed in the current model, including everyday stressors and identity valence. Meyer proposed that everyday stressors were a significant contributor to minority stress. Further, he suggested that identity valence could potentially mediate the effects of minority stress on mental health outcomes.

Minority Stress as a Latent Variable

Originally, it was proposed that minority stress would be measured by the following four scales: the Internalized Homophobia Scale (IHS; Herek, et al., 1997) as indicative of internalized homophobia; the Stigma Consciousness Questionnaire for Gay Men and Lesbians (SCQ; Pinel, 1999) as a proxy for expectations of rejection; the Outness Inventory (OI; Mohr & Fassinger (2000) measuring one's level of concealment; and the Heterosexist Harassment, Rejection, and Discrimination Scale (HHRDS;

Szymanski, 2006) to evaluate one's experience of discrimination and prejudice events. However, the SCQ was not included as part of further analyses, as results of the earlier CFA indicated poor model fit.

The Perceived Stress Scale (PSS; Cohen, Kamarck, and Mermelstein, 1983) also did not meet *a priori* criteria for goodness of fit, and so was not included as part of this model. Identity valence, or one's evaluation of one's own identity, was measured via the Collective Self-Esteem Scale (CSE; Luhtanen & Crocker, 1992)

Measurement model.

The measurement model was specified as follows. The HHRDS, OI, and IHS were each specified as unidimensional factors based on the preliminary CFAs. A latent variable of minority stress was then created based on the specification of each factor, HHRDS, OI, and IHS. The advantage of creating this latent variable of minority stress from the HHRDS, OI, and IHS was to simultaneously account for contributions of each factor to the construct of minority stress, decreasing the likelihood of introducing measurement error from the specification of multiple single indicators of minority stress (Kline, 2011; Wong, Schragger, Holloway, Meyer, & Kipke, 2014). The HHRDS and OI were allowed to covary in the measurement model. A latent variable for working memory was created from items from BRIEF-A. The latent variables for rumination and psychological distress were created from items from the RRS and HSC, respectively, each also specified as a unidimensional based on the results from the previous CFA. The latent variable of identity valence was specified from the four-factor structure of the CSE. The use of the hierarchical model was supported by the prior research of Luhtanen and

Crocker (1992), whereby the hierarchical model was the better fitting model from the original psychometric studies.

The fit of the measurement model was adequate, with fit statistics generally being within pre-defined parameters, $\chi^2(3385) = 5658.546$; RMSEA = .047 (90% CI .044 - .049); CFI = .908; TLI = .905, although perhaps not based on some more restrictive criteria (e.g., CFI > .95; Hu & Bentler, 1995). However, a negative residual variance (-.078) was identified involving Factor 2 (“Private”) on the CSE. Based on recommendations from Dillon et al. (1987), the Factor 2 residual variance was specified to zero, as zero was contained within the standard error and the negative value was statistically nonsignificant. The model was then reanalyzed. Fit statistics remained largely unchanged, $\chi^2(3384) = 5656.546$; RMSEA = .047 (90% CI .044 - .049); CFI = .908; TLI = .905. This second measurement model was retained having corrected for the negative residual variance. All freely estimated parameter estimates were significantly different from zero. Most indicators of each factor were generally high. For instance, those indicators contributing to the discrimination factor ranged from .715-.877.

Of note, path coefficients associated with the latent variable minority stress were quite low, including .348 for the discrimination indicator and -.190 for the concealment indicator, although the internalized homophobia indicator was more substantial at .721. Thus, the latent variable of minority stress may indeed be a heterogeneous variable that is not sufficiently described by the indicators of internalized homophobia, level of concealment (i.e., “outness”), and experience of discrimination. Rather, the level of internalized homophobia may be the most relevant marker of minority stress in the current model.

Table 14
Selected Fit Statistics for Structural Equation Model

	χ^2	<i>df</i>	RMSEA	RMSEA 90% CI	CFI	TLI
Measurement Model	5656.546	3384	.047	.044-.049	.908	.905
Structural Model						
Model 1	5723.243***	3465	.046	.044-.048	.905	.903
Alternate Model	5386.103***	3462	.042	.040-.045	.919	.917

Note. WLSMV estimation. RMSEA = root mean square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis index.

*** $p < .000$.

Structural Equation Model

Proposed Model

Following analysis of the measurement model, the structural portion of the SEM was added utilizing item-level data and WLSMV estimation in Mplus (Version 7.3). The latent variable of psychological distress was added to the model as a mediator of the relationship between minority stress and working memory. Rumination was also added to the model as a latent variable to further mediate the relationship between minority stress and working memory through psychological distress. Identity valence was also added as a mediator of the relationship between minority stress and working memory. Both direct and indirect effects were evaluated. Finally, a variable controlling for time was added. Given the timing of the current project during the 2016 presidential election cycle, it was hypothesized that minority stress may have increased as a function of the election outcome (Stack, 2016). The structural model was specified with the “Private” factor from the CSE having a residual variance of zero, based on the results of the measurement model previously specified. Goodness of fit statistics suggested an adequate fit, $\chi^2(3465) = 5723.243, p < .000$; RMSEA = .046 (90% CI .44 - .48); CFI = .905; and TLI = .903, although the CFI and TLI were lower than more stringent criteria (e.g., > .95; Hu & Bentler, 1995).

A visual summary of the full structural equation model (direct effects only) is presented in Figure 9. Indirect effects are listed in Table 15. Of the nine direct effect structural regression paths specified in the hypothesized model, five were statistically significant ($p < .05$). All reported coefficients are standardized parameter estimates. Parameter estimates were significant for the latent variable associated with the HHRDS,

reflecting experiences of discrimination. Path coefficients in the structural model ranged from .723 to .877, suggesting substantial contributions of each item to the overall construct. Indicators for the OI ranged from .561 to .955, again indicative of substantial construct validity. Internalized homophobia pattern coefficients ranged from .614 to .941. Items from the BRIEF-A loaded onto the working memory factor significantly, ranging from .734 to .873. Pattern coefficients of the RRS items were also substantial, ranging from .483 to .872. Items from the HSC loaded onto the psychological distress variable with estimates ranging from .452 to .836. For each of the four factors associated of the CSE, pattern coefficients ranged from .467 to .896.

Two of the three latent factors loading on higher-order the minority stress factor were relatively weak, with a path coefficient of $-.204$ for the level of concealment variable and $.373$ for the experiences of discrimination factor. However, the internalized homophobia factor was substantial, with a path coefficient of $.753$. Thus, as with the measurement model, minority stress was predominately characterized by the internalized homophobia factor.

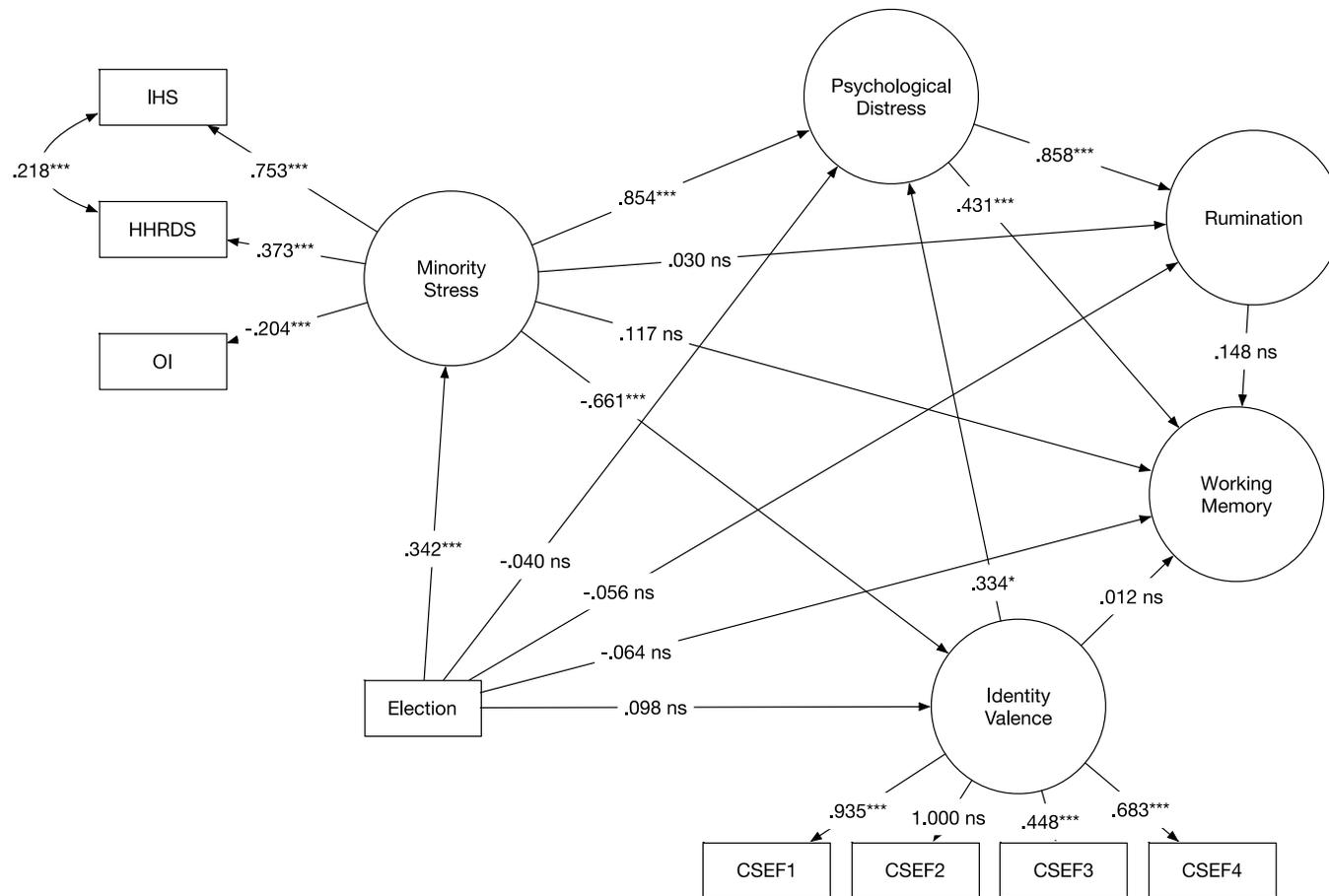


Figure 9. Model 1. Structural equation model with all direct effect paths and standardized coefficients shown for the prediction of working memory. Indirect paths are modeled elsewhere. Item-level data were used for the full structural equation model. For visual clarity, item-level data was omitted from this depiction. IHS = Internalized Homophobia Scale. HHRDS = Heterosexist Harassment, Rejection, and Discrimination Scale. OI = Outness Inventory. *** $p < .001$. ** $p < .01$. * $p < .05$. ns = nonsignificant paths.

Research Question 1: Does minority stress predict psychological distress?

The first research question being evaluated as part of this project asked whether minority stress (i.e., the experience of discrimination, expectations of rejection, concealment, and internalized homophobia) predict psychological distress, specifically internalizing symptoms. As previously noted, the concept of expectations of rejection was to be measured by the Stigma Consciousness Questionnaire, but the SCQ could not be included as part of this model due to a lack of model fit during the measurement model phase. Thus, the minority stress variable was defined by the experience of discrimination, concealment, and internalized homophobia. As expected, a higher level of minority stress predicts greater levels of psychological distress ($\beta = .854, p < .000$). In addition, the relationship between identity valence, or one's positive or negative evaluation of one's identity, and minority stress was also statistically significant ($\beta = -.661, p < .000$). The negative direction of this relationship was also expected, suggesting a decrease in minority stress predicts a more positive identity evaluation. That is to say, the more positive identification with an LGB identity, the less minority stress experienced by the individual. The effect of identity valence on predicting psychological distress was statistically significant ($\beta = .334, p = .028$), however, counterintuitively, suggesting that individuals with more positive identification with their LGB identity experienced greater levels of psychological distress. A significant effect for time on minority stress was observed ($\beta = .342, p < .000$). This finding suggests that those individuals completing the survey after the election exhibited greater levels of minority stress.

Research Question 2: Does rumination mediate the effects of psychological distress?

The second research question sought to answer whether rumination significantly mediated the effects of psychological distress on working memory. There is a significant effect of psychological distress predicting rumination ($\beta = .858, p < .000$); however, rumination did not predict working memory impairments ($\beta = .148, p = .179$). Further, high levels of minority stress do not appear to predict rumination in any meaningful way ($\beta = .035, p = .458$). The indirect effect of minority stress predicting working memory through psychological distress and rumination (Figure 10) was not statistically significant ($\beta = .109, p = .190$). In addition, an indirect effect for the path minority stress through rumination predicting working memory (Figure 11) was not statistically significant ($\beta = .004, p = .621$).

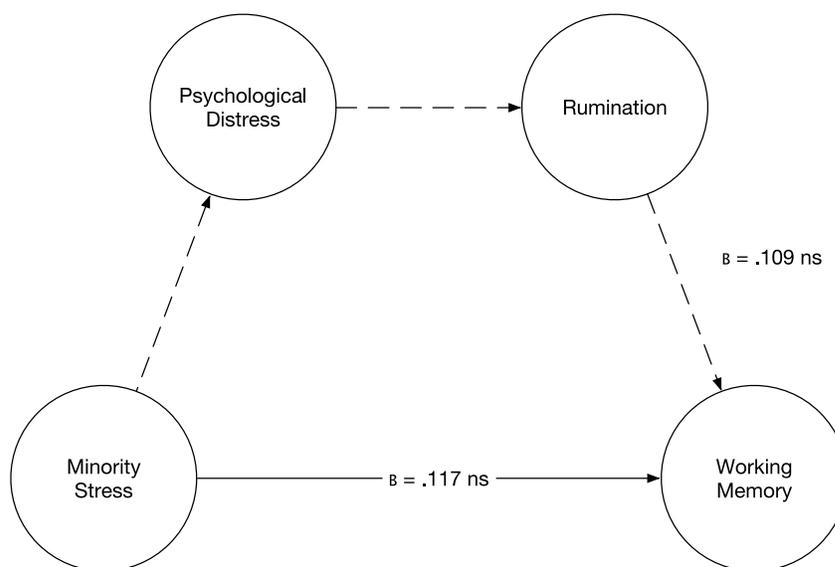


Figure 10. Dashed line = indirect effect. Solid line = direct effect. Total indirect effect ($\beta = .109, p = .190$) of minority stress predicting working memory through psychological distress and rumination. Results indicate that rumination did not further mediate the relationship between minority stress and working memory through psychological distress. ns = not significant.

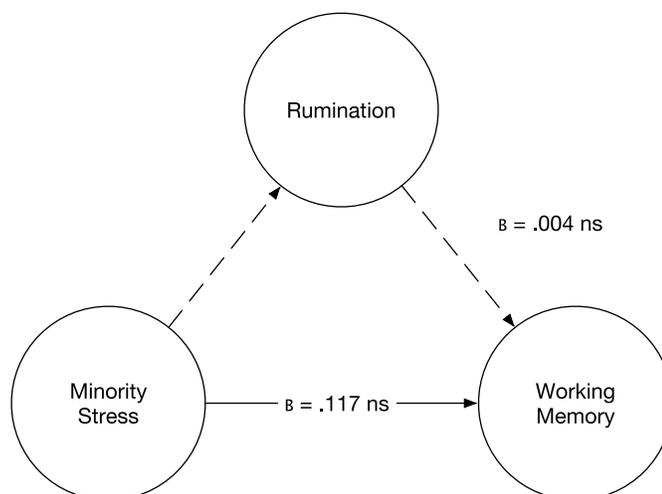


Figure 11. Dashed line = indirect effect. Solid line = direct effect. Total indirect effect ($\beta = .004$, $p = .621$) of minority stress on working memory through rumination. Results indicate that rumination alone did not mediate the relationship between minority stress and working memory. ns = not significant.

Research Question 3: Does psychological distress mediate the relationship between minority stress and working memory?

The final component being assessed as part of this project was to determine whether the characteristics of minority stress predict working memory impairment, and whether that relationship is mediated by self-reported psychological distress. Based on the current model, there was no direct significant effect of minority stress on working memory ($\beta = .117$, $p = .483$). As previously noted, high psychological distress is predicted by high levels of minority stress ($\beta = .854$, $p < .000$). Working memory impairments were significantly predicted by high levels of psychological distress ($\beta = .431$, $p < .000$). Thus, the indirect effect of minority stress predicting working memory through psychological distress (Figure 12) was significant ($\beta = .369$, $p = .007$). Further, there was no significant effect of identity valence impacting working memory ($\beta = .012$, $p = .901$). In addition, there was no significant indirect effect between minority stress on

working memory through identity valence (Figure 13; $\beta = -.008$, $p = .902$). Figure 14 exhibits the indirect effect of identity valence and psychological distress on working memory, evidencing a nonsignificant effect ($\beta = -.095$, $p = .115$).

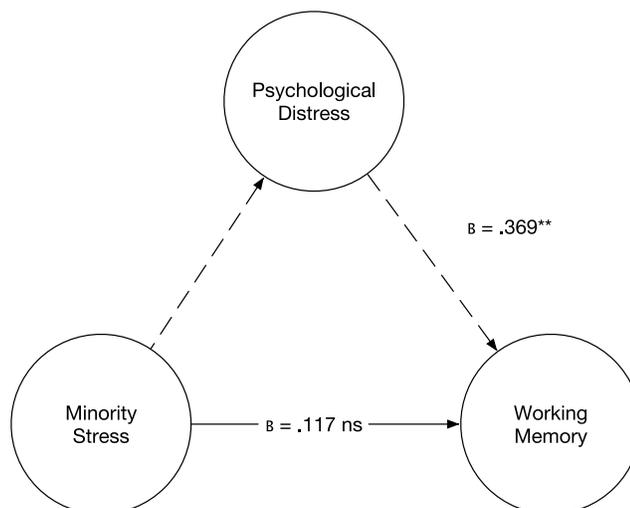


Figure 12. Dashed line = indirect effect. Solid line = direct effect. Total indirect effect ($\beta = .369$, $p = .007$) of minority stress predicting working memory through psychological distress. Results suggest that psychological distress fully mediated the relationship between minority stress and working memory. $**p < .01$. ns = not significant.

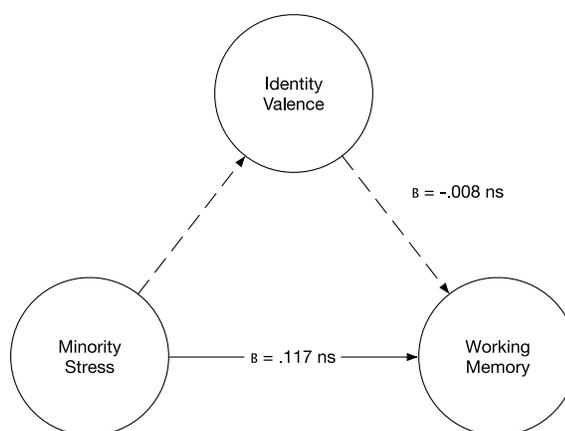


Figure 13. Dashed line = indirect effect. Solid line = direct effect. Total indirect effect ($\beta = -.008$, $p = .902$) of minority stress predicting working memory through identity valence. Results suggest that the relationship between minority stress and working memory was not mediated by identity valence. ns = not significant.

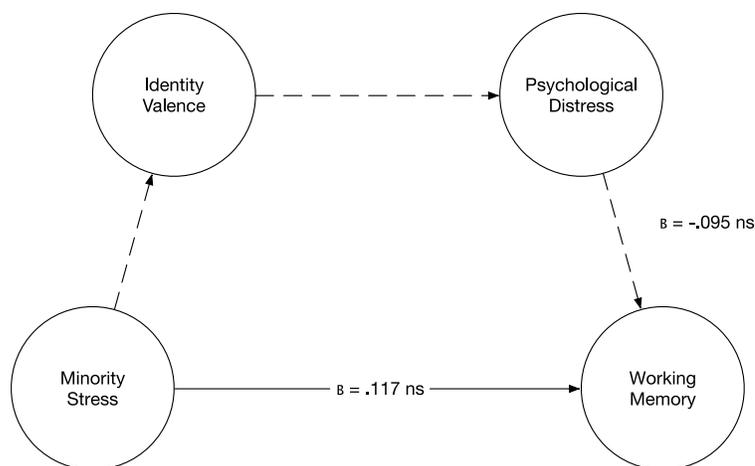


Figure 14. Dashed line = indirect effect. Solid line = direct effect. Total indirect effect ($\beta = -.095, p = .115$) of minority stress predicting working memory through identity valence and psychological distress. ns = not significant.

In sum, the specified model fit the data adequately. Indeed, minority stress predicted psychological distress among respondents. Further, rumination predicted working memory, and psychological distress predicted rumination. Finally, psychological distress did not predict working memory directly. Rather, an indirect effect of minority stress and working memory through psychological distress and rumination was significant. Indirect effects are summarized on Table 15.

Table 15

Indirect Effects of Minority Stress on Working Memory for Model 1

	β	S. E.	z
Minority stress \rightarrow psychological distress \rightarrow rumination	.109	.083	1.312
Minority stress \rightarrow psychological distress	.369	.137	2.696 ^a
Minority stress \rightarrow identity valence	-.008	.064	-.124
Minority stress \rightarrow identity valence \rightarrow psychological distress	-.095	.060	-1.575
Minority stress \rightarrow rumination	.004	.009	.494

Note. ^a $p = .007$

Alternate Model

A further alternate model was specified for the purposes of comparison to the proposed structural model. The proposed structural model included the latent variables of expectations of discrimination, level of concealment, and internalized homophobia specified as indicators of a further latent variable of minority stress, based on Meyer's (1995, 2003) proposed model of minority stress. However, in modeling minority stress as a latent variable of expectations of discrimination, level of concealment, and internalized homophobia, the variance accounted for by the three variables is shared. The alternate model was specified to include expectations of discrimination, level of concealment, and internalized homophobia as direct predictors of outcomes of interest.

In this alternative model, depicted in Figure 15, paths were specified each from the discrimination, concealment, and internalized homophobia variables to psychological distress, working memory, and identity valence. An additional path was specified directly from internalized homophobia to rumination, as it was hypothesized that internalized homophobia would predict rumination based on prior research (Hatzenbuehler, Dovidio, Nolen-Hoeksema, & Phillips, 2009). Further, residual variance of Factor 2 of the CSE was once again specified as zero, as in the previous models due to a negative residual variance. Model fit statistics were largely similar to Model 1, $\chi^2(3462) = 5386.103, p < .000$; RMSEA = .042 (90% CI .040 - .045); CFI = .919; and TLI = .917. As compared to the fit statistics for Model 1, the Alternative Model was not a meaningful improvement, but nor was the fit of Model 1 superior to the Alternative Model. Model 1 and the Alternative Model appear to be equivalent models.

In conclusion, Model 1 was retained for two reasons. First, Model 1 demonstrated adequate fit of the data. The Alternative Model, although also demonstrating good fit of the data, did not improve the model significantly over Model 1. Second, Model 1 was the proposed model developed prior to data collection and data analysis. As SEM is a theory driven data analysis technique, Model 1 was accepted as the final model. However, the Alternative Model does not meaningfully differ from the proposed model. In other words, there is no evidence to suggest that Model 1 explains the interrelationships between variables any better than the alternative model. Moreover, the possibility that other, superior or equivalent alternative models exist cannot be discounted. Rather, the final model should be considered for its advantages over the alternative model in this interpretation. Specifically, the modeling of the minority stress latent variable, as it accounts for the covariance of the three individual indicators of minority stress is an advantage over the Alternative Model.

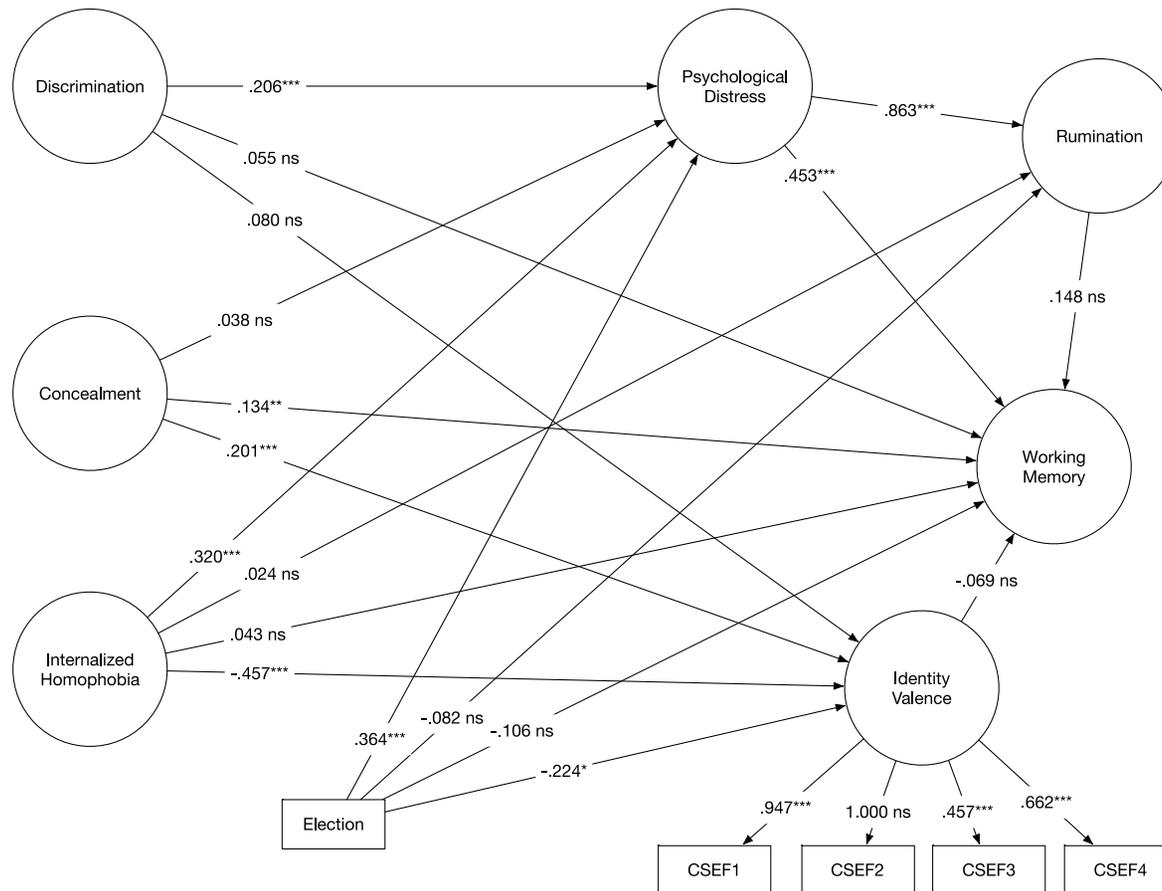


Figure 15. Alternate Model. Structural equation model with all paths and standardized coefficients shown for the prediction of working memory. Item-level data were used for the full structural equation model. For visual clarity, item-level data was omitted. IHS = Internalized Homophobia Scale. HHRDS = Heterosexist Harassment, Rejection, and Discrimination Scale. OI = Outness Inventory. *** $p < .001$. ** $p < .01$. * $p < .05$. ns = not significant.

CHAPTER 5

DISCUSSION

Purpose of the Current Study

A significant literature base exists that describes higher rates of mental illness among members of the LGB community relative to heterosexual individuals (Bostwick et al., 2010; S. D. Cochran et al., 2003; Meyer, 1995, 2003; Oswalt & Wyatt, 2011; Ziyadeh et al., 2007). Additionally, research suggests that the experiences of discrimination contribute to such disparate rates of mental illness among individuals who identify as lesbian, gay, or bisexual (Mays & Cochran, 2001; Meyer, 2003). Meyer (1995, 2003) proposed that minority stress, or the stress related to one's status as a minority, contributes to higher rates of mental illness among members of the LGB community. Thus, the goal of this research is to extend such findings to better explain the relationship between minority stress, psychological distress, and a third variable, working memory.

The first objective of the current project is to examine, using structural equation modeling, the relationship between minority stress (Meyer, 2003), psychological distress, and working memory. Thus, psychological distress was defined as internalizing symptomology, specifically anxious and depressive symptoms. Working memory was measured via self-report, utilizing a psychometrically well-established adult behavior rating scale (Roth et al., 2005). In addition, Hatzenbuehler and colleagues (2009) identified rumination as a factor that contributes to psychological distress among members of the LGB community. The current research sought to further investigate and extend existing research not only by investigating the effects of minority stress (of which stigma is a component) on psychological distress and working memory, but also to

further understand how rumination may impact working memory among individuals who experience high levels of minority stress and whether identity valence served as a protective factor (Meyer, 2003).

Review of Findings

Minority stress and psychological distress

Hypothesis one stated that sexual minorities with high minority stress will have increased levels of internalizing symptoms. This hypothesis was supported. The findings are consistent with previous research examining the nature of stigma and mental illness in the LGB community (Hatzenbuehler, Nolen-Hoeksema, et al., 2009; Mays & Cochran, 2001; Meyer, 2003). Further, one's positive connection to one's identity served as a protective factor, with less minority stress reported among individuals with more positive identity valence. However, an unexpected finding related to identity valence was noted. Strong identity valence, that is a strong positive evaluation of one's sexual identity, was associated with higher levels of psychological distress. The exact nature of this relationship is unclear and requires further investigation. Meyer (2003) hypothesized that identity valence would be a protective factor against adverse mental health outcomes. Indeed, literature has demonstrated identity valence to be a protective factor against psychological distress (Kertzner et al., 2009). Speculatively, it is possible that, despite high personal regard for one's identity or association with a stigmatized group, the social identity remains devalued within the societal context, which may contribute to the relationship with increased psychological distress. Further, additional factors that should be explored in the current research to better explain this finding including coping

strategies utilized by sexual minority individuals and available social support (Hatzenbuehler, Nolen-Hoeksema, et al., 2009; Meyer, 2003).

Interestingly, relative to concealment of one's sexual identity status and the experience of discrimination and rejection, internalized homophobia accounted for a larger proportion of variance of the construct of minority stress. That is, while concealment and discrimination were significant contributors to minority stress, reports of internalized homophobia were greater. This finding should be explored further in future research. The current research utilized one's self-reported sexual identity and did not include reported same-sex attraction. Individuals with same sex attraction may not necessarily identify as lesbian, gay, or bisexual, and were thus not included in the current study. Individuals with same-sex attraction but who do not identify as LGB may have higher rates of concealment out of fear of rejection or discrimination (Gilman et al., 2001). Future studies should include individuals with same-sex attraction who do not identify as LGB.

In addition, the findings of this project may have been impacted by the presidential election of November 2016. The results of this election cycle were hypothesized to have a significant influence on the results of this survey, as data collection was well underway during the election. Since the presidential election, news outlets have reported possible effects that a Trump presidency may have on the rights of sexual minorities (e.g., The New York Times; Stack, 2016; CNN; Grinberg, 2016; and Reuters; Malo, 2016). There exists among members of the LGBT community a fear that advances in the rights of sexual minorities in America will be reversed, including such issues as marriage equality, military service, transgender protections, and that there will

be lack of progress on other LGBT protections such as employment discrimination rights (Landsbaum, 2016). Accordingly, the timing of response (i.e., before or after the election) had a significant relationship with participants' report of minority stress in the current study.

Psychological distress and rumination

The second hypothesis addressed by this study was whether high levels of psychological distress would predict working memory deficits, and if this relationship was mediated by rumination. It was evident that there was a positive relationship between psychological distress (i.e., internalizing symptoms) and rumination, with greater levels of internalizing symptoms predicting greater rumination. Psychological distress had a significant direct effect in predicting working memory. Rumination was expected to be a significant predictor of working memory difficulties, as theorists have suggested that the perseverative cognitions associated with rumination interfere with working memory (Joormann, Levens, & Gotlib, 2011; Nolen-Hoeksema, 1991). Joorman and colleagues, however, suggest that rumination may have a more salient effect among individuals who have a major depressive disorder, versus dysphoric individuals or members of the general public.

Minority stress and working memory

Finally, this project sought to explain whether the characteristics of minority stress predicted working memory deficits, and whether that relationship was mediated through self-reports of internalizing symptoms, or evidence of psychological distress. This hypothesis was supported to the extent that the relationship between minority stress and working memory was fully mediated by psychological distress. Thus, the current

research extends the existing research base to more fully describe how minority stress may influence behavior, as reported by respondents on a measure of working memory. As a capacity-limited executive function, working memory can only be taxed so far (Baddeley, 1996; Baddeley & Hitch, 1974; Diamond, 2013; Hofmann et al., 2012). The effects of chronic stress on working memory have been demonstrated previously (Brady & Sinha, 2005; Brosschot et al., 2006; Gathmann et al., 2014; Hackman & Farah, 2009; Miller et al., 2007). Further, research into stereotype threat suggests that under acutely stressful situations regarding one's marginalized identity (e.g., gender, sexuality, race, or ethnicity), working memory is impaired as a result of stigma-related stressors (Schmader & Johns, 2003; Schmader et al., 2008). Various researchers have also suggested that psychological distress itself is related to working memory deficits, although evaluation of the causal links of this relationship is still necessary (e.g., Snyder, 2013).

Alternate Model

An alternate model was specified as a point of comparison for the proposed structural model, wherein the latent variables of discrimination, level of concealment, and internalized homophobia were specified as directly predicting outcome variables. The rationale for this was to evaluate whether variance specific to each of the three latent variables had a significant, direct predictive effect over and above the latent variable of minority stress in the original proposed model. However, fit statistics for the alternate model did not differ meaningfully from the alternate model.

It should be noted that while the fit statistics of Model 1 were adequate, there were two significant issues that arose over the course of the research. First, the scales utilized to measure the identified constructs had mixed results in terms of goodness of fit

to the data. Second, the fit of Model 1 was not significantly more improved than the Alternative Model (i.e., equivalent models). As a result, these findings should be interpreted with some caution, and further research is necessary to determine how best to characterize the relationship between these variables of interest. Based on these findings, it is not clear that Model 1 best explains variation within the data.

In sum, the current research suggested that higher levels of minority stress predicted greater psychological distress, specifically internalizing symptoms of anxiety and depression. The relationship between minority stress and working memory was fully mediated by psychological distress. Rumination, however, was not a significant predictor of working memory deficits, and did not significantly mediate the relationship between psychological distress and working memory deficits. However, given the statistical equivalence of Model 1 and the Alternative Model, additional research is necessary to further explain the relationship between these variables.

Strengths of the Present Study

A number of strengths can be identified in the current study. The current project utilized a snowball recruitment strategy to build upon a community-based sampling approach. Respondents were encouraged to share this survey through a variety of social media platforms. The use of a snowball recruitment strategy was utilized to reduce bias in the sample from only recruiting participants who have high affiliation with the gay community (Meyer & Colten, 1999; Meyer & Wilson, 2009).

The current project has demonstrated that self-reported working memory is significantly predicted by self-reported minority stress, as mediated by psychological distress. The results of the current project are meaningful. From a theoretical perspective,

this is the first demonstration that minority stress, a form of chronic stress, may have a negative impact on working memory among individuals who identify as lesbian, gay, or bisexual. The relationship between chronic stress and working memory has been examined previously (Calvo & Bialystok, 2014; Hackman & Farah, 2009; Scott et al., 2015). Further, as in the case of stereotype threat, Schmader and Johns (2003) demonstrated that by priming racial stereotypes, the working memory system is interrupted. The researchers posited that physiological stress resulting from participation in a stereotype threat condition contributed to working memory deficits (Schmader et al., 2008). The current findings support the position that chronic stress related to one's identity has the potential to influence working memory. Importantly, however, the current findings suggest that psychological distress, particularly symptoms of anxiety and depression mediate that relationship. Further research is necessary, including experimental manipulation, to further clarify the nature of this relationship.

Further, the use of structural equation modeling (SEM) is a strength of the current project. Various authors (Byrne, 2012; Kline, 2011) have reviewed the strengths of SEM as compared to other multivariate analysis approaches. For instance, utilizing SEM as the data analytic approach allowed for the inclusion of multiple indicators to comprehensively investigate the relationships estimated in the proposed model. Multiple regression allows for the explanation of a predictive relationship between constructs, but does not allow for the simultaneous analysis of all constructs of interest. SEM is capable of handling both non-normal and categorical data, making it an ideal choice for modeling the relationship between minority stress and working memory (Finney & DiStefano, 2006). As noted previously, there were a number of normality violations in the data, and

data throughout were treated as categorical in nature. Further, by its nature, SEM is a confirmatory statistical technique, providing additional support for its use in testing the proposed model of minority stress in which a model is specified *a priori* and then tested (Kline, 2011). Minority stress, proposed by Meyer (1995; 2003), was modeled and extended prior to specification and confirmed using SEM analysis.

Moreover, an additional strength of the current study is the inclusion of multiple variables to model minority stress as a latent variable within an SEM framework. Meyer (1995, 2003), in first proposing minority stress, indicated a number of factors that contribute to minority stress, including internalized homophobia, experiences of prejudice and discrimination, and identity concealment. Thus, while minority stress itself is the variable of interest, minority stress cannot be measured directly. Rather, minority stress is a multidimensional factor that is hypothesized to impact mental health outcomes. Multiple indicators were incorporated into the measurement of minority stress. The advantage of modeling minority stress using multiple factors is to more accurately model the theoretical minority stress model proposed by Meyer. Previous literature has generally not modeled minority stress as a latent variable using multiple factors (for an exception, see Wong et al., 2014). With multiple indicators predicting outcomes of interest, accounting for increased measurement error is possible (Kline, 2011). Thus, covariance among the minority stress variables is included as part of the model to reduce measurement error. Thus, the information provided from multiple factors provides research support for minority stress as a multidimensional construct.

Related to survey research, a number of issues can arise, including social desirability and issues of collecting sensitive information (Paulhus, 2002). The online

survey format was an advantage of the current project (Kreuter et al., 2008). The anonymity of completing the survey form online provided the opportunity for individuals who may not otherwise disclose their sexual identity or sexual attraction to do so without fear of disclosure. Further, the sampling techniques were designed to reach an extended community-based sample of individuals who identify as LGB. Rather than focusing on centers in the LGB community, such as health centers or entertainment venues that may cater specifically to members of the LGB community, a wider distribution method was employed (Meyer & Colten, 1999). Further, the recruitment strategy included distribution through a number of online sources and allowed the ability to share the survey link with LGB individuals outside of the traditional LGB community (e.g., those who are not out).

Limitations

The current model is based on confirmation of a theoretical construct of minority stress proposed by Meyer (1995, 2003). The theoretical model proposes several factors that contribute to minority stress, including concealment, expectations of rejection, experiences of discrimination and internalized homophobia. In the current research, however, several challenges arose. Specifically, the scale proposed to measure an individual's expectations of rejection (Stigma Consciousness Questionnaire, SCQ; Pinel, 1999) did not function adequately enough to be included in the proposed structural equation model. As a result, components of the minority stress model could not be included (i.e., experiences of rejection and general stressors). Additional exploratory and confirmatory factor analyses would be necessary to provide psychometric support, including factor structure and additional measures of validity and reliability, for the further use of this scale. One factor that may have contributed to the lack of usefulness of

the SCQ is time. Stigma, as a function of time, changes in form (Sexual Minority Assessment Research Team (SMART), 2009). That is, social norms change over time, which may influence how stigma is perceived or how attitudes are expressed. As an example, attitudes toward lesbians and gay men have changed, according to some researchers, possibly reflecting new, but albeit continued heterosexist views of lesbians and gay men (Morrison & Morrison, 2002). As such, the items of the SCQ should be evaluated for its current relevance, close to 20 years after it was authored.

Also of note, the internalized homophobia scale appeared as a better indicator of the construct of minority stress, relative to concealment and experiences of discrimination. While it is possible that internalized homophobia may indeed be a more significant contributor to minority stress, further independent replication would be required to evaluate this theory. As noted by Meyer (2003), internalized homophobia is the most proximal stressor within the minority stress model. Level of concealment and expectations of discrimination are more distal stressors. Thus, internalized homophobia may be a more personal risk factor for psychological distress and impaired working memory as compared to the other variables. Further, even as LGB individuals begin to accept their sexual identity more successfully and positively, internalized homophobia may not be entirely reduced. As a result, higher levels of internalized homophobia are consistently predictive of higher levels of psychological distress (Herek et al., 1998; Lehavot & Simoni, 2011; Williamson, 2000; Wong et al., 2014).

Moreover, the scales utilized in this research, except for the Hopkins Symptom Checklist and Ruminative Response Scale, suffered from mixed model fit statistics. In particular, RMSEA values were generally greater than .08, a fairly liberal criteria

according to many researchers (Hu & Bentler, 1995; MacCallum, Browne, & Sugawara, 1996). Thus, multiple criteria were used to evaluate the goodness of fit, including previously established research, multiple fit indexes, and the residual correlation matrix (McDonald, 2010; Tanaka, 1993). Despite the mixed model fit statistics of individual scales, the overall structural model fit of Model 1 was adequate with RMSEA value less than .050 and CFI and TLI values greater than .90.

Another concern related to the psychometric properties of the scales utilized is the issue of measurement equivalence/invariance. Recall that the HHRDS and IHS, for instance, specifically required slight modifications in language based on the self-reported sexual identity of respondents (i.e., lesbian, gay, or bisexual). However, the functioning of such changes in the current sample was not explored directly as it relates to measurement invariance. The other scales utilized as part of this research may also function differently as a function of group (i.e., lesbian, gay, or bisexual participants). Future research should explore the measurement equivalence of these scales across groups (Pendergast et al., 2017).

While the current project effectively demonstrated that minority stress predicts working memory through psychological distress, working memory was evaluated based on self-report of respondents and was not directly assessed. Self-report measures of psychological constructs have disadvantages. For example, response bias may contribute to error in the sample, such as socially desirable responding (Paulhus, 2002). Further, while a self-report measure was an effective means of assessing working memory via online survey format, the information gained is limited to one's own responses. Further research is necessary to examine the direct behavioral correlates of the findings of the

current research utilizing performance-based measures. That is, to extend the current findings, demonstrating with a sample of LGB individuals, the effects of chronic minority stress on a direct measure of working memory (e.g., operation span task; Schmader & Johns, 2003). There is some evidence to suggest that behavior ratings and performance-based measures are not highly correlated, and may measure differing constructs (see Toplak, West, & Stanovich, 2013 for a review). Thus, future research should investigate the effects of minority stress on performance-based measures of working memory (e.g., Strauss et al., 2006).

The nature of the survey format used in the current project necessitated certain restrictions in how individuals reported their sexual identity, gender identity, and sexual attraction. Participants were generally limited to categorical responses of sexual identity, gender identity, and sexual attraction. Although participants were able to specify an open-ended response, for the purposes of routing individuals to a particular set of survey questions, only participants who self-reported being lesbian, gay, or bisexual were included as part of these analyses. This is an important consideration for several reasons. First, sexual identity and gender identity are largely considered as occurring on a continuum. Further, individuals who do not identify as lesbian, gay, or bisexual, yet have same-sex attraction, were not included in the current sample. Questionnaires that were administered were specific to those individuals who identify as lesbian, gay, or bisexual, and the language used in survey forms would not have been appropriate for individuals who do not identify as lesbian, gay, or bisexual. As a result, the findings of the current study are limited in terms of generalizability, as individuals with same-sex sexual attraction and behavior were not included as part of this sample. Future research should

include measures that are more inclusive in terms of gendered language and recruitment should include a wide array of individuals with same-sex sexual attraction and behavior.

Lessons Learned

Although the purpose of this research may appear pointed and direct, a number of challenges arose during the course of survey design and data collection. Sampling individuals of a minority sexual orientation poses a number of challenges. Specifically, community-based samples can be difficult to recruit using standard recruitment strategies, such as contacting health and community centers that serve primarily LGB individuals, or recruitment through public establishments that cater specifically to LGB individuals. By doing so, there is the possibility of a biased sample, recruiting primarily individuals who are more open about their sexual identity and may therefore experience fewer symptoms of minority stress (Meyer & Colten, 1999; Meyer & Wilson, 2009). Thus, recruitment strategies for this project relied on several sources and utilized a snowball sample to further recruit a more varied sample of participants who may not access the LGB community.

Relatedly, in as much as the goal of this project was to sample individuals with varying experiences of minority stress, issues arose in terms of data collection, ensuring that individuals had an opportunity to adequately describe their gender identity, sexual identity, and sexual attraction. Efforts were made to ensure that the survey design was as inclusive as possible, following the guidelines from the Sexual Minority Assessment Research Team (SMART) of the UCLA Williams Institute (Sexual Minority Assessment Research Team (SMART), 2009). However, a number of individuals did not categorically identify as a particular proscribed gender or sexual identity. For example, a

number of individuals ($N = 79$) of the original whole group sample did not identify as heterosexual, lesbian, gay, or bisexual, and could therefore not be surveyed in terms of a minority stress model.

The reasons for not being surveyed are largely related to systematic research design problems. For one, the use of Qualtrics in this project required that an individual's responses be routed to a particular set of survey questions, based on self-reported sexual identity. Further, the availability of questionnaires using inclusive language was limited for the purposes of this project. For example, the language on the HHRDS and the IHS was adjusted based on the group answering the questions. Participants who identified as lesbian, for instance, were routed to the lesbian version of the HHRDS (e.g., "How many times have you been treated unfairly by teachers or professors because you are a lesbian?"), while gay men were routed to the Gay men version of the HHRDS (e.g., "How many times have you been treated unfairly by teachers or professors because you are a gay man?") and bisexual individuals were routed to the bisexual version of the HHRDS (e.g., "How many times have you been treated unfairly by teachers or professors because you are bisexual?").

Through sampling, survey design, and data collection, I attempted to design the project to be as inclusive as possible. However, given the nature of survey design and online data collection limitations, the full spectrum of sexual identity and gender identity could not be ascertained. Further research is necessary to develop more inclusive measures with psychometric support to truly characterize the full spectrum of sexual identity and gender identity.

Directions for Future Research

The current project had several strengths and limitations. Future research should continue to build on this and other lines of research to further understand the reasons for disparate rates of mental illness among individuals who identify as lesbian, gay or bisexual. Several lines for future research have been suggested above. Researchers should continue to explore the construct of minority stress and develop the most parsimonious model to explain the construct. The nature of self-report scales presents limitations in and of itself, particularly when asking for such sensitive information as sexual identity and gender identity. Models of measurement invariance among groups should be utilized to demonstrate equivalence of existing scales among groups.

Rather than relying solely on self-report measures of working memory, future research should attempt to create a behavioral model of the effects of minority stress on working memory, which should include both performance-based measures (e.g., performance on a working memory task; Strauss et al., 2006; Toplak et al., 2013) as well as behavioral outcomes associated with working memory challenges (e.g., risky decision making; Hinson et al., 2003). As noted, self-report measures have limitations in terms of their ecological validity and should be correlated with demonstrations of working memory efficiency through performance-based measures. Further, the nature of working memory deficits should be extended to include an exploration of the effects on matters of real world importance, including risky behaviors such as alcohol- and drug-use and risky sexual behaviors. As Brady and Sinha (2005) have noted, for example, chronic stress may lead to such risky behaviors as alcohol and/or drug use. Future research should seek to

include such variables as risky decision making in the context of minority stress and weak working memory systems.

An examination of the coping strategies utilized by LGB individuals should also be explored to determine what effect, if any, appropriate coping strategies may have on minority stress. Appropriate coping strategies may reduce overall stress and group specific minority stress. In addition, treatment interventions that specifically target psychological distress related to minority stress should be explored for their efficacy in improving psychological well-being and how that may lead to an improvement in working memory. The current study lacked the ability to control for respondents perceived overall stress level. Future studies should seek to differentiate minority stress from general stressors in a statistically meaningful way.

Further, a number of researchers have documented differences in psychological distress between lesbian, gay, and bisexual individuals (e.g., Herek & Garnets, 2007). For example, individuals who identify as bisexual tend to have higher rates of psychological distress as compared to lesbians or gay men (Bostwick et al., 2010). Group differences should be explored with a larger group sample size. Item functioning should be explored across groups in terms of measurement equivalence/invariance (Pendergast et al., 2017).

Finally, the current research also highlights the need for continued intervention for individuals with high levels of minority stress. Internalized homophobia, given the significant contributions to minority stress in the current model, may require targeted intervention, as others have suggested (Meyer, 2003; Williamson, 2000). I have hypothesized that working memory impairments may lead to risky behaviors, and this area should be examined further. Meyer (2003) has speculated that certain protective

factors may counter the negative impact of minority stress, such as proactive coping strategies and social support. Addressing these protective factors may mitigate the effects of minority stress on psychological distress, thereby decreasing the influence on working memory.

Conclusions

There were several main findings of the current research. First, higher rates of minority stress predicted higher rates of psychological distress among individuals who identify as lesbian, gay, or bisexual. Further, individuals who reported high minority stress also reported difficulty with working memory, fully mediated by psychological distress. While psychological distress predicted rumination, rumination did not predict working memory deficits. Importantly, this project highlights the continued adversity that sexual minority individuals face as a result of societal structures that foster heteronormative standards. In sum, this is the first research study to demonstrate how minority stress, a form of chronic stress, relates to working memory among LGB individuals. While the current research provides a first step in better understanding the effects of minority stress on working memory, this project has the potential to contribute significantly to the research and development of interventions to promote mental health among LGB individuals.

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