RESILIENCE AND HEALTH-RELATED QUALITY OF LIFE FOLLOWING DISCHARGE FROM A LEVEL 1 TRAUMA CENTER

A Dissertation

by

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ABSTRACT

Trauma can notably impact health-related quality of life (HRQoL) and result in psychiatric symptomology. There is a dearth of longitudinal research examining resilience as a predictor of HRQoL and depression outcomes post-exposure to trauma. This study examines the ability of resilience, as measured by the Connor-Davidson Resilience Scale 10-item (CD-RISC 10), to longitudinally predict mental and physical HRQoL and depression from a Level 1 trauma center at four timepoints: during hospitalization and at three, six, and 12 months post-discharge. Structural equation modeling was used to assess two models of resilience – one conceptualizing it as a latent variable using the CD-RISC 10 items, and the other using the CD-RISC 10 total score – to predict HRQoL and depression overtime. Both models accounted for potential associations with age and gender.

Fit indices indicate that both models evidenced good fit to the data. The models had similar path estimates. Higher resilience was significantly associated with higher mental and physical HRQoL and lower depression at baseline and lower physical HRQoL at three months. Resilience was not significantly associated with HRQoL and depression at other measurement occasions. Age was significantly associated with lower physical HRQoL at baseline and lower depression at six months. Age was not significantly associated with other HRQoL or depression at other measurement occasions. Gender was not significantly associated with HRQoL or depression at any measurement occasion. Depression was consistently associated with subsequent

assessments of depression. Depression was associated with lower mental and physical HRQoL over time, except for physical HRQoL at 12 months. Higher physical HRQoL was significantly associated with higher physical HRQoL at later assessments, and with lower depression at 12 months. Higher mental HRQoL was significantly associated with higher mental HRQoL at later assessments, and with lower depression and physical HRQoL at 12 months. However, baseline mental HRQoL at baseline was not able to predict mental HRQoL at 12 months. Baseline mental HRQoL was significantly associated with lower depression and physical HRQoL at 12 months.

DEDICATION

I dedicate this dissertation work to my biological and chosen family, friends, professors, supervisors, and mentors who have seen me through my graduate work and made me the person I am today.

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All other work conducted for the dissertation was completed by the student independently.

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CHAPTER I

INTRODUCTION

Traumatic injuries are one of the leading causes of death in the first 40 years of life (Halcomb, Daly, Davidson, Elliott, & Griffiths, 2005) and the most prevalent type of injury in America (Faul, Xu, Wald, & Coronado, 2010). Exposure to a traumatic event can result in an array of outcomes to an individual such as the loss of abilities, difficulty returning to work, prolonged recovery time, and impacted health-related quality of life (HRQoL) (e.g., psychological and physical well-being; Halcomb et al., 2005; Mayou, Bryant, & Duthie, 1993; Pittman et al., 2012; Vanderploeg, Belanger, & Curtiss, 2009). The American Psychiatric Association (2013) defines Criterion A of posttraumatic stress-disorder (PTSD) as:

> Exposure to actual or threatened death, serious injury, or sexual violence in one (or more) of the following ways: 1.) Directly experiencing the traumatic event(s); 2.) Witnessing, in person, the event(s) as it occurred to others; 3.) Learning that the traumatic event(s) occurred to a close family member or close friend. In cases of actual or threatened death of a family member or friend, the event(s) must have been violent or accidental; 4.) Experiencing repeated or extreme exposure to aversive details of the traumatic event(s). (p. 271)

Traumatic events (e.g., traffic accident, assault, gunshot or knife wound, and falling) may meet Criterion A of PTSD (American Psychiatric Association, 2013), which results in higher risk of developing comorbid disorders (e.g., depressive, substance abuse, and other anxiety disorders).

The foremost cause of trauma-related psychiatric disorders is exposure to traumatic injury (Bryant et al., 2010). Eaton et al.'s (2008) systematic review of the burden of diseases in the world ranks mental health disorders as the third most taxing on individuals and society. Problems associated with impacted psychological health after traumatic injury include increased substance abuse, depression, strained relationships, impaired cognitions and mood, difficulty focusing, avoidance, and reduced quality of life. An estimated 33% of traumatic injury survivors meeting criteria for a psychiatric disorder seek mental health treatment (Bryant et al., 2010).

PTSD and Major Depressive Disorder (MDD) are two of the most frequent psychiatric disorders following traumatic injury (Bryant et al., 2010; O'Donnell, Bryant, Creamer, & Carty, 2008). Interpersonal difficulty, hypervigilance, depressed and anxious mood, avoidance, substance abuse, isolation, hypervigilance, altered cognitions, emotional numbing, and substance abuse are common problems associated with PTSD. An estimated 81% of people experience some form of trauma in their life time (Bahraini, Breshears, Hernandez, Schneider, Forster, & Brenner, 2014). Using Bahraini et al.'s (2014) 81% estimate, 261,733,286 people experienced a form of trauma in 2016. The O'Donnell et al. (2008) study reported that 10% to 30%, or 200,000-400,000 people in 2005, of traumatic injury survivors developed a PTSD diagnosis. However, less than 47.7% of individuals with PTSD seek help (Bryant et al., 2010). Assuming the 81% estimate reported by Bahraini et al. (2014) met Criterion A for PTSD then 26,173,329-78,519,986 people in the United States in 2016 would potentially develop symptomology that would meet criteria for a diagnosis utilizing the prevalence rates

indicated by O'Donnell et al. (2008). This would also mean that of the 26,173,329-78,519,986 people that developed PTSD, 12,484,678-37,454,033 (47.7%; Bryant et al., 2010) would not seek help. The risk of developing maladaptive coping mechanisms and subsequent symptomology is commonly noted to increase in untreated disorders throughout the literature, resulting in potentially significant future problems.

MDD is a highly comorbid psychiatric disorder with PTSD (American Psychiatric Association, 2013) that is strongly associated with exposure to traumatic injury (Bryant et al., 2010; O'Donnell et al., 2008). Significant impairment is most strongly associated with MDD compared to most other disorders (Eaton et al., 2008). Problems associated with MDD include difficulty focusing, impaired relationships, depressed mood, irritability, altered cognitions, low energy, thoughts of suicide/death, isolation, and difficulty maintaining work. The Center for Disease Control and Prevention (CDC) reports a 7.9% prevalence of MDD in the United States in any given two-week period for individuals age 12 and older (Pratt & Brody, 2014). Rates of depression following exposure to traumatic injury are estimated to be 6% to 42% (O'Donnell et al., 2008). A review of several studies indicated a 70% increased risk of all-cause mortality, or deaths within a population regardless of cause, in individuals with a depressive disorder diagnosis (Eaton et al., 2008).

The high rates of PTSD and MDD experienced by traumatic injury survivors significantly impacts mental and physical health-related quality of life (HRQoL; Pittman et al., 2011), which can result in prolonged length of stay (LOS) for recovery in hospitals (Bourgeois, Kremen, Servis, Wegelin, & Hales, 2005). Additional problems impacting

HRQoL are poorer health and functioning, difficulty with performing daily activities, fatigue, and chronic pain (Lee, Chaboyer, & Wallis, 2008). HRQoL outcomes that can result from exposure to traumatic injury may lead to difficulty maintaining employment and leave an individual at higher risk for decreased HRQoL that, in turn, impacts their ability to work and afford treatment. Michaels et al. (2000) reported that 36% of survivors were unable to return to work after 12 months, resulting in an estimated annual loss of $56,516 for the average United States household in 2015 (U.S. Census Bureau, 2015).

Individuals who experience income loss experience financial stressors in addition to the problems associated with traumatic injuries which create higher likelihood of further impacted HRQoL. Transportation, adequate hygiene, and professional clothing are often necessary elements that become barriers to finding future employment. The inability to attain employment due to these barriers can develop into another barrier, lack of financial stability, that affects survivors' ability to afford the necessary resources to overcome the created negative feedback loop. Income loss can further impact an individual's ability to pay hospital bills, afford day-to-day living, support themselves or their families, and afford housing.

Patient recovery and associated financial costs are receiving more attention as some studies have indicated a 10% to 100% increase in LOS for individuals with mental health diagnoses, which creates larger concern for patient recovery and financial costs (Bourgeois et al., 2005). Individuals that experience mental health disorders (e.g., depression, substance abuse, and anxiety disorders) are noted to have higher probability

of extended recovery time/LOS in treatment settings (Bourgeois et al., 2005). Financial analysts from the University of California Medical Center in Sacramento estimate a $10,000,000 annual cost for every 0.1-day increase in LOS for the population served at their Level 1 trauma center (Bourgeois et al., 2005).

Untreated mental health impacts of traumatic events are markedly concerning as they often result in hospitalization, emergency care, and police intervention. These outcomes prove to be both costly to the individual as well as treatment facilities and government systems (e.g., state and federal; Insel, 2008). The increase in the number of individuals needing psychological attention utilizing emergency room (ER) and Veteran's Affairs (VA) hospital systems is a notable concern (Insel, 2008; Tanielian et al., 2008). Hospitals that work with the uninsured can experience an inability to collect money from patients who cannot afford the costs of care, which results in depletion of funds from government systems (e.g., state and federal). Insel (2008) estimated a total loss of $317.6 billion dollars (healthcare expenditure, loss of income, & disability benefits) in 2002 due to severe mental illness in the American economy. Tanielian et al. (2008) found 300,000 veterans to have combat-related mental health disorders and predicted that post-deployment veterans with PTSD and MDD will result in an estimated cost of $4.0 billion to $6.2 billion dollars.

The numerous consequences of traumatic injury to individuals and systems has resulted in a growing body of research focused on how survivors who appear to be resilient recover following exposure to trauma. Resilient survivors are noted to recover more quickly, maintain functioning, and experience fewer problems immediately after a

traumatic injury (Bonanno, Westphal, & Mancini, 2011). Psychological and HRQoL stability is also noted in the majority of traumatic injury survivors (Bonanno et al., 2012; Bonanno, Rennicke, & Dekel, 2005; Skogstad et al., 2014; Zatzick et al., 2010). Prior health before exposure to a traumatic event has not been studied extensively creating difficulty in determining whether psychological distress after exposure is due to injury or pre-existing health or distress variables (McGiffin, Galatzer-Levy, & Bonanno, 2016).

Given the high incidence rates of traumatic injuries, and the likelihood of developing resulting mental health disorders (MDD, PTSD, substance abuse disorders, etc.), research is warranted to understand the association of resilience with HRQoL over time. A method of exploring the HRQoL outcomes is to investigate the predictive power of resilience and other variables (e.g., gender, age) in longitudinal designs. Variables such as resilience that impact mental health may potentially provide insight to patient recovery trajectories with implications for research and intervention strategies.

Resilience and Trauma

Resilience was originally conceptualized as an exception versus a norm in the population; however, contemporary research has noted that it may be a more common in individuals than previously thought (Bonanno, 2004). For example, 78.2% of individuals in the 1992 Los Angeles riots, 79% motor vehicle accident survivors, and 62.5% of Gulf War veterans did not meet criteria for PTSD (Bonanno, 2004). This can also be seen in the large estimate of traumatic exposure in the U.S. (81%; Bahraini et al., 2014) that does not develop into a psychiatric disorder 12 months post-injury (Bryant et al., 2010).

It is typically assumed that most individuals experience distress immediately after injury. A considerable number of survivors are noted to experience psychological distress (e.g., depressive and trauma symptoms) post-exposure to traumatic injury. However, a majority of experienced symptoms become mild or dissipate after one week (O'Donnell et al. 2008). Chronic psychological adjustment difficulties post-injury is seen to be uncommon in the literature. Wang, Tsay, and Bond (2005) found that a majority of survivors who developed depression (78%) and anxiety (72%) one week after traumatic injury exposure did not meet criteria 6-weeks post-injury. Similarly, another study reported survivors who experienced depression after trauma exposure had a 60% decrease in rates of depression at discharge; 31% did not meet criteria after 6-months (O'Donnell et al. 2008).

There are several factors associated with resilient characteristics that predict better treatment/recovery outcomes in survivors of traumatic injury: proactive behavior, establishment of meaningful goals, treatment adherence, utilization of support and healthy coping strategies, engagement with others and the environment, and positive thinking (Quale & Schanke, 2010; Walsh et al., 2016). These characteristics lend themselves to create positive stress management and better treatment outcomes (Quale & Schanke, 2010; Walsh et al., 2016). Resilient individuals tend to report experiencing less elevated distress compared to non-resilient individuals and are less likely to develop a psychiatric disorder (Bonanno, 2004). Additionally, these individuals are more likely to engage in proactive behavior (e.g., engaging with others and their environment, establishing meaningful goals, and treatment adherence) and positive emotion promoting

for better HRQoL outcomes such as lower experienced pain and probability of developing PTSD and depression (Walsh et al., 2016) or other psychiatric disorders (Bonanno, 2004). One study found that 54% of survivors who endorsed positive affect had better treatment/recovery outcomes post-discharge, compared to individuals that endorsed strong negative affect (21%; Quale & Schanke, 2010).

Luthar (2003) notes that resilience is a result of one's ability to adjust to a situation suggesting that resilience can be taught (e.g., skills, behaviors, and thoughts; Quale & Schanke, 2010). Conceptualizing resilience as an acquirable set of characteristics creates possibility for interventions utilizing survivor strengths to create better HRQoL. Longitudinal resilience research is needed to better understand the interaction between resilience and HRQoL after traumatic injury to provide more information on future directions.

Resiliency can be conceptualized as one's ability to adjust that involves behavior, thoughts and skills (Luther, 2003) resulting in the stable equilibrium and positive outcomes (Bonanno, 2004). Resilience is composed of several variables that include the presence of adaptive behaviors, thoughts, and personal characteristics requiring an assessment measure to capture the concept. Self-report measures are commonly used to facilitate resilience assessment. The Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003) assesses adaptive characteristics allowing for the study of score fluctuation over time in correspondence to maturation, interventions, and context.

There are several concerns about the CD-RISC properties despite its popular use in the literature base. The CD-RISC is an atheoretical instrument that was reduced to the

ten items due to the unstable factor structure of the original 25-item version (Campbell-Sills & Stein, 2007). The original CD-RISC (25 items) had several high inter-item correlations, which led to the use of exploratory factor analyses (EFAs) and confirmatory factor analyses (CFAs) to develop the current ten item version (Galli & Gonzalez, 2015; Gucciardi et al., 2011). An EFA is used to explore unknown factor structures (Kline, 2016). A CFA is an analysis used to test hypothesized factor structures (Kline, 2016).

Purpose of Study

The purpose of this study is to examine the elements of the CD-RISC 10 that predict HRQoL (i.e., mental health, physical health, and depression) among individuals discharged from a Level 1 trauma center following admission and treatment for a traumatic injury. This study examines data collected from individuals for one-year post-injury on measures of physical health, mental health, depression, and resilience.

Identifying factors (e.g., resilience) that predict HRQoL can inform clinical practice, theory, and future directions in research. This study will examine the impact of resilience on HRQoL outcomes utilizing structural equation modeling (SEM). This will permit a close examination of the elements of the CD-RISC 10-item measure that predict HRQoL over the first-year post-injury.

CHAPTER II

LITERATURE REVIEW

HRQoL (physical and mental) is one of the most important outcome variables studied in trauma research as survivors do not always return to pre-exposure baselines (Lee et al. 2008; Pittman et al., 2011). There are various definitions of HRQoL throughout the literature. However, HRQoL can generally be defined as an individual's experienced health outcomes regarding psychological, physical, and social functioning (Sprangers & Schwartz, 1999). Research continues to indicate that HRQoL is negatively associated with psychiatric disorders (e.g., PTSD, depression, and anxiety), which may reflect an individual's ability to adjust to exposure to an aversive event, such as traumatic injury (Pittman et al., 2011). Individuals with poor HRQoL after traumatic injury tend to have difficulties with mental health (e.g., depression, anxiety, and substance abuse), returning to work, and, subsequently, financial problems (Bourgeois et al., 2005; Pittman et al., 2011). Consequently, this further impacts the HRQoL creating a downward spiraling health cycle that affects recovery outcomes.

Understanding the impact of mental health on recovery outcomes (e.g., HRQoL and depression) is integral for the treatment of traumatic injury survivors (Michaels et al., 2000). Research indicates that mental health has a significant impact on an individual's recovery outcomes (Bonanno, 2011; Elliott et al., 2015; Sprangers & Schwartz, 1999). For example, Pittman et al. (2011) found that veterans from Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) that met criteria for PTSD and depression had poorer HRQoL outcomes compared to individuals without

psychiatric disorders. Walsh et al. (2016) found that greater positive emotion was negatively correlated with lower depression, PTSD, and activity restriction in a sample of individuals who had incurred upper limb loss. Similarly, Terrill et al.'s (2014) study of individuals with physical disabilities found that resiliency was associated with better HRQoL outcomes.

Sprangers and Schwartz (1999) posit that an individual's self-evaluation of their health status has a significant impact on the cognitions, mood, adjustment, and recovery they experience. Several studies report associations between one's self-evaluation of psychological well-being, a facet of HRQoL, and recovery trajectories. Bombardier et al. (2006) found that psychological well-being was the strongest predictor of major depression in a sample of TBI survivors. Similarly, White, Driver, and Warren (2010) found a negative correlation between psychological well-being and depression and a significantly positive association between resiliency and psychological well-being. Individuals that are characterized by high levels of psychological well-being tend to have better HRQoL outcomes that may be due to an ability to effectively utilize resources; this is theoretically considered a quality of resilience (Block & Block, 1980; Bonanno & Diminich, 2013). Low levels of psychological well-being are indicative of potential risk for poorer HRQoL and adjustment. Studying predictors of HRQoL enhances our ability to deliver more informed care and interventions to those at risk for complicated adjustment following trauma.

Age

The study of age and its association with HRQoL outcomes has had mixed findings. Some studies have indicated that older age is associated with poorer HRQoL due to the body's declining ability to heal with age (Cifu, Huang, Kolakowsky-Hayner, & Seel, 1999; Hukkelhoven et al., 2003; Mosenthal, 2004). However, other studies indicate that older age is associated with better HRQoL outcomes (Russo, Katon, and Zatzick, 2013; Terrill et al., 2014). Successful aging requires the ability to learn and adjust in a proficient manner which may translate into one's ability to utilize internal and external resources to create better recovery outcomes (Terrill et al., 2014). Terrill et al. (2014) found that age was associated with decreased risk of depression in individuals with physical disabilities. Another study found that younger traumatic injury survivors had higher likelihood of developing PTSD (Russo et al., 2013), which may be due to a lack of or an unsuccessful deployment of coping skills. Other studies have found no significant correlations between age and HRQoL outcomes (e.g., mental health; Agustini, Asniar, & Matsuo, 2011; Bal & Jensen, 2007).

Socioemotional Selectivity Theory (SST) posits that individuals prioritize present-oriented goals (e.g., information acquisition) when individuals perceive limits on time (Lo¨ckenhoff & Carstensen, 2004). This type of behavior is strongly associated with emotional regulation, age, and interpersonal relationships and preferences (Lo¨ckenhoff & Carstensen, 2004). Older adults may have a stronger awareness and perception of their life-span, which is correlated with behaviors known to promote recovery (e.g., utilization of support networks, non-avoidant behaviors, and emotion-

based coping strategies; Lo¨ckenhoff & Carstensen, 2004). Application of adaptive coping behaviors aids in both psychological and physical recovery. In general, however, the mixed findings in the literature warrant more study (e.g., meta-analysis) of the relationship with age and HRQoL outcomes after traumatic injury.

Gender

Trauma research indicates that women have higher risk of developing PTSD than men (Breslau, 2009; Breslau, Chilcoat, Kessler, & Davis, 1999; Norris, Foster, & Weisshaar, 2002); however, men are more likely to experience traumatic events (Breslau, 2009; Breslau & Anthony, 2007). Although men have higher rates of assaultive violence (e.g., being shot, stabbed, mugged) compared to women, they have lower rates of developing PTSD (Breslau & Anthony, 2007). Several studies have found that women have twice the likelihood of developing PTSD with symptoms that last four times longer compared to men (Breslau, 2009; Breslau et al., 1999; Norris et al., 2002). Breslau and Anthony (2007) found that women had higher risk of developing PTSD after assaultive trauma versus non-assaultive and were almost five times as likely of developing PTSD to a non-assaultive trauma after exposure to assaultive trauma compared to men. The authors also found that men experienced no differences in relation to type of trauma (assaultive versus non-assaultive) and PTSD development (Breslau & Anthony, 2007). Holbrook and Hoyt (2004) found significantly lower HRQoL outcomes in women, compared to men, in a longitudinal study of trauma survivors. Some research attributes the gender differences to the higher rates of

interpersonal traumas (e.g., sexual assault) experienced by women (Breslau & Anthony, 2007; Kessler, 2000), which may cause an increased sense of betrayal (Freyd, 1994).

Other research suggests that gender differences may be due to the "rough-and-tumble play" seen in boys that may contribute desensitization to trauma and decrease likelihood of PTSD development (Breslau & Anthony, 2007). One study suggests that HRQoL outcomes may be more impacted as a result of the age and coping strategies of the individual after finding no significant differences between men and women who incurred spinal cord injury (Middleton, Tran, & Craig, 2007). Many studies have found that gender has been a significant predictor of facets of HRQoL outcomes (e.g., mental health); however, gender has been noted to only explain a small amount of variance (Frans, Rimmo, Aberg, & Fredrickson, 2005; Hetzel-Riggen & Robby, 2013). Consequently, more research is necessary to determine the relationship with gender and HRQoL outcomes in the context of traumatic injury.

Resiliency

Resilience has been studied in relation to HRQoL after trauma exposure. Several studies have found that resilient individuals exposed to trauma tend to have better HRQoL (Michaels et al., 2000; Terrill et al., 2014; Walsh et al., 2016). Additionally, Pittman et al. (2011) found that resilience is inversely associated with poor mental health outcomes (e.g., PTSD and depression) that are negatively associated with recovery trajectories. For example, Walsh et al. (2016) found self-reported resilience was significantly predictive of positive emotions and greater activity that predicted lower PTSD and depression scores among individuals with traumatic upper limb loss.

Similarly, Terrill et al.'s (2014) study indicated that resilience had negative association with HRQoL outcomes (i.e., pain, fatigue, and depression) in individuals with long-term disabilities. However, there is a noticeable dearth of knowledge regarding the longitudinal effects of resilience on HRQoL.

There are two common views of resiliency noted in the literature: trait or state/acquirable. The trait perspective views resiliency as a factor that an individual is born with and, like personality, is relatively stable (Luthans, Avolio, Avey, & Norman, 2007). The state perspective refers to resilience as being malleable and, thus, acquirable (Luthans et al., 2007). Trait models of resilience aid in theoretically understanding resilience; however, they are limited in their ability to discern interventions to promote resilience and discount experiences of individuals that may experience chronic stressors (e.g., discrimination and persecution) in addition to traumas. Studies adopting this view are compelled to identify the manner in which trait resilience facilitates adjustment, and these mediators are then targeted in psychological interventions to benefit those who are not resilient (e.g., Elliott et al., 2015). It is difficult to compare resilience in different individuals that have protective factors (e.g., privilege and higher SES, more access to resources) to an individual who does not. State resilience models can account for how individuals cope or learn to cope with adverse events and provides opportunity to promote resilience.

The different models of resilience (e.g., trait and state) may, in part, explain the inconsistent operational definition of resiliency found in the field (Davydov, Stewart, Ritchie, & Chaudieu, 2010). The different emphases on outcomes or protective factors

in resilience models also contribute to the definition inconsistency noticed in the resilience literature (Robson, 2014). However, resilience can be thought of as one's ability to adjust to an aversive stressor or traumatic event regarding maintaining homeostasis/mental and physical functioning and balance (Bonanno, 2004; McCauley, et al., 2013).

The current study of holistic adjustment outcomes (e.g., HRQoL, psychological distress, and functioning) indicates that resilience is more common than previously believed (Bonanno, 2004). The U.S. population is estimated to experience at least one traumatic event in their life time; however, only a minority develop psychiatric disorders after exposure (O'Donnell et al. 2008; Ozer, Best, Lipsey, & Weiss, 2003). Development of subclinical trauma-related symptoms is common immediately after exposure, however, the vast majority of symptoms subside over the course of time (Bonanno, 2004). The literature notes that this may begin occurring the week after exposure (O'Donnell et al. 2008), but may steadily decrease over several months (Bonanno, 2004). For example, during the September 11th terrorist attack only 1.7% of survivors experienced PTSD symptoms after four months, which decreased to only 0.6% at six months (Bonanno, 2004).

Bonanno (2004) defines resiliency as an individual's ability to maintain emotional homeostasis throughout exposure to difficult experiences. His theory emphasizes that resilience is acquirable - a variation of the state perspective - as opposed to an innate trait (Bonanno, 2004; Bonanno & Diminich, 2013). Bonanno (2004) used latent growth mixture modeling to identify four latent trajectories of

resilience among individuals who experienced loss or trauma: chronic, recovery, delayed, and resilient. However, in later research he distinguished that the resilient trajectory was divided into: minimal-impact resilience and emergent resilience trajectories (Bonanno & Diminich, 2013). The recovery trajectory is similar to resilient trajectories in that individuals in either trajectory return to baseline; however, individuals that demonstrate resilient trajectories do not exhibit the escalated distress noted in recovery trajectories and can experience a quicker return to baseline (Bonanno, 2004; Bonanno & Diminich, 2013). Individuals with chronic trajectories of recovery exhibit high levels of distress/symptoms with little improvement over time (Bonanno, 2004; Bonanno & Diminich, 2013). Individuals with positive adjustment and minimal to no reaction to acute adversity is characteristic of minimal-impact resilience. Emergent resilience is characteristic of individuals that demonstrate gradual improvement in functioning and positive adjustment in the face of chronic stressful circumstances. Delayed trajectories exhibit mild levels of distress post-exposure that increases in intensity overtime (Bonanno, 2004; Bonanno & Diminich, 2013). Both resilient and recovery trajectories have the best outcomes of Bonanno and Diminich's (2013) identified trajectories.

Bonanno's model defines resilience from the pattern of adjustment following exposure to an aversive event (Mancini & Bonanno, 2009). Thus, "…Resilience cannot be defined in the abstract or applied to individuals in the absence of an extremely aversive experience, such as loss" (Mancini & Bonanno, 2009, pp. 1806-1807). Notably, Bonanno's model of resilience does not account for survivors' prior distress or

problems, characteristics, and traits that contribute to further difficulties and exacerbating symptoms post-exposure (Bonanno & Diminich, 2013). For example, Elliott et al. (2017) found that positive traumatic brain injury (TBI) status in an Afghanistan/Iraq War veteran sample was directly associated with PTSD symptomology. Another issue with Bonanno's model is the implicit assumption that the presence of psychological/emotional distress (e.g., depression or anxiety) innately labels a trauma survivor as having a resilience deficiency. The manner in which trajectories are identified in Bonanno's model have also been critiqued as they are assessed post-exposure to trauma, which measures patterns of adjustment rather than pre-exposure data (e.g., pre-existing conditions).

A developmental perspective of resilience appeared in the literature some time before the Bonanno model: Block and Block (1980) conceptualized resiliency as a stable personality trait that is composed of two principal constructs: ego-control and ego-resilience (Block & Kremen, 1996; Waugh, Fredrickson, & Taylor, 2008). In this model, ego-control refers to one's ability to regulate impulse inhibition and expression and ego-resilience is an individual's level of adaptiveness in response to dynamic environmental demands (Farkas & Orosz, 2015). Block's resilience model identifies three personality types in relation to resilience: overcontrolled, undercontrolled, and ego-resilient.

Overcontrolled individuals demonstrate rigid or restrained impulse and emotional regulation that result in maladaptive coping (e.g., numbing, isolation, or avoidance behaviors). Undercontrolled prototypes are characterized by individuals that have

difficulty with emotional regulation or impulse control. Maladaptive coping is also a difficulty experienced by their prototype in relation to emotion regulation and impulse control; however, undercontrolled individuals are more less likely to isolate than overcontrolled individuals. Ego-resilient individuals are characterized by an ability to adaptively regulate emotions and impulses in the face of environmental stressors. Block and Block (1980) emphasize that high ego-resilient individuals have personalities that are characterized by intelligence, flexibility, and adaptability to stressors. In contrast, low ego-resilient individuals are characterized as inflexible or rigid which impedes their ability to effectively adapt to dynamic situations that occur in one's life.

Block's resilience model has been utilized to differentiate individuals with high-ego resilience through the outcome trajectories after exposure to aversive events. Charney (2004) posits that high ego-resilient individuals learn to effectively recover at a quicker rate than low ego-resilient individuals due to more adept learning in effective recovery methods that can be seen in the person's daily activity (e.g., ability to adapt to a changing environment). High ego-resilient individuals are noted to have better HRQoL (e.g., quicker recovery and reduced psychological and physiological distress; Elliott et al., 2015; Tugade & Fredrickson, 2004; Waugh, Wager, Fredrickson, Noll, & Taylor, 2008).

Block's resilience model is not without flaws. Positing that resilience is a personality-based trait would imply that interventions to foster resilience would have a trivial effect or take a prolonged period of time to benefit a client. Additionally, Block's assumption also implies that individuals with low ego-resilience do not have adaptive

behaviors. Arguably, some symptomology noticed in trauma survivors (e.g., isolation and arousal) are adaptive in the sense that they act in a manner that protects them from dangers. For example, an individual currently in a dangerous situation may exhibit trauma symptomology that meets criteria for a mental health disorder (e.g., PTSD), however, those behaviors are protecting them from adverse outcomes (e.g., being abuse, assaulted, and harmed).

Adept utilization of resources (e.g., skills, behaviors, and reframing) to adapt to environmental demands is an essential characteristic of resilient individuals. Self-report measures are routinely used to assess the level to which individuals use these adaptive characteristics to capture resiliency. The Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003) is a popular instrument used to assess these adaptive qualities. Its use permits the observation of fluctuations in scores over a period of time in response to context, maturation, and interventions (Farkas & Orosz, 2015). The authors of the CD-RISC define resilience in a similar manner to Block and Bonanno: resilience is reflected in individual qualities that allow an individual to adjust to stressors and environmental demands (Connor & Davidson, 2003).

A study comparing resilience measures found that the CD-RISC was psychometrically superior to other measures, such as the Ego-Resilience 11 (ER11; a Block resilience model-based instrument), in its ability to explain an individual's level of adjustment (e.g., state anxiety, trait anxiety, well-being, stability, and affect; Farkas & Orosz, 2015). Campbell-Sills, Cohan, and Stein (2006) found that the CD-RISC total score was significantly correlated with three personality constructs: neuroticism (*r* =

-.65), extraversion (r = .61), and conscientiousness (r = .46). These correlations suggest that the CD-RISC is an instrument that is able to explain elements of resilience seen in trait personality characteristics (e.g., low negative affect, sociability, self-regulation). The CD-RISC appears to measure an individual's level of stability or the ability to maintain emotional equilibrium in the face of an aversive situation (Farkas & Orosz, 2015). Gucciardi et al. (2011) found that the CD-RISC was negatively associated with burnout/emotional exhaustion, which is related to difficulty responding to environmental demands. A CFA found that the CD-RISC was a psychometrically sound instrument that equivalently measures resilience among male and female genders, and among people varying in race and ethnicity (Campbell-Sills & Stein, 2007).

The CD-RISC is not without limitations. DeYoung and colleagues posit that stability is a meta-trait composed of agreeableness, conscientiousness, and emotional stability; another meta-trait, plasticity, is composed of characteristics typically associated with openness and extraversion (DeYoung, Peterson, & Higgins, 2002; DeYoung, 2006; DeYoung, Hasher, Djikic, Criger, & Peterson, 2007; DeYoung, Peterson, Séguin, & Tremblay, 2008). In their comprehensive study of the psychometric properties of several self-report resilience measures, Farkas and Orosz (2015) concluded that the CD-RISC appears to assess qualities consistent with the stability factor associated with resilience (i.e., agreeableness, conscientiousness, and emotional stability), but it did not adequately represent characteristics associated with plasticity (i.e., openness and extroversion). This insensitivity to the meta-trait of plasticity may suggest that the CD-RISC may evaluate an individual's immediate state or ability to adjust, but it does not

assess characteristics associated with the flexibility and sociability that may be required in utilizing resources necessary for adjustment over time. Interestingly, Elliott et al. (2015) found that the CD-RISC did not predict longitudinal outcomes in a study of OEF/OIF veterans in a model that took into consideration trait indicators of resilience, which they attributed, in part, to the "face valid" nature of the instrument.

There is still relatively little research on how trauma impacts an individual's self-reported resilience over time. An investigation of potential differences in PTSD development in survivors who experienced mild traumatic brain injuries (mTBI) or orthopedic injuries at two respective Level 1 trauma centers administered the CD-RISC at baseline, one-week, and one-month post-discharge (McCauley et al., 2013). However, the complex and inconsistent pattern of the findings precluded any clear interpretation of the relationship between self-reported resilience (as reflected by the CD-RISC total score) and adjustment. Terrill et al. (2014) found that the CD-RISC predicted better HRQoL and lower levels of depression in individuals who participated in a longitudinal study of secondary health conditions among people with disabilities. The CD-RISC allows for a brief measurement of resilience that provides opportunity to efficiently and effectively measure an individual's report of their ability to adapt to a given stressor. The Terrill et al. (2014) study provides some insight into the longitudinal impact of resilience on treatment outcomes; however, the complicated pattern found in the McCauley et al. (2013) study raises concerns about the prospective relationship of the CD-RISC total score to adjustment. Studies with longer time frames are needed to

understand the impact of resilience on treatment outcomes to inform potential interventions to aid in recovery and individualized treatment.

The consequences experienced by some survivors (e.g., significant financial debt, poor recovery trajectories, resulting psychiatric disorders, and inability/problems returning to work) compared to individuals with resilient characteristics demonstrate further need for longitudinal resilience research. The CD-RISC has proven to be a reliable and valid measure that has predicted HRQoL outcomes in cross-sectional studies of individuals who have been exposed to traumatic injuries (Campbell-Sills & Stein, 2007; Farkas & Orosz, 2015; Windle, Bennett, & Noyes, 2011). However, there is concern that the CD-RISC is unable to predict longitudinal HRQoL outcomes (Elliott et al., 2015). This may be due to the lack of theory utilized during its construction. Farkas and Orosz's (2015) study refers to the CD-RISC as being a measure of stability (i.e., adjustment characterized by positive mood versus utilization of proactive behaviors) which may indicate that the measure assesses more temporal qualities of resilience (e.g., positive mood). The dearth of information on the longitudinal relationship between resilience as measured by the CD-RISC and HRQoL undermines the clinical utility of the instrument. The CD-RISC is a useful resilience measure that has demonstrated notable psychometric strength (Campbell-Sills & Sullivan, 2007; Farkas & Orosz, 2015). Yet its utility in longitudinal research requires further investigation in order to inform further studies of its utility.

The Present Study

This study examined the prospective relationship of the CD-RISC items to HRQoL reported by individuals who incurred traumatic injuries and who received treatment at a Level 1 trauma center. Eligible individuals admitted to the trauma center and consented to participate in the larger project studying outcomes post-injury completed measures at baseline (prior to discharge from the facility) and later at three, six, and 12 months following their return to the community. This permitted a prospective examination of the specific CD-RISC 10 items as they predict HRQoL over time. In addition, this study examined the prospective relationship of the CD-RISC 10 to self-reported adjustment in the context of participant gender and age, as these factors can be associated with adjustment following trauma.

Specifically, this study addressed several research questions: Does the CD-RISC 10 predict HRQoL at baseline in traumatic injury survivors? Does the CD-RISC 10 predict depression at baseline in traumatic injury survivors? Does the CD-RISC 10 prospectively predict HRQoL over the year post-discharge? Does the CD-RISC 10 prospectively predict depression over the year post-discharge? Are the prospective relationships of resilience to these indicators of adjustment (i.e., physical and mental HRQoL and depression) significant regardless of participant age and gender? Further, this study examined alternative uses of the CD-RISC 10 to compare the utility of the CD-RISC 10 total score and the use of the separate CD-RISC 10 items as a latent variable in predicting HRQoL and depression at baseline and over the first year post-discharge.

CHAPTER III

METHOD

The study is part of the Baylor Trauma Outcome Project (BTOP) conducted at the Baylor Scott & White Trauma Center in Dallas, Texas. This project has been reviewed and approved by the Baylor Scott & White Medical Center Dallas Institutional Review Board and this study was approved by the Institutional Review Board at Texas A&M University. The BTOP is an ongoing study that began in March 2012 and continues to collect data on the admissions from the Baylor Scott & White Trauma Center in Dallas, Texas (Warren et al., 2014).

Procedure

Participants included Level 1 Trauma and Ortho-Trauma Service trauma patients who were approached about the study once they were stabilized prior to discharge from the Baylor Scott & White Trauma Center. Inclusionary criteria were: 1) the patient was admitted to the trauma services within 24 hours of sustaining their injury; 2) the patient was 18 years or older; 3) the patient was able to provide at least one telephone number to be used for follow-up assessments at three, six, and 12 months. Exclusion criteria were: 1) patient experienced a traumatic brain injury and/or had existing cognitive deficits that precluded them from giving informed consent and 2) patient was unable to understand spoken English or Spanish.

Informed consent was discussed with identified patients who met inclusionary criteria. Prospective participants were then informed about the purpose of the study and study requirements to complete questionnaires, available in English and Spanish, at

subsequent follow-up assessments and the accompanying time requirement. Private rooms at the hospital were used to obtain informed consent during admission. Individuals were given the baseline questionnaires and provided demographic information (e.g., age at injury, gender, ethnicity, and education level) after receipt of consent.

Participants were reassessed at three, six, and 12 months after discharge via phone. An IRB-approved script was read to participants at follow-up to further inform them about the requirements of the study. Research assistants verbally administered assessments in English or Spanish to the participants and recorded responses after receipt of their continued consent. Participants were not assigned to a particular research assistant. Calls to participants were made by various research assistants. Data were then entered into an Excel spreadsheet for each participant at each measurement occasion. Research assistants made a maximum of 12 attempts (calls were separated by 24-hour intervals) to reach participants that did not answer for four weeks. If the participant did not answer a reminder letter was sent to their home. Continued attempts at the next study time interval (e.g., 6 or 12-month period) were made for participants that did not respond to calls. Hispanic Origin was an ethnicity variable coded as a separate variable from Racial Background. The Hispanic Origin variable indicates whether an individual self-identified as having Hispanic heritage.

For the purpose of this study, data from 308 individuals were included. The mean age was 44.25 years old (*SD* = 17.42 years; range of 17 years to 88 years). It was unclear whether the individual coded as 17 was due to a coding error or a lapse in

protocol. The sample was composed of 107 women (34.7%) and 201 men (65.3%). The composition of the sample included 218 (70.8%) individuals identifying as Caucasian/White, 78 (25.3%) identifying as African-American, 8 (2.6%) identifying as American Indian or Alaskan Native, 2 (.6%) identifying as Asian, 1 (.3%) identifying as Native Hawaiian or Pacific Islander, and 1 (.3%) identifying as multiple races. 53 (17.2%) individuals identified as being of Hispanic origin, 254 (82.5%) individuals identified as not being of Hispanic origin, and 1 person (.3%) did not answer the item about Hispanic origin.

Predictor and Outcome Variables

Although there are several variables assessed in the BTOP protocol, only six were included in this study (i.e., self-reported resilience, age at injury, gender, physical and mental HRQoL, and depression) to explore the CD-RISC 10's ability to predict self-reported adjustment in the context of a participant's age and gender (two factors that can be associated with adjustment post-traumatic exposure). Three predictor variables investigated in this study were age at injury, gender, and self-reported resilience. Age at injury and gender variables were treated as time-invariant factors (i.e., they are measured only at baseline). The self-reported resilience measure (CD-RISC 10) was administered at baseline and at the 12 months assessment. The current study examined the elements of self-reported resilience assessed by the CD-RISC 10 that predict HRQoL and depression over time. Consequently, only the baseline CD-RISC 10 scores were used in this study to investigate self-reported resilience's ability to predict HRQoL over the course of a year for traumatic injury survivors discharged from a Level 1 trauma center.

Predictor Variables

Gender. Gender was included in the models with women coded as "0" and men coded as "1" to study the prospective relationship of gender on HRQoL and depression outcomes.

Age at injury. An individual's age at admittance to the Level 1 trauma center was included in the models.

Connor-Davidson Resilience Scale (CD-RISC 10; Connor & Davidson, 2003). The current study will use the CD-RISC 10 given at baseline. The CD-RISC 10 was derived from the original 25-item CD-RISC, which assessed five dimensions of resiliency including personal competence, trust/tolerance/strengthening effects of stress, acceptance of change and secure relationships, control, and spiritual influences (Connor & Davidson, 2003). Several studies have found that the CD-RISC 10 has significant statistical strength regarding consistency, validity, reliability, responsiveness, floor and ceiling effects, and interpretability (Farkas & Orosz, 2015; Windle et al., 2011). The CD-RISC 10 was found to be the only instrument used for pre- and post-intervention measures in a literature review that investigated 19 different measures of resilience (Windle et al., 2011). The instrument has demonstrated similar psychometric properties in samples of OEF/OIF warzone veterans (Elliott et al., 2015), trauma survivors (Karaırmak, 2010) and from different countries including Iran (Khoshouei, 2009) and China (Xie, Peng, Zuo, & Li, 2015; Yu & Zhang, 2007).

Factor analysis was used to develop a 10-item Likert-scale (scores range from zero to four) version of the CD-RISC from the original 25-item version (Campbell-Sills

& Stein, 2007). The measure demonstrated improved psychometric ability when reduced to the 10-item unidimensional measure (factor loadings ranged from .39 to .74; Campbell-Sills & Stein, 2007). Possible scores range from 0 to 40; higher scores indicate greater self-reported resilience. The 10-item version of the CD-RISC is used in the BTOP protocol and in this study. Individuals' total scores and item responses (loaded onto a latent variable) were used in the study in two respective models.

The internal consistency of the CD-RISC-10 has been acceptable in prior research (Cronbach's alphas ranging from .85 to .90; Campbell-Sills & Stein, 2007; Hartley, 2012). The alpha for this study was .87, which is within the range reported in prior research (Campbell-Sills & Stein, 2007; Hartley, 2012). The CD-RISC 10 is highly correlated with the original CD-RISC (r = .92; Campbell-Sills & Stein, 2007). A CFA supported the unidimensional factor structure in the original validation study of the CD-RISC 10 (Burns & Anstey, 2010). Test-retest reliability was high (over a two-week interval; r = .90) in a study among Chinese earthquake victims (Wang, Shi, Zhang, & Zhang, 2010).

Outcome Variables

Health-related Quality of Life (HRQoL). Participants' HRQoL was assessed with the Veterans RAND 12-Item Health Survey (VR-12) Mental Health and Physical Health Composite Scores (Kazis et al., 2006). The VR-12 is a well-validated measure of HRQoL that has been utilized with veterans (Kazis et al., 1998) and community (Selim et al., 2009) samples. The VR-12 was derived from the VR-36, which was validated with 9,000 patients from six respective Veterans Administration Hospitals producing

internal consistency that ranged from .80 to .95 (Jones et al., 2001). The 12-item measure accounted for 90% of the variance of the larger 36-item version (Jones et al., 2001). The measure utilizes a Likert-scale and produces a weighted score (derived from an algorithm) that is converted to mental component and physical component scale scores that range from zero to 100. Higher scores reflect greater self-reported HRQoL. VR-12 Mental Component Scores (MCS) and Physical Component Scores (PCS) prior to discharge and at, three, six, and 12 months post-discharge are utilized in this study.

Depression. Depression was measured by the Patient Health Questionnaire-8 (PHQ-8; Kroenke et al., 2009). The PHQ-8 is the shortened version of Patient Health Questionnaire-9 (PHQ-9). Both measures are brief self-report screeners for major depression; however, the PHQ-8 measures eight of the nine symptoms of major depression found in the DSM-V. The screeners provide opportunity for providers to assess for need for intervention in a short amount of time. The item pertaining to self-harm or suicide was omitted due to findings indicating that is the least endorsed item in the general population and concern that researchers would not be able to provide appropriate support via phone should the item be endorsed (Kroenke & Spitzer, 2002). Kroenke et al. (2009) reported an internal consistency of .86. In the present study the Cronbach's alphas ranged from .86 to .91 (across baseline, three months, six months, and 12 months). The PHQ-8 was administered at baseline and three, six, and 12 months post-discharge. Instructions on the screener ask participants about their experience with problems related to depression "over the last two weeks." Symptoms are rated on a four-point scale with scores that range from 0-3. The highest score possible is a 24.

Higher scores represent greater number and severity of symptoms. Scores above 10 indicate potential major depressive disorder (Kroenke et al., 2009). Five-point score fluctuations indicate significant change (Kroenke & Spitzer, 2002). Validation studies on the PHQ-8 indicate that it is comparable to the PHQ-9 (Kroenke & Spitzer, 2002).

Data Analysis

The Excel spreadsheet was converted to a SPSS 22.0 (IBM Corp., 2013) data file. Descriptive statistics were analyzed in SPSS 22.0 (IBM Corp., 2013) to identify possible outliers. SPSS 22.0 (IBM Corp., 2013) syntax was used to identify invalid entries. Cases were removed, utilizing syntax, for individuals that did not complete the CD-RISC 10 at baseline or provide their gender and age at injury. Data were converted in SPSS 22.0 (IBM Corp., 2013) to a comma-separated values (CSV) file to meet the Mplus 7 (Muthén & Muthén, 2012) software data file requirements. The longitudinal models were built and fit using SEM with Mplus 7 (Muthén & Muthén, 2012) software with the default estimator, Maximum Likelihood Estimation.

All variables utilized in this study maintained the original coding that was utilized in the BTOP protocol, with the exception of the creation of a study completion variable. A code of "0" indicated individuals had data only at baseline, and individuals who completed measures at baseline and at the 12-month measurement occasion were coded as "1." The study completion variable was only used in preliminary analysis and was not a variable in the models analyzed in this study.

SEM is commonly utilized for longitudinal modeling and allows for the ability to observe the relationship between multiple predictor and outcome variables. This

statistical method also demonstrates the explained variance associated between exogenous and endogenous variables. Additionally, SEM allows for the creation of latent variables to be used in analyses by loading items associated with the desired construct. This allows for the non-observed variables (e.g., resilience) to be analyzed in this study. For example, the CD-RISC 10 items can be loaded onto the resilience latent variable.

SEM also allows for the analysis of data at various timepoints permitting studies to capture longitudinal outcomes. As such, the baseline and three, six, and 12 month post-discharge timepoints were analyzed to observe the CD-RISC 10's ability to predict HRQoL and depression outcomes pre- and post-discharge. Goodness of fit statistics (Chi-square, RMSEA, SRMR, and CFI) help determine whether the models in this study are able to capture/explain the relationship patterns in the data. Moreover, SEM allowed for the observation of the separate CD-RISC 10 items as they contribute to the prospective prediction of HRQoL and depression over time in the context of participant age and gender.

Additional analyses were conducted to examine different uses of the CD-RISC 10. One model utilized the CD-RISC 10 total score as a predictor, and another model examines the use of CD-RISC 10 items onto a latent variable that then served as a predictor. These models would provide information about the relative benefits of the CD-RISC 10 total score or CD-RISC 10 items on a latent variable in the prediction of HRQoL and depression.

In this study age, gender, and resilience were exogenous variables. Resilience is a latent variable in the Resilience Latent Variable Model (composed of the CD-RISC 10 items loaded onto a latent variable). Resilience is an observed variable, the CD-RISC 10 total score, in the Resilience Total Score Model. Age at traumatic injury, gender, mental HRQoL, physical HRQoL, and depression are observed variables. Resilience is only an observed variable in the Resilience Total Score Model. Mental and physical HRQoL are measured by the VR-12 MCS and PCS respectively. Depression is measured by the total sum of PHQ-8 item scores. The models are sufficient to answer the research questions posed by the study:

1. Do elements of the CD-RISC 10 predict HRQoL and depression at baseline in traumatic injury survivors?
2. Does the CD-RISC 10 prospectively predict HRQoL and depression over the year post-discharge?
3. Are the prospective relationships of resilience to these indicators of adjustment significant regardless of participant age and gender?

   Are different patterns observed in the use of the CD-RISC 10 total score and the CD-RISC 10 items loaded onto a latent variable as predictors of HRQoL and depression?

CHAPTER IV

RESULTS

Preliminary Analysis

Table 1 shows the attrition rates of the study at the four timepoints from baseline. Participants were not counted as active at the different time periods if they were unable to be contacted, withdrew from the study, or were deceased. Study attrition rate was 29% at 3 months, 45% at 6 months, and 52% at 12 months.

Table 1. Attrition Rates from Baseline

	Baseline	**3 Months**	**6 Months**	**12 months**
Attrition Rate	-	29%	45%	52%

12 *t*-tests were conducted to examine whether there was a statistically significant mean difference for HRQoL and depression outcomes for females and males. Gender was used as the grouping variable to examine the mean differences for the three outcome variables (i.e., physical and mental HRQoL and depression) at each of the four timepoints. A Bonferroni correction was calculated (.004) to account for error that can occur when conducting multiple comparisons. The mean difference for baseline physical HRQoL was statistically significant, $t(299) = -3.052$, $p = .002$, indicating that females reported worse physical HRQoL outcomes at baseline ($M = 42.91$; $SD = 12.58$) than males ($M = 46.84$; $SD = 9.38$). There were no other statistically significant differences in HRQoL and depression outcomes for females and males.

14 *t*-tests were conducted to examine whether there was a statistically significant mean difference for the baseline measurements (i.e., CD-RISC 10, VR-12, and PHQ-8) between individuals who completed assessments at the baseline and 12-month measurement occasions and individuals who completed the baseline assessment but did not answer at the 12-measurement occasion. A Bonferroni correction was calculated (.004) to account for error that can occur when conducting multiple comparisons. There were no statistically significant differences at baseline in the CD-RISC 10 items, CD-RISC 10 total score, and HRQoL and depression outcomes between individuals who completed assessments at the baseline and 12-month measurement occasions and those who completed assessments at baseline but did not answer at the12 month measurement occasion.

Table 2 shows the PHQ-8 sample size, means, standard deviation (*SD*), and minimum and maximum scores in the sample at each of the respective timepoints. The respective minimum and maximum scores for each timepoint were zero (lowest possible score) and 24 (highest possible score). At baseline, the PHQ-8 had been completed by 308 participants. The baseline mean score was 7.61 (mild depressive symptom range; Kroenke et al., 2009) with a *SD* of 6.08. As depicted in the table, the number of participants completing the measure decreased over time, but the average score at each measurement occasion for the sample remained in the mild depressive symptom range. However, these results may have been affected by participant attrition.

Table 2. Descriptive Statistics of PHQ-8 Scores at Each Timepoint

Timepoint	***n***	**Mean**	***SD***	**Minimum Score**	**Maximum Score**
Baseline	308	7.61	6.08	0	24
3 Months	222	8.00	6.83	0	24
6 Months	187	7.05	6.82	0	24
12 months	167	6.84	6.75	0	24

Note. *n*=participant sample; *SD*= Standard Deviation.

Tables 3 and 4 show the VR-12 MCS and PCS sample size, means, standard deviation (*SD*), and minimum and maximum scores in the sample at each of the respective timepoints. Study participants completed 301 VR-12s at baseline, 211 at three months, 183 at six months, and 123 at 12 months. Higher scores on the VR-12 are indicative of better HRQoL for mental health and physical health respectively.

Table 3. Frequencies and Descriptive of VR-12 MCSs at Each Timepoint

Timepoint	***n***	**Mean**	***SD***	**Minimum Score**	**Maximum Score**
Baseline	301	51.11	11.19	0.52	72.88
3 Months	211	46.20	14.72	2.92	69.33
6 Months	183	46.78	14.24	10.84	71.57
12 months	123	47.82	13.10	9.43	71.53

Note. n= participant sample; *SD*= Standard Deviation; MCS = VR-12 Mental Health Composite.

Table 4. Frequencies and Descriptive of VR-RAND PCSs at Each Timepoint

Timepoint	***n***	**Mean**	***SD***	**Minimum Score**	**Maximum Score**
Baseline	301	45.49	10.72	5.86	62.47
3 Months	211	30.02	11.95	3.63	56.96
6 Months	183	34.62	12.27	4.47	55.90
12 months	123	36.04	11.92	11.36	57.28

Note. n= Study Sample; *SD*= Standard Deviation; PCS = VR-12 Physical Health Composite.

The MCS baseline mean score was 51.11 with a *SD* of 11.19 and a respective minimum and maximum score of 0.52 and 72.88. The three month timepoint had a mean score of 46.20 (*SD* = 11.19; range 2.92 to 69.33). At the six month timepoint, the mean score was a 46.78 (*SD* = 14.24; range 10.84 to 71.57). The 12 month timepoint had a mean score of 47.82 (*SD* = 13.10; range 9.43 to 71.53).

The PCS baseline mean score was 45.49 with a *SD* of 10.72 and a respective minimum and maximum score of 5.86 and 62.47. The three month timepoint had a mean score of 30.02 (*SD* = 11.95; range 3.63 to 56.96). At the six month timepoint, the mean score was a 34.62 (*SD* = 12.27; range 4.47 to 55.90). The 12 month timepoint had a mean score of 36.04 (*SD* = 11.92; range 11.36 to 57.28).

Modeling Resilience as a Predictor of HRQoL and Depression

Two different models of resilience as a predictor of HRQoL and depression were conducted. The model using the CD-RISC 10 items loaded onto a latent variable as a predictor of resilience is presented first (the Resilience Latent Variable Model). The model using the CD-RISC 10 total score as a predictor (the Resilience Total Score Model) will then follow. A comparison of the two models will be presented. For both models the model fit indices, maximum likelihood estimates for the model pathways, statistically significant pathways, and variances are reported. CD-RISC 10 item loadings onto the resilience latent variable will also be reported with results for the Resilience Latent Variable Model.

Both models had the same timepoint endogenous/HRQoL variables bidirectionally correlated as it was theoretically sound (e.g., depression impacts mental

and physical HRQoL and vice versa). Endogenous variables at prior timepoints had one-directional pathways set to subsequent timepoints throughout both models (e.g., baseline MCS, PCS, and PHQ-8 to the three month timepoint MCS, PCS, and PHQ-8).

Resilience Latent Variable Model

Model Fit. Four model fit statistics (i.e., Chi-square Test, Root Mean Square of Error Approximation [RMSEA], Comparative Fit Index [CFI], and Standardized Root Mean Residual [SRMR]) will be reported for each model. The Chi-square test examines the fit of a given model and differences between the data and covariance matrix (Kline, 2016). Chi-square tests are sensitive to sample size. Chi-square test values can become larger with bigger samples. Kline (2016) cautions that statistical significance in Chi-square tests may not be indicative of poor model fit. The RMSEA "is an absolute fit index scaled as a badness-of-fit statistic" (Kline, 2016, p. 273). The CFI measures goodness-of-fit and the difference between a specified model and the null model (Kline, 2016). Similar to the RMSEA, the SRMR examines badness-of-fit. The SRMR is "a measure of the mean absolute correlation residual" (Kline, 2016, p. 277).

Table 5 shows the model fit indices (i.e., Chi-Square Test, RMSEA, CFI, and SRMR) for the Resilience Latent Variable Model. The Resilience Latent Variable Model Chi-Square Test of Model Fit was statistically significant ($p < .001$), though this may be influenced by the large sample size. The RMSEA produced a 0.047 estimate, indicating good fit (RMSEA < .05). The CFI for the Resilience Latent Variable Model yielded a value of.958, indicating a good fit (CFI > .95). The SRMR value for the model was.040, indicating good fit (SRMR < .05). Overall, the model indices indicated that the

Resilience Latent Variable Model was a good fit to the data despite the statistical significance found in the Chi-Square Test of Model Fit.

Table 5. Fit Indices for Resilience Latent Variable Model

Model Fit Test	**Value**	***DF***	***p* Value**
Chi-Square Test of Model Fit	274.745	163	< .001
	Estimate		
RMSEA	0.047	-	-
	Value		
CFI	.958	-	-
	Value		
SRMR	.040	-	-

Note: DF, Degrees of Freedom; RMESA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; SRMR = Standardized Root Mean Residual.

CD-RISC 10 Item Loadings. The CD-RISC 10 item loadings for the latent resilience variable are seen in Table 6. CD-RISC item one was utilized as the loading item. Overall, the resilience variable item loadings were similar to the loadings found by Campbell and Sills (2007) and noted in the literature (Galli & Gonzalez, 2015; Gucciardi et al., 2011). Notably, the third item has been found to have the lowest loading value, while the second and ninth items have had the highest loading values. Similarly, the third item ("I try to see the humorous side of things when I am faced with problems") in this model had the lowest standardized loading value (0.445). The second item ("I can deal with whatever comes my way") had the highest loading value (0.782). The ninth

item (“I think of myself as a strong person when dealing with life’s challenges and difficulties”) had the second highest loading (.708).

Table 6. Resilience Latent Variable Model for CD-RISC 10 Item Loadings on Latent Resilience Variable

Variable	Unstandardized	SE	Standardized	SE
CD1	1.000	0.000	0.682	0.035
CD2	1.121	0.091	0.782***	0.027
CD3	0.732	0.101	0.445***	0.049
CD4	1.016	0.119	0.529***	0.045
CD5	0.867	0.087	0.624***	0.039
CD6	0.890	0.083	0.683***	0.034
CD7	0.997	0.102	0.624***	0.039
CD8	1.242	0.116	0.688***	0.034
CD9	1.031	0.094	0.708***	0.033
CD10	1.070	0.110	0.622***	0.039

Note: Resilience, Resilience Latent Variable (CD-RISC 10 Items 1-10); CD1-10, CD-RISC 10 items by number, *$p < .05$; **$p < .01$, ***$p < .001$.

The Resilience Latent Variable Model pathways and maximum likelihood estimates are shown in Table 7. A visual representation of the statically significant pathways is shown in Figure 1 and Figure 2.

Table 7. Maximum Likelihood Estimates for the Full Resilience Latent Variable Model

Parameter	**Unstandardized**	**SE**	**Standardized**	**SE**
Resilience→PCSB	3.299**	0.988	0.189**	0.054
Resilience→MCSB	7.346***	1.142	0.402***	0.052
Resilience→PHQB	-42.12***	0.620	-0.424***	0.051
Resilience→PCS3	-4.155**	1.557	-0.212**	0.077
Resilience→MCS3	0.510	1.746	0.021	0.072
Resilience→PHQ3	1.463	0.799	0.130	0.070
Resilience→PCS6	1.475	1.335	0.073	0.066
Resilience→MCS6	-0.477	1.419	-0.020	0.059
Resilience→PHQ6	0.780	0.697	0.067	0.060
Resilience→PCS12	0.256	1.428	0.012	0.068
Resilience→MCS12	1.031	1.698	0.047	0.078
Resilience→PHQ12	-0.329	0.655	-0.029	0.059
Age→PCSB	-0.232***	0.033	-0.377***	0.049
Age→MCSB	-0.002	0.035	-0.003	0.055
Age→PHQB	-0.010	0.019	-0.028	0.053
Age→PCS3	0.034	0.047	0.049	0.069
Age→MCS3	0.032	0.054	0.038	0.063
Age→PHQ3	-0.014	0.024	-0.035	0.061
Age→PCS6	-0.052	0.039	0.074	0.055
Age→MCS6	0.076	0.041	0.091	0.049
Age→PHQ6	-0.039*	0.020	-0.096*	0.049
Age→PCS12	0.012	0.037	0.016	0.051
Age→MCS12	-0.004	0.046	-0.005	0.060
Age→PHQ12	-0.018	0.019	-0.047	0.049
Gender→PCSB	2.034	1.188	0.091	0.091
Gender→MCSB	-0.077	1.276	-0.003	0.054
Gender→PHQB	-0.302	0.679	-0.024	-0.024
Gender→PCS3	2.202	1.620	0.088	0.064
Gender→MCS3	-0.952	1.835	-0.031	0.059
Gender→PHQ3	1.406	0.824	0.098	0.057
Gender→PCS6	-0.686	1.372	-0.027	0.053
Gender→MCS6	0.709	1.456	0.023	0.047
Gender→PHQ6	-0.068	0.710	-0.005	0.048
Gender→PCS12	-2.401	1.267	-0.090	0.048
Gender→MCS12	-1.428	1.525	-0.051	0.055
Gender→PHQ12	0.608	0.639	0.042	0.045
PCSB→PCS3	0.241**	0.080	0.215**	0.070

Table 7. Continued

Parameter	Unstandardized	SE	Standardized	SE
PCSB→MCS3	0.071	0.092	0.051	0.066
PCSB→PHQ3	-0.053	0.042	-0.083	0.065
PCSB→PCS6	0.124	0.068	0.108	0.059
PCSB→MCS6	0.089	0.073	0.065	0.053
PCSB→PHQ6	-0.046	0.035	-0.069	0.053
PCSB→PCS12	0.215**	0.063	0.180**	0.053
PCSB→MCS12	-0.040	0.076	-0.032	0.061
PCSB→PHQ12	-0.062	0.034	-0.096	0.053
PCS3→PCS6	0.561***	0.059	0.546***	0.053
PCS3→MCS6	0.053	0.063	0.044	0.051
PCS3→PHQ6	-0.024	0.031	-0.041	0.053
PCS3→PCS12	0.041	0.068	0.038	0.064
PCS3→MCS12	0.022	0.089	0.020	0.080
PCS3→PHQ12	0.020	0.038	0.036	0.066
PCS6→PCS12	0.767***	0.080	0.739***	0.063
PCS6→MCS12	-0.003	0.102	-0.003	0.094
PCS6→PHQ12	-0.093*	0.041	-0.168*	0.073
MCSB→PCS3	-0.135	0.086	-0.126	0.080
MCSB→MCS3	0.194*	0.098	0.147*	0.074
MCSB→PHQ3	-0.052	0.044	-0.084	0.072
MCSB→PCS6	-0.092	0.075	-0.084	0.068
MCSB→MCS6	0.203**	0.080	0.155**	0.061
MCSB→PHQ6	-0.024	0.039	-0.037	0.061
MCSB→PCS12	-0.163*	0.074	-0.142*	0.064
MCSB→MCS12	0.124	0.089	0.104	0.075
MCSB→PHQ12	-0.078*	0.039	-0.127*	0.064
MCS3→PCS6	0.257**	0.075	0.308**	0.089
MCS3→MCS6	0.198*	0.078	0.198*	0.078
MCS3→PHQ6	-0.067	0.039	-0.126	0.080
MCS3→PCS12	-0.014	0.075	-0.016	0.087
MCS3→MCS12	0.201*	0.096	0.222*	0.105
MCS3→PHQ12	0.045	0.038	0.097	0.082
MCS6→PCS12	0.354***	0.103	0.407***	0.115
MC6→MCS12	0.341**	0.128	0.374**	0.139
MCS6→PHQ12	-0.095	0.050	-0.203	0.108
PHQB→PCS3	-0.382*	0.163	-0.194*	0.082
PHQB→MCS3	-0.843***	0.185	-0.347***	0.073
PHQB→PHQ3	0.526***	0.084	0.465***	0.069

Table 7. Continued

Parameter	Unstandardized	SE	Standardized	SE
PHQB→PCS6	-0.331*	0.155	-0.164*	0.076
PHQB→MCS6	-0.281	0.162	-0.116	0.067
PHQB→PHQ6	0.258**	0.077	0.220**	0.065
PHQB→PCS12	-0.093	0.168	-0.045	0.080
PHQB→MCS12	0.197	0.203	0.089	0.092
PHQB→PHQ12	-0.120	0.072	-0.106	0.064
PHQ3→PCS6	0.091	0.172	0.051	0.097
PHQ3→MCS6	-0.980***	0.180	-0.459***	0.081
PHQ3→PHQ6	0.527***	0.088	0.510***	0.082
PHQ3→PCS12	0.089	0.179	0.048	0.096
PHQ3→MCS12	-0.331	0.229	-0.170	0.118
PHQ3→PHQ12	0.284**	0.100	0.285**	0.100
PHQ6→PCS12	0.447*	0.206	0.249*	0.113
PHQ6→MCS12	-0.207	0.254	-0.110	0.135
PHQ6→PHQ12	0.368***	0.100	0.382***	0.104
MCSB↔PCSB	3.441	5.712	0.035	0.058
MCSB↔PHQB	-26.745***	3.670	-0.477***	0.045
PCSB↔PHQB	-11.169***	3.133	-0.213***	0.056
MCS3↔PCS3	10.521	10.072	0.072	0.069
MCS3↔PHQ3	-55.351***	6.348	-0.720***	0.033
PCS3↔PHQ3	-17.608***	4.738	-0.263***	0.064
MCS6↔PCS6	4.654	5.859	0.061	0.076
MCS6↔PHQ6	-24.700***	3.587	-0.617***	0.047
PCS6↔PHQ6	-9.176**	2.991	-0.243**	0.073
MCS12↔PCS12	-11.515*	4.868	-0.233*	0.091
MCS12↔PHQ12	-15.863***	3.077	-0.530***	0.069
PCS12↔PHQ12	-2.199	2.286	-0.096	0.099

Note. Resilience, Resilience Latent Variable (CD-RISC 10 Items 1-10); Age, Age at Admission; Gender = Identified Gender (coded as male and female); PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

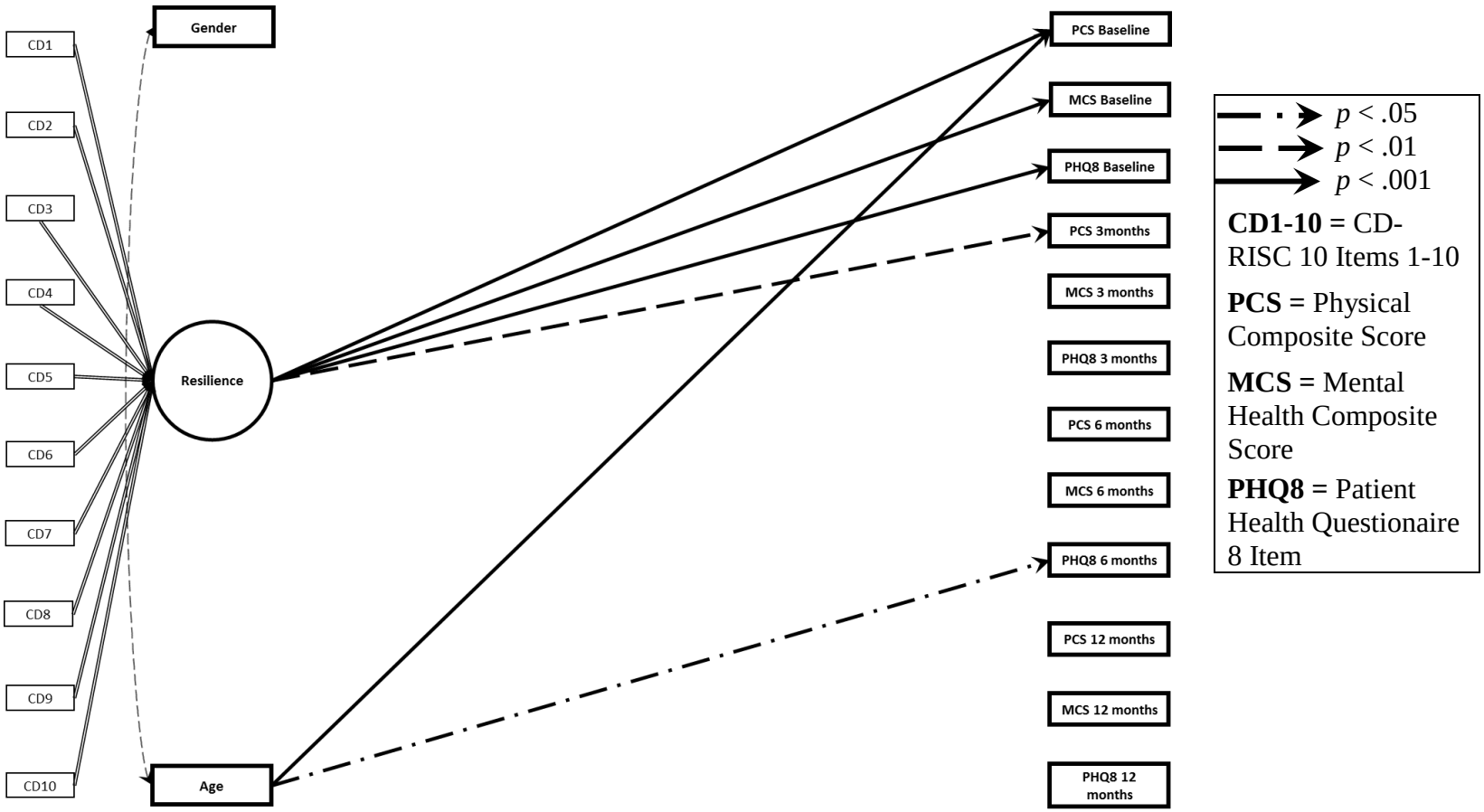

Figure 1. Resilience Latent Variable Model Statistically Significant Correlations: Endogenous to Exogenous Variables Without Exogenous Correlations

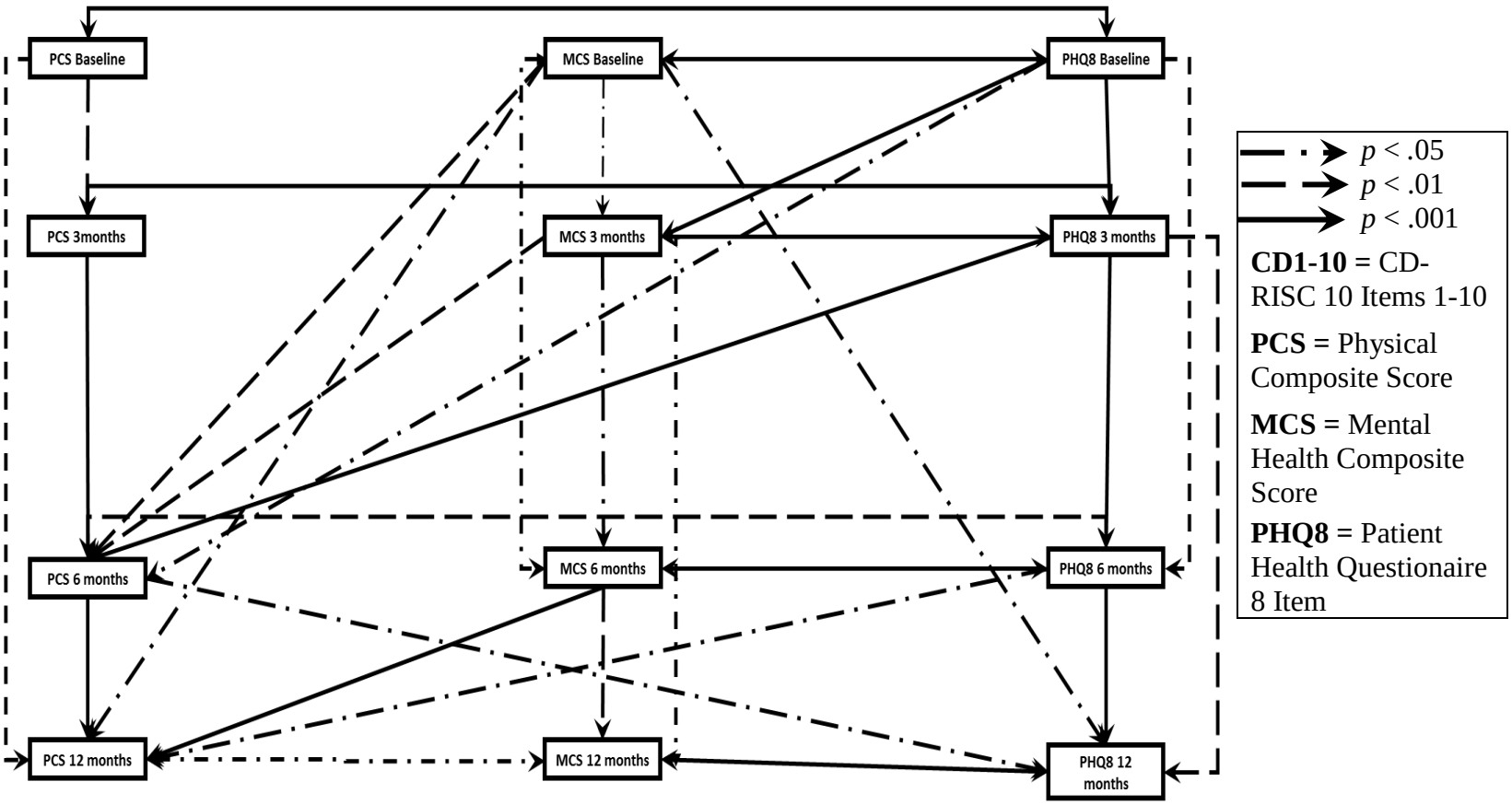

Figure 2. Resilience Latent Variable Model Statistically Significant Correlations: Exogenous Variables Intercorrelations Without Endogenous Variables

Resilience. The Maximum Likelihood Estimates data for the full Resilience Latent Variable Model are presented in Table 7. Table 8 shows the maximum likelihood estimates for the resilience latent variable (CD-RISC 10 items one to 10 loaded) as predictor to the endogenous variables (i.e., PCS, MCS, & PHQ-8). The resilience latent variable had four statistically significant pathways with the baseline PCS (0.189, $p < .01$), MCS (0.402, $p < .001$), and PHQ-8 (-0.424, $p < .001$) and PCS at three months (-0.212, $p < .01$; see Figure 1). The remainder of the resilience latent variable to outcome variable pathways were not statistically significant.

These findings indicate that resilience significantly predicted mental and physical HRQoL and depression at baseline and physical HRQoL at three months. The results indicate that higher resilience, as measured by the CD-RISC 10, was significantly associated with higher mental and physical HRQoL and lower depression at baseline. Higher resilience was also associated with lower physical HRQoL at three months. However, resilience did not significantly predict HRQoL or depression at the other timepoints.

Table 8. Resilience Latent Variable Maximum Likelihood Estimates for Resilience Latent Variable Model

Parameter	Unstandardized	SE	Standardized	SE
Resilience→PCSB	3.299**	0.988	0.189**	0.054
Resilience→MCSB	7.346***	1.142	0.402***	0.052
Resilience→PHQB	-42.12***	0.620	-0.424***	0.051
Resilience→PCS3	-4.155**	1.557	-0.212**	0.077
Resilience→MCS3	0.510	1.746	0.021	0.072
Resilience→PHQ3	1.463	0.799	0.130	0.070
Resilience→PCS6	1.475	1.335	0.073	0.066
Resilience→MCS6	-0.477	1.419	-0.020	0.059

Table 8. Continued

Parameter	Unstandardized	SE	Standardized	SE
Resilience→PHQ6	0.780	0.697	0.067	0.060
Resilience→PCS12	0.256	1.428	0.012	0.068
Resilience→MCS12	1.031	1.698	0.047	0.078
Resilience→PHQ12	-0.329	0.655	-0.029	0.059

Note. Resilience = Resilience Latent Variable (CD-RISC 10 Items 1-10); PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Age. Table 9 contains the maximum likelihood estimates for age as predictor to the endogenous variables (see Table 7 for the full model). Age had two statistically significant pathways with the baseline PCS (-0.377, $p < .001$) and PHQ-8 (-0.096, $p < .05$; see Figure 1). This pattern suggests that older age was associated with a lower baseline physical HRQoL, and with lower depression scores at six months. However, age was not associated with any additional HRQoL or depression outcomes at other timepoints.

Table 9. Age Maximum Likelihood Estimates for Resilience Latent Variable Model

Parameter	Unstandardized	SE	Standardized	SE
Age→PCSB	-0.232***	0.033	-0.377***	0.049
Age→MCSB	-0.002	0.035	-0.003	0.055
Age→PHQB	-0.010	0.019	-0.028	0.053

Table 9. Continued

Parameter	Unstandardized	SE	Standardized	SE
Age→PCS3	0.034	0.047	0.049	0.069
Age→MCS3	0.032	0.054	0.038	0.063
Age→PHQ3	-0.014	0.024	-0.035	0.061
Age→PCS6	-0.052	0.039	0.074	0.055
Age→MCS6	0.076	0.041	0.091	0.049
Age→PHQ6	-0.039*	0.020	-0.096*	0.049
Age→PCS12	0.012	0.037	0.016	0.051
Age→MCS12	-0.004	0.046	-0.005	0.060
Age→PHQ12	-0.018	0.019	-0.047	0.049

Note. Age = Age at Admission; PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Gender. Table 10 shows the maximum likelihood estimates for gender as predictor to the endogenous variables (also see Table 7 for the full model). Gender did not have any statistically significant pathways with the HRQoL variables (i.e., PCS, MCS, and PHQ-8; see Figure 1), suggesting that that gender was not associated with HRQoL or depression outcomes at any timepoint.

Table 10. Gender Maximum Likelihood Estimates for Resilience Latent Variable Model

Parameter	Unstandardized	SE	Standardized	SE
Gender→PCSB	2.034	1.188	0.091	0.091
Gender→MCSB	-0.077	1.276	-0.003	0.054
Gender→PHQB	-0.302	0.679	-0.024	-0.024

Table 10. Continued

Parameter	Unstandardized	SE	Standardized	SE
Gender→PCS3	2.202	1.620	0.088	0.064
Gender→MCS3	-0.952	1.835	-0.031	0.059
Gender→PHQ3	1.406	0.824	0.098	0.057
Gender→PCS6	-0.686	1.372	-0.027	0.053
Gender→MCS6	0.709	1.456	0.023	0.047
Gender→PHQ6	-0.068	0.710	-0.005	0.048
Gender→PCS12	-2.401	1.267	-0.090	0.048
Gender→MCS12	-1.428	1.525	-0.051	0.055
Gender→PHQ12	0.608	0.639	0.042	0.045

Note. Gender = Identified Gender (coded as male and female); PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Physical HRQoL. Table 11 shows the maximum likelihood estimates for the PCS pathways to the endogenous variables at subsequent timepoints (also see Table 7 for the full model). The PCS had five statistically significant pathways to the other HRQoL variables (see Table 11 and Figure 2). Four of the pathways were from prior PCS timepoints to PCSs at subsequent timepoints and one was from the PCS at a prior timepoint to the PHQ-8 at a subsequent timepoint. The baseline PCS accounted for two statistically significant pathways: PCS assessed at the 3rd month (0.215; $p < .01$) and at the 12th month (0.180; $p < .01$). The three month PCS was significantly predictive of the PCS at the 6th month (0.546; $p < .001$). The PCS at six months was then, in turn,

predictive of the PCS and depression at the 12th month (0.739; $p < .001$; -0.168; $p < .05$; respectively).

The results of this model indicate that higher physical HRQoL from a directly prior timepoint was predictive of higher physical HRQoL at an immediately subsequent timepoint (e.g., physical HRQoL at three months predicting physical HRQoL at six months). Higher physical HRQoL at baseline was significantly associated with higher physical HRQoL at three months. Endorsement of higher physical HRQoL at three months was significantly associated with higher physical HRQoL at six months. Higher physical HRQoL at six months significantly predicted higher physical HRQoL at 12 months. Individuals who endorsed higher physical HRQoL at baseline had better physical HRQoL at 12 months. Notably, individuals at six months had the largest standardized pathway estimates (0.739), indicating that the six month timepoint physical HRQoL was the largest predictor of physical HRQoL at 12 months. Additionally, physical HRQoL at six months was significantly associated with lower depression at 12 months. Physical HRQoL was not significantly associated with other HRQoL and depression outcomes at other timepoints.

Table 11. Physical Health Composite Score Maximum Likelihood Estimates for Resilience Latent Variable Model

Parameter	**Unstandardized**	**SE**	**Standardized**	**SE**
PCSB→PCS3	0.241**	0.080	0.215**	0.070
PCSB→MCS3	0.071	0.092	0.051	0.066
PCSB→PHQ3	-0.053	0.042	-0.083	0.065
PCSB→PCS6	0.124	0.068	0.108	0.059
PCSB→MCS6	0.089	0.073	0.065	0.053
PCSB→PHQ6	-0.046	0.035	-0.069	0.053

Table 11. Continued

Parameter	Unstandardized	SE	Standardized	SE
PCSB→PCS12	0.215**	0.063	0.180**	0.053
PCSB→MCS12	-0.040	0.076	-0.032	0.061
PCSB→PHQ12	-0.062	0.034	-0.096	0.053
PCS3→PCS6	0.561***	0.059	0.546***	0.053
PCS3→MCS6	0.053	0.063	0.044	0.051
PCS3→PHQ6	-0.024	0.031	-0.041	0.053
PCS3→PCS12	0.041	0.068	0.038	0.064
PCS3→MCS12	0.022	0.089	0.020	0.080
PCS3→PHQ12	0.020	0.038	0.036	0.066
PCS6→PCS12	0.767***	0.080	0.739***	0.063
PCS6→MCS12	-0.003	0.102	-0.003	0.094
PCS6→PHQ12	-0.093*	0.041	-0.168*	0.073

Note. PCSB = VR-12 Physical Health Composite Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Mental HRQoL. Table 12 shows the maximum likelihood estimates for the MCS pathways to the endogenous variables at subsequent timepoints (also see Table 7 for the full model). The MCS at baseline was significantly associated with the MCS at the 3rd (0.147; $p < .05$) and 6th (0.155; $p < .01$) measurement occasions, and with the PCS (-0.142; $p < .05$) and PHQ-8 (-0.127; $p < .05$) assessed at the 12th month. The MCS at the 3rd month was significantly predictive of the PCS (0.257; $p < .01$) and MCS (0.198; $p < .05$) at the 6th month, and the MCS at the 12th month (0.222; $p < .05$). MCS at the 6th month was significantly predictive of PCS (0.354; $p < .001$) and MCS (0.374; $p < .01$) at

the 12th month. The remainder of the MCS one directional pathways were not statistically significant.

Mental HRQoL from directly prior to subsequent timepoints was a predictor of mental HRQoL throughout the 12 month period in this model. Additionally, the results indicate that mental HRQoL at prior assessments was predictive of mental HRQoL at the next two timepoints (e.g., baseline mental HRQoL predicting mental HRQoL at three and six month timepoints). Higher mental HRQoL at baseline significantly predicted higher mental HRQoL at the three and six month measurement occasion. Higher mental HRQoL at three months significantly associated with higher mental HRQoL at six and 12 months. Higher mental HRQoL was significantly associated with higher mental HRQoL over time with the exception of mental HRQoL at 12 months. Higher mental HRQoL at baseline was significantly associated with lower depression and lower physical HRQoL at the 12th months. Higher mental HRQoL at three months was significantly associated with higher physical HRQoL at six months. Additionally, higher mental HRQoL at six months was significantly associated with higher physical HRQoL at 12 months. Mental HRQoL at baseline was not significantly associated with physical HRQoL and depression at three months, physical HRQoL and depression at six months, and mental HRQoL at 12 months. Mental HRQoL at three months was not significantly associated with depression at six months and physical HRQoL and depression at 12 months. Additionally, mental HRQoL at six months was not significantly associated with depression at 12 months.

Table 12. Mental Health Composite Score Maximum Likelihood Estimates for Resilience Latent Variable Model

Parameter	Unstandardized	SE	Standardized	SE
MCSB→PCS3	-0.135	0.086	-0.126	0.080
MCSB→MCS3	0.194*	0.098	0.147*	0.074
MCSB→PHQ3	-0.052	0.044	-0.084	0.072
MCSB→PCS6	-0.092	0.075	-0.084	0.068
MCSB→MCS6	0.203**	0.080	0.155**	0.061
MCSB→PHQ6	-0.024	0.039	-0.037	0.061
MCSB→PCS12	-0.163*	0.074	-0.142*	0.064
MCSB→MCS12	0.124	0.089	0.104	0.075
MCSB→PHQ12	-0.078*	0.039	-0.127*	0.064
MCS3→PCS6	0.257**	0.075	0.308**	0.089
MCS3→MCS6	0.198*	0.078	0.198*	0.078
MCS3→PHQ6	-0.067	0.039	-0.126	0.080
MCS3→PCS12	-0.014	0.075	-0.016	0.087
MCS3→MCS12	0.201*	0.096	0.222*	0.105
MCS3→PHQ12	0.045	0.038	0.097	0.082
MCS6→PCS12	0.354***	0.103	0.407***	0.115
MCS6→MCS12	0.341**	0.128	0.374**	0.139
MCS6→PHQ12	-0.095	0.050	-0.203	0.108

Note. MCSB = VR-12 Mental Health Composite Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Depression. Table 13 shows the maximum likelihood estimates for the PHQ-8 as a predictor to the endogenous variables at subsequent timepoints (also see Table 7 for the full model). The PHQ-8 at baseline was significantly predictive of the PCS (-0.194; $p < .05$), MCS (-0.347; $p < .001$), and PHQ-8 (0.465; $p < .001$) at the 3rd month, and of the PCS (0.164; $p < .05$) and PHQ-8 (0.220; $p < .01$) at the 6th month. The PHQ-8 at the 3rd month was significantly predictive of the MCS (-0.459; $p < .001$) and PHQ-8 (0.510;

$p < .001$) at the 6th month, and of the PHQ-8 (0.285; $p < .01$) at the 12th month. The PHQ-8 at the 6th month significantly predicted the PCS (0.249; $p < .05$) and PHQ-8 (0.382; $p < .001$) at the 12th month. The remainder of the PHQ-8 one directional pathways were not statistically significant.

These data indicate that depression was the most consistent statistically significant predictor of HRQoL and depression at subsequent timepoints in this model. Depression at any point in time was significantly associated, with varying magnitudes, with next assessment of depression. Additionally, depression predicted subsequent depression to the next two timepoints at any measurement occasion. Higher endorsement of depressive symptoms at previous measurement occasions was indicative lower mental HRQoL at directly subsequent assessments over the one-year course of this study (except for the MCS at the 12th month). Additionally, higher depression at baseline was significantly associated with lower physical HRQoL at three and six months. These data also suggest that higher depression at six months was significantly associated with higher physical HRQoL at 12 months. Depression at baseline was not significantly associated with mental HRQoL at six months and physical and mental HRQoL and depression at 12 months. Depression at three months was not significantly associated with physical HRQoL at six months and physical and mental HRQoL at 12 months. Depression at six months was not significantly associated with mental HRQoL at 12 months. The results from this model suggest that depression is significantly associated with self-reported physical and mental HRQoL.

Table 13. Depression Maximum Likelihood Estimates for Resilience Latent Variable Model

Parameter	Unstandardized	SE	Standardized	SE
PHQB→PCS3	-0.382*	0.163	-0.194*	0.082
PHQB→MCS3	-0.843***	0.185	-0.347***	0.073
PHQB→PHQ3	0.526***	0.084	0.465***	0.069
PHQB→PCS6	-0.331*	0.155	-0.164*	0.076
PHQB→MCS6	-0.281	0.162	-0.116	0.067
PHQB→PHQ6	0.258**	0.077	0.220**	0.065
PHQB→PCS12	-0.093	0.168	-0.045	0.080
PHQB→MCS12	0.197	0.203	0.089	0.092
PHQB→PHQ12	-0.120	0.072	-0.106	0.064
PHQ3→PCS6	0.091	0.172	0.051	0.097
PHQ3→MCS6	-0.980***	0.180	-0.459***	0.081
PHQ3→PHQ6	0.527***	0.088	0.510***	0.082
PHQ3→PCS12	0.089	0.179	0.048	0.096
PHQ3→MCS12	-0.331	0.229	-0.170	0.118
PHQ3→PHQ12	0.284**	0.100	0.285**	0.100
PHQ6→PCS12	0.447*	0.206	0.249*	0.113
PHQ6→MCS12	-0.207	0.254	-0.110	0.135
PHQ6→PHQ12	0.368***	0.100	0.382***	0.104

Note. PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

HRQoL and Depression Bidirectional Pathways. Table 14 shows the maximum likelihood estimates for the bidirectional pathways at each respective timepoint (e.g., baseline MCS, PCS, and PHQ; also see Table 7 for the full model). The bidirectional MCS-PHQ pathways were statistically significant at each respective timepoint: baseline (-0.477; $p < .001$), three month (-0.720; $p < .001$), six month (-0.617; $p < .001$), and 12 month (-0.530; $p < .001$). The MCS-PHQ bidirectional pathways had

the largest bidirectional pathway estimates. The PCS-PHQ bidirectional pathways accounted for three more statistically significant pathways at baseline (-0.213, $p < .001$), three months (0.263, $p < .001$), and six months (-0.243, $p < .01$). The MCS-PCS bidirectional pathway at 12 month (-0.233; $p < .05$) accounted for one of the eight statistically significant pathways. The remainder of the bidirectional pathways were not statistically significant.

This pattern implies that same timepoint depression had statistically significant bidirectional associations with mental HRQoL at every measurement occasion. Depression and physical HRQoL at the same measurement occasion appears to be mutually influential at every timepoint except at 12 months. Additionally, the results indicate that mental and physical HRQoL were significantly associated at the 12 months.

Table 14. HRQoL Bidirectional Maximum Likelihood Estimates for Resilience Latent Variable Model

Parameter	**Unstandardized**	**SE**	**Standardized**	**SE**
MCSB↔PCSB	3.441	5.712	0.035	0.058
MCSB↔PHQB	-26.745***	3.670	-0.477***	0.045
PCSB↔PHQB	-11.169***	3.133	-0.213***	0.056
MCS3↔PCS3	10.521	10.072	0.072	0.069
MCS3↔PHQ3	-55.351***	6.348	-0.720***	0.033
PCS3↔PHQ3	-17.608***	4.738	-0.263***	0.064
MCS6↔PCS6	4.654	5.859	0.061	0.076
MCS6↔PHQ6	-24.700***	3.587	-0.617***	0.047
PCS6↔PHQ6	-9.176**	2.991	-0.243**	0.073
MCS12↔PCS12	-11.515*	4.868	-0.233*	0.091
MCS12↔PHQ12	-15.863***	3.077	-0.530***	0.069
PCS12↔PHQ12	-2.199	2.286	-0.096	0.099

Note. PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three

months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Variances. Table 15 shows the variances and residual variances for the Resilience Latent Variable Model. The variances and residual variances for the variables were within acceptable ranges. The CD-RISC 10 item one was the loading item, giving it a standardized value of 1.000. The CD-RISC 10 item three had the highest variance (0.802) out of the CD-RISC 10 items, which is similar to previous research (Galli & Gonzalez, 2015; Gucciardi et al., 2011). The baseline HRQoL variables had the highest variance compared to other timepoints: PHQ-8 = 0.819, PCS = 0.801, and MCS = 0.838. The residual variance values progressively shrank as the timepoints proceeded, which may be due to the increasing number of variables explaining variables at later timepoints.

Table 15. Variances/Residual Variances for Resilience Latent Variable Model

Variable	Unstandardized	SE	Standardized	SE
Resilience	0.373	0.058	1.000	0.000
CD1	0.430	0.039	0.536	0.047
CD2	0.297	0.030	0.388	0.042
CD3	0.810	0.067	0.802	0.044
CD4	0.990	0.084	0.720	0.047
CD5	0.440	0.039	0.611	0.048
CD6	0.337	0.031	0.533	0.047
CD7	0.583	0.051	0.611	0.048
CD8	0.639	0.058	0.526	0.047
CD9	0.395	0.037	0.499	0.046
CD10	0.677	0.060	0.614	0.049

Table 15. Continued

Variable	Unstandardized	SE	Standardized	SE
PCSB	91.339	7.486	0.801	0.041
MCSB	104.307	8.699	0.838	0.042
PHQB	30.116	2.498	0.819	0.043
PCS3	127.226	12.496	0.891	0.040
MCS3	167.976	16.152	0.776	0.049
PHQ3	35.153	3.310	0.746	0.050
PCS6	72.349	8.017	0.481	0.054
MCS6	81.280	8.703	0.379	0.044
PHQ6	19.693	2.145	0.391	0.045
PCS12	38.147	5.293	0.235	0.038
MCS12	64.001	8.624	0.360	0.051
PHQ12	13.685	1.625	0.293	0.039

Note: Resilience = Resilience Latent Variable (CD-RISC 10 Items 1-10); CD1-10 = CD-RISC 10 items by number; Age, Age at Admission; Gender = Identified Gender (coded as male and female); PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months.

Resilience Total Score Model

Model Fit. Table 16 shows the model fit indices (i.e., Chi-Square Test, RMSEA, CFI, and SRMR) for the Resilience Total Score Model. The Resilience Total Score Model Chi-Square Test of Model Fit yielded was statistically significant ($p < .001$), which may be influenced by the large sample size. The RMSEA produced 0.000 estimate, indicating a good fit (RMSEA <.05). The CFI for the Resilience Total Score Model yielded a value of 1.000, indicating a good fit (CFI >.95). The Resilience Total

Score Model is saturated, which can influence model fit statistics in regard to appearing to have a "perfect" fit. Overall, the model indices indicated that the Resilience Total Score Model was a good fit to the data despite the statistical significance found in the Chi-Square Test of Model Fit.

Table 16. Fit Indices for Resilience Total Score Model

Model Fit Test	**Value**	***DF***	***p* Value**
Chi-Square Test of Model Fit	0.000	0	< .001
	Estimate		
RMSEA	0.000	-	-
	Value		
CFI	1.000	-	-
SRMR	0.000	-	-

Note: DF, Degrees of Freedom; RMESA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; SRMR = Standardized Root Mean Residual.

The Resilience Total Score Model pathways and maximum likelihood estimates are shown in Table 17. A visual representation of the statically significant pathways is shown in Figure 3 and Figure 4.

Table 17. Maximum Likelihood Estimates for the Full Resilience Total Score Model

Parameter	Unstandardized	SE	Standardized	SE
Resilience→PCSB	0.275**	0.085	0.168**	0.051
Resilience→MCSB	0.672***	0.090	0.393***	0.049
Resilience→PHQB	-0.380***	0.048	-0.409***	0.048
Resilience→PCS3	-0.350**	0.131	-0.192**	0.007
Resilience→MCS3	0.048	0.149	0.022	0.066
Resilience→PHQ3	0.127	0.068	0.121	0.064
Resilience→PCS6	0.119	0.113	0.063	0.060
Resilience→MCS6	-0.023	0.120	-0.010	0.054
Resilience→PHQ6	0.061	0.059	0.057	0.054
Resilience→PCS12	0.026	0.121	0.013	0.062
Resilience→MCS12	0.086	0.144	0.042	0.071
Resilience→PHQ12	-0.037	0.055	-0.036	.053
Age→PCSB	-0.233***	0.033	-0.379***	0.049
Age→MCSB	-0.007	0.035	-0.010	0.054
Age→PHQB	-0.007	0.018	-0.021	0.053
Age→PCS3	0.035	0.047	0.050	0.069
Age→MCS3	0.032	0.054	0.038	0.064
Age→PHQ3	-0.014	0.024	-0.036	0.061
Age→PCS6	-0.052	0.039	-0.074	0.055
Age→MCS6	0.076	0.041	0.091	0.049
Age→PHQ6	-0.039*	0.020	-0.096*	0.049
Age→PCS12	0.012	0.037	0.016	0.051
Age→MCS12	-0.004	0.046	-0.005	0.060
Age→PHQ12	-0.019	0.019	-0.047	0.049
Gender→PCSB	2.050	1.190	0.091	0.053
Gender→MCSB	-0.103	1.268	-0.004	0.054
Gender→PHQB	-0.294	0.676	-0.023	0.053
Gender→PCS3	2.242	1.622	0.089	0.064
Gender→MCS3	-0.969	1.835	-0.031	0.059
Gender→PHQ3	1.396	0.824	0.097	0.057
Gender→PCS6	-0.710	1.372	-0.028	0.053
Gender→MCS6	0.720	1.456	0.023	0.047
Gender→PHQ6	-0.083	0.710	-0.006	0.048
Gender→PCS12	-2.399	1.266	-0.090	0.048
Gender→MCS12	-1.459	1.523	-0.052	0.055
Gender→PHQ12	0.616	0.638	0.043	0.045
PCSB→PCS3	0.233**	0.080	0.209**	0.070
PCSB→MCS3	0.072	0.091	0.052	0.066

Table 17. Continued

Parameter	Unstandardized	SE	Standardized	SE
PCSB→PHQ3	-0.051	0.041	-0.079	0.065
PCSB→PCS6	0.127	0.068	0.111	0.059
PCSB→MCS6	0.087	0.072	0.063	0.053
PCSB→PHQ6	-0.043	0.035	-0.065	0.053
PCSB→PCS12	0.215**	0.063	0.181**	0.053
PCSB→MCS12	-0.037	0.076	-0.030	0.061
PCSB→PHQ12	-0.062	0.034	-0.097	0.053
PCS3→PCS6	0.559***	0.059	0.544***	0.053
PCS3→MCS6	0.054	0.063	0.044	0.051
PCS3→PHQ6	-0.025	0.031	-0.042	0.052
PCS3→PCS12	0.041	0.067	0.038	0.063
PCS3→MCS12	0.021	0.088	0.019	0.079
PCS3→PHQ12	0.020	0.038	0.034	0.066
PCS6→PCS12	0.767***	0.080	0.740***	0.062
PCS6→MCS12	-0.001	0.102	-0.001	0.094
PCS6→PHQ12	-0.094*	0.041	-0.168*	0.074
MCSB→PCS3	-0.142	0.086	-0.133	0.080
MCSB→MCS3	0.193	0.097	0.147*	0.073
MCSB→PHQ3	-0.050	0.044	-0.081	0.072
MCSB→PCS6	-0.088	0.074	-0.080	0.067
MCSB→MCS6	0.200*	0.079	0.152*	0.060
MCSB→PHQ6	-0.022	0.039	-0.034	0.061
MCSB→PCS12	-0.163*	0.074	-0.143*	0.064
MCSB→MCS12	0.127	0.088	0.106	0.074
MCSB→PHQ12	-0.077*	0.039	-0.127*	0.064
MCS3→PCS6	0.259**	0.075	0.310***	0.089
MCS3→MCS6	0.197*	0.078	0.197*	0.078
MCS3→PHQ6	-0.060	0.039	-0.124	0.080
MCS3→PCS12	-0.014	0.075	-0.016	0.087
MCS3→MCS12	0.201*	0.096	0.222*	0.105
MCS3→PHQ12	0.045	0.038	0.097	0.082
MCS6→PCS12	0.354**	0.103	0.407***	0.115
MCS6→MCS12	0.342**	0.128	0.376**	0.139
MCS6→PHQ12	-0.094	0.050	-0.202	0.108
PHQB→PCS3	-0.371*	0.162	-0.189*	0.082
PHQB→MCS3	-0.844***	0.185	-0.348***	0.073
PHQB→PHQ3	0.524***	0.084	0.463***	0.068
PHQB→PCS6	-0.338*	0.154	-0.167*	0.076

Table 17. Continued

Parameter	Unstandardized	SE	Standardized	SE
PHQB→MCS6	-0.274	0.161	-0.113	0.066
PHQB→PHQ6	0.254**	0.077	0.218**	0.001
PHQB→PCS12	-0.092	0.167	-0.044	0.079
PHQB→MCS12	0.191	0.201	0.087	0.092
PHQB→PHQ12	-0.122	0.072	-0.108	0.064
PHQ3→PCS6	0.096	0.172	0.054	0.096
PHQ3→MCS6	-0.983***	0.179	-0.461***	0.081
PHQ3→PHQ6	0.530***	0.088	0.513***	0.082
PHQ3→PCS12	0.090	0.179	0.049	0.096
PHQ3→MCS12	-0.329	0.229	-0.170	0.117
PHQ3→PHQ12	0.285**	0.100	0.287**	0.100
PHQ6→PCS12	0.446*	0.205	0.249*	0.113
PHQ6→MCS12	-0.201	0.253	-0.107	0.135
PHQ6→PHQ12	0.368***	0.100	0.382***	0.104
MCSB↔PCSB	4.589	5.673	0.047	0.057
MCSB↔PHQB	-27.379***	3.602	-0.483***	0.044
PCSB↔PHQB	-11.884***	3.117	-0.224***	0.054
MCS3↔PCS3	10.473	10.069	0.071	0.068
MCS3↔PHQ3	-55.346***	6.348	-0.719***	0.033
PCS3↔PHQ3	-17.867***	4.736	-0.266***	0.064
MCS6↔PCS6	4.627	5.863	0.060	0.076
MCS6↔PHQ6	-24.754***	3.592	-0.618***	0.047
PCS6↔PHQ6	-9.143**	2.993	-0.242**	0.073
MCS12↔PCS12	-11.538*	4.872	-0.233*	0.091
MCS12↔PHQ12	-15.685***	3.075	-0.530***	0.069
PCS12↔PHQ12	-2.170	2.285	-0.095	0.099

Note: Resilience = Resilience (CD-RISC Total Score); Age = Age at Admission; Gender = Identified Gender (coded as male and female); PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; *p < .05; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

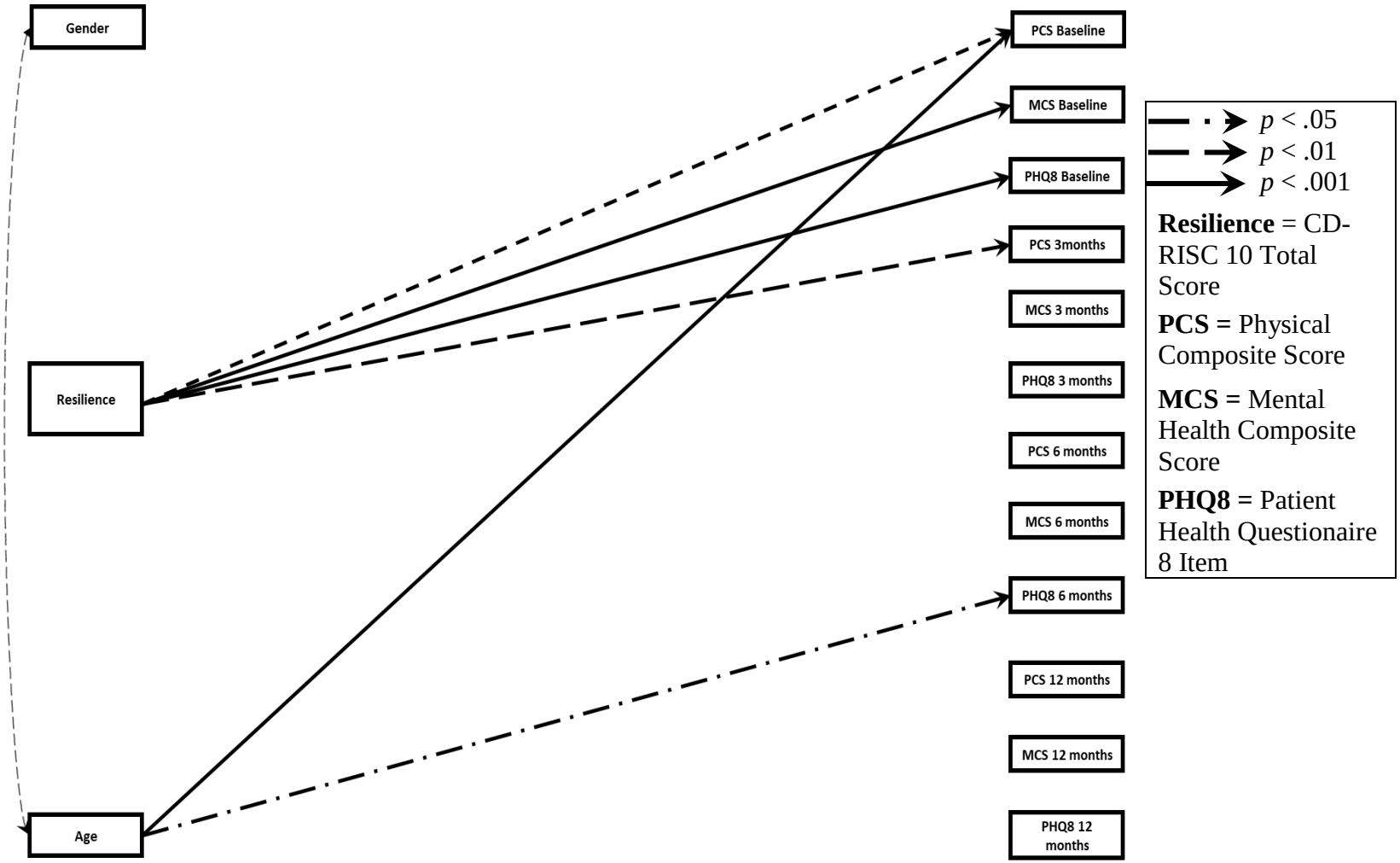

Figure 3. Resilience Total Score Model Statistically Significant Correlations: Endogenous to Exogenous Variables Without Exogenous Correlations

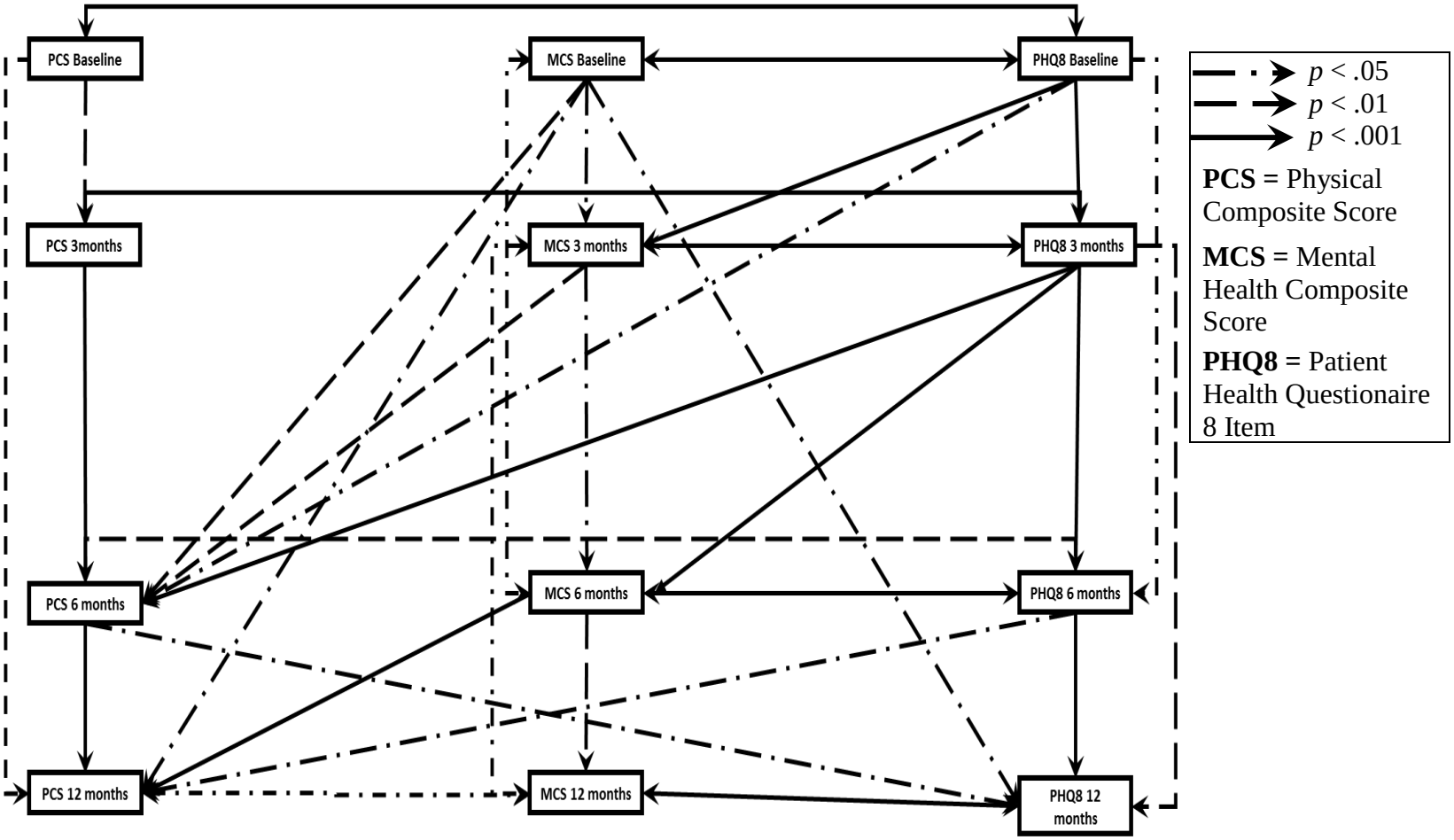

Figure 4. Resilience Total Score Model Statistically Significant Correlations: Exogenous Variables Intercorrelations Without Endogenous Variables

Resilience. Table 18 shows the maximum likelihood estimates for the resilience latent variable (CD-RISC 10 one-10 items loaded) as a predictor to the endogenous variables, which can also be seen in the full Resilience Total Score Model seen in Table 17. The resilience variable (CD-RISC 10 total score) was significantly predictive of the PCS (0.168, $p < .01$), MCS (0.393, $p < .001$), and PHQ-8 (-0.409, $p < .001$) at baseline, and of the PCS at the 3rd month (-0.192, $p < .01$). There were no other significant pathways for resilience in this model.

Higher resilience was associated with higher mental and physical HRQoL and lower depression at baseline, and with lower physical HRQoL at three months. However, the CD-RISC10 total score was not a significant, prospective predictor of any other adjustment variable in the model.

Table 18. CD-RISC 10 Total Score Maximum Likelihood Estimates for Resilience Total Score Model

Parameter	Unstandardized	SE	Standardized	SE
Resilience→PCSB	0.275**	0.085	0.168**	0.051
Resilience→MCSB	0.672***	0.090	0.393***	0.049
Resilience→PHQB	-0.380***	0.048	-0.409***	0.048
Resilience→PCS3	-0.350**	0.131	-0.192**	0.007
Resilience→MCS3	0.048	0.149	0.022	0.066
Resilience→PHQ3	0.127	0.068	0.121	0.064
Resilience→PCS6	0.119	0.113	0.063	0.060
Resilience→MCS6	-0.023	0.120	-0.010	0.054
Resilience→PHQ6	0.061	0.059	0.057	0.054
Resilience→PCS12	0.026	0.121	0.013	0.062
Resilience→MCS12	0.086	0.144	0.042	0.071
Resilience→PHQ12	-0.037	0.055	-0.036	.053

Note. Resilience = Resilience Latent Variable (CD-RISC 10 Items 1-10); PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12

Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Age. Table 19 shows the maximum likelihood estimates for age as predictor to the endogenous variables (also see Table 17 for the full model). Age was significantly predictive of the baseline PCS (-0.377, $p < .001$) and PHQ-8 at the 6th month measurement occasion (-0.096, $p < .05$; see Figure 1). No other significant effects were observed for age. Older age was associated with lower physical HRQoL at baseline, and with lower depression scores at six months. However, age was not significantly associated with other HRQoL or depression outcomes at other timepoints.

Table 19. Age Maximum Likelihood Estimates for Resilience Total Score Model

Parameter	Unstandardized	SE	Standardized	SE
Age→PCSB	-0.232***	0.033	-0.377***	0.049
Age→MCSB	-0.002	0.035	-0.003	0.055
Age→PHQB	-0.010	0.019	-0.028	0.053
Age→PCS3	0.034	0.047	0.049	0.069
Age→MCS3	0.032	0.054	0.038	0.063
Age→PHQ3	-0.014	0.024	-0.035	0.061
Age→PCS6	-0.052	0.039	0.074	0.055
Age→MCS6	0.076	0.041	0.091	0.049
Age→PHQ6	-0.039*	0.020	-0.096*	0.049
Age→PCS12	0.012	0.037	0.016	0.051
Age→MCS12	-0.004	0.046	-0.005	0.060
Age→PHQ12	-0.018	0.019	-0.047	0.049

Note. Age = Age at Admission; PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8

Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Gender. Table 20 shows the maximum likelihood estimates for gender as predictor to the HRQoL and depression variables (also see Table 17 for the full model). Gender was not significantly associated with any of the HRQoL or depression variables (i.e., PCS, MCS, and PHQ-8; see Figure 3). The results suggest that self-identified male or female gender was not associated with HRQoL or depression outcomes at any time.

Table 20. Gender Maximum Likelihood Estimates for Resilience Total Score Model

Parameter	Unstandardized	SE	Standardized	SE
Gender→PCSB	2.050	1.190	0.091	0.053
Gender→MCSB	-0.103	1.268	-0.004	0.054
Gender→PHQB	-0.294	0.676	-0.023	0.053
Gender→PCS3	2.242	1.622	0.089	0.064
Gender→MCS3	-0.969	1.835	-0.031	0.059
Gender→PHQ3	1.396	0.824	0.097	0.057
Gender→PCS6	-0.710	1.372	-0.028	0.053
Gender→MCS6	0.720	1.456	0.023	0.047
Gender→PHQ6	-0.083	0.710	-0.006	0.048
Gender→PCS12	-2.399	1.266	-0.090	0.048
Gender→MCS12	-1.459	1.523	-0.052	0.055
Gender→PHQ12	0.616	0.638	0.043	0.045

Note. Gender = Identified Gender (coded as male and female); PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score

at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Physical HRQoL. Table 21 shows the maximum likelihood estimates for the PCS as a predictor to the endogenous variables at subsequent timepoints (also see Table 17 for the full model). The baseline PCS was significantly predictive of the PCS at six months (0.209; $p < .01$) and 12 months (0.181; $p < .01$). The PCS at the 3rd month was significantly predictive of the PCS at the 6th month (0.544; $p < .001$). The PCS at the 6th month was significantly predictive of the PCS (0.740; $p < .001$) and the PHQ-8 (-0.168; $p < .05$) at the 12th month. The remainder of the PCS one directional pathways were not statistically significant.

Higher physical HRQoL at directly prior timepoints was predictive of higher physical HRQoL at immediately subsequent measurement occasions (e.g., physical HRQoL at three months significantly predicting physical HRQoL at six month). Higher physical HRQoL at baseline was significantly associated with higher physical HRQoL at three months. Endorsement of higher physical HRQoL at three months was significantly associated with higher physical HRQoL at six months. Higher physical HRQoL at six months significantly predicted higher physical HRQoL at 12 months. Higher baseline physical HRQoL was significantly associated with higher physical HRQoL at 12 months. Notably, individuals at six months had the largest standardized pathway estimates (0.739), indicating that the physical HRQoL at this measurement occasion was the largest predictor of physical HRQoL at 12 months. Additionally, physical HRQoL at

six months was significantly associated with lower depression at 12 months. Physical HRQoL was not significantly associated with other HRQoL and depression outcomes at other timepoints.

Table 21. Physical Health Composite Score Maximum Likelihood Estimates for Resilience Total Score Model

Parameter	Unstandardized	SE	Standardized	SE
PCSB→PCS3	0.233**	0.080	0.209**	0.070
PCSB→MCS3	0.072	0.091	0.052	0.066
PCSB→PHQ3	-0.051	0.041	-0.079	0.065
PCSB→PCS6	0.127	0.068	0.111	0.059
PCSB→MCS6	0.087	0.072	0.063	0.053
PCSB→PHQ6	-0.043	0.035	-0.065	0.053
PCSB→PCS12	0.215**	0.063	0.181**	0.053
PCSB→MCS12	-0.037	0.076	-0.030	0.061
PCSB→PHQ12	-0.062	0.034	-0.097	0.053
PCS3→PCS6	0.559***	0.059	0.544***	0.053
PCS3→MCS6	0.054	0.063	0.044	0.051
PCS3→PHQ6	-0.025	0.031	-0.042	0.052
PCS3→PCS12	0.041	0.067	0.038	0.063
PCS3→MCS12	0.021	0.088	0.019	0.079
PCS3→PHQ12	0.020	0.038	0.034	0.066
PCS6→PCS12	0.767***	0.080	0.740***	0.062
PCS6→MCS12	-0.001	0.102	-0.001	0.094
PCS6→PHQ12	-0.094*	0.041	-0.168*	0.074

Note. PCSB = VR-12 Physical Health Composite Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Mental HRQoL. Table 22 shows the maximum likelihood estimates for the MCS as a predictor of the endogenous variables at subsequent timepoints (also see Table

17 for the full model). The baseline MCS was significantly predictive of the MCS at the 3rd (0.147; $p < .05$) and 6th month (0.152; $p < .05$), and of the PCS (-0.143; $p < .05$) and PHQ-8 (-0.127; $p < .05$) at the 12th month. MCS at the 3rd month significantly predicted the PCS (0.310; $p < .001$) and MCS (0.197; $p < .05$) at the 6th month, and the MCS at the 12th month (0.222; $p < .05$). The MCS at the 6th month significantly predicted the PCS (0.407; $p < .001$) and MCS (0.376; $p < .01$) at the 12th month. The remainder of the MCS one directional pathways were not statistically significant.

Mental HRQoL from prior to subsequent timepoints was a predictor of mental HRQoL throughout the 12 month period in this model. These data also indicate that mental HRQoL at prior assessments was predictive of mental HRQoL at the next two timepoints (e.g., mental HRQoL at three months significantly predicted mental HRQoL at six and 12 months). Higher mental HRQoL at baseline significantly predicted higher mental HRQoL at the three and six month measurement occasion. Higher mental HRQoL at three months significantly associated with higher mental HRQoL at six and 12 months. Higher mental HRQoL was significantly associated with higher mental HRQoL, with varying magnitudes, over time; however, baseline mental HRQoL was not significantly associated with mental HRQoL at 12 months. Higher mental HRQoL at baseline was significantly associated with lower depression and lower physical HRQoL at the 12th months. Higher mental HRQoL at three months was significantly associated with higher physical HRQoL at six months. Additionally, higher mental HRQoL at six months was significantly associated with higher physical HRQoL at 12 months. Mental HRQoL at baseline was not significantly associated with physical HRQoL and

depression at three months, physical HRQoL and depression at six months, and mental HRQoL at 12 months. Additionally, mental HRQoL at three months was not significantly associated with depression at six months, physical HRQoL and depression at 12 months. Mental HRQoL at six months was also not significantly associated with depression at 12 months.

Table 22. Mental Health Composite Score Maximum Likelihood Estimates for Resilience Total Score Model

Parameter	Unstandardized	SE	Standardized	SE
MCSB→PCS3	-0.142	0.086	-0.133	0.080
MCSB→MCS3	0.193*	0.097	0.147*	0.073
MCSB→PHQ3	-0.050	0.044	-0.081	0.072
MCSB→PCS6	-0.088	0.074	-0.080	0.067
MCSB→MCS6	0.200*	0.079	0.152*	0.060
MCSB→PHQ6	-0.022	0.039	-0.034	0.061
MCSB→PCS12	-0.163*	0.074	-0.143*	0.064
MCSB→MCS12	0.127	0.088	0.106	0.074
MCSB→PHQ12	-0.077*	0.039	-0.127*	0.064
MCS3→PCS6	0.259**	0.075	0.310***	0.089
MCS3→MCS6	0.197*	0.078	0.197*	0.078
MCS3→PHQ6	-0.060	0.039	-0.124	0.080
MCS3→PCS12	-0.014	0.075	-0.016	0.087
MCS3→MCS12	0.201*	0.096	0.222*	0.105
MCS3→PHQ12	0.045	0.038	0.097	0.082
MCS6→PCS12	0.354**	0.103	0.407***	0.115
MCS6→MCS12	0.342**	0.128	0.376**	0.139
MCS6→PHQ12	-0.094	0.050	-0.202	0.108

Note. MCSB = VR-12 Mental Health Composite Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Depression. Table 23 shows the maximum likelihood estimates for the PHQ-8 as a predictor to the endogenous variables at subsequent timepoints (also see Table 17 for the full model). The baseline PHQ-8 was significantly predictive of the PCS (-0.189; $p < .05$), MCS (-0.348; $p < .001$), and PHQ-8 (0.463; $p < .001$) at the 3rd month, and of the PCS (0.167; $p < .05$) and PHQ-8 (0.218; $p < .01$) at the 6th month. The PHQ-8 at the 3rd month was significantly predictive of the MCS (-0.461; $p < .001$) and PHQ-8 (0.513; $p < .001$) at the 6th month, and of the PHQ-8 at the 12th month (0.287; $p < .01$). The PHQ-8 at the 6th month was significantly predictive of the PCS (0.249; $p < .05$) and PHQ-8 (0.382; $p < .001$) assessed at the 12th month. The remainder of the PHQ-8 one directional pathways were not statistically significant.

Depression was the most consistent statistically significant predictor of HRQoL and depression in this model. Depression at any point in time was significantly associated with next assessment of depression, with varying magnitudes. Depression at a previous measurement occasion predicted subsequent depression to the following two timepoints at any measurement occasion. These data indicate that higher endorsement of depression from a previous timepoint was associated with higher endorsement of depression at subsequent timepoints. Higher endorsement of depressive symptoms was indicative lower mental HRQoL at the next assessment over the one-year course of this study (except for the MCS at the 12th month). Higher depression at baseline was significantly associated with lower physical HRQoL at three and six months. The results also suggest that higher depression at six months is significantly associated with higher HRQoL at 12 months. Depression at baseline was not significantly associated with

mental HRQoL at six months and physical and mental HRQoL and depression at 12 months. Additionally, depression at three months was not significantly associated with physical HRQoL at six months and physical and mental HRQoL at 12 months. Depression at six months was also not significantly associated with mental HRQoL at 12 months.

Table 23. Depression Maximum Likelihood Estimates for Resilience Total Score Model

Parameter	**Unstandardized**	**SE**	**Standardized**	**SE**
PHQB→PCS3	-0.371*	0.162	-0.189*	0.082
PHQB→MCS3	-0.844***	0.185	-0.348***	0.073
PHQB→PHQ3	0.524***	0.084	0.463***	0.068
PHQB→PCS6	-0.338*	0.154	-0.167*	0.076
PHQB→MCS6	-0.274	0.161	-0.113	0.066
PHQB→PHQ6	0.254**	0.077	0.218**	0.001
PHQB→PCS12	-0.092	0.167	-0.044	0.079
PHQB→MCS12	0.191	0.201	0.087	0.092
PHQB→PHQ12	-0.122	0.072	-0.108	0.064
PHQ3→PCS6	0.096	0.172	0.054	0.096
PHQ3→MCS6	-0.983***	0.179	-0.461***	0.081
PHQ3→PHQ6	0.530***	0.088	0.513***	0.082
PHQ3→PCS12	0.090	0.179	0.049	0.096
PHQ3→MCS12	-0.329	0.229	-0.170	0.117
PHQ3→PHQ12	0.285**	0.100	0.287**	0.100
PHQ6→PCS12	0.446*	0.205	0.249*	0.113
PHQ6→MCS12	-0.201	0.253	-0.107	0.135
PHQ6→PHQ12	0.368***	0.100	0.382***	0.104

Note. PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

HRQoL Bidirectional Pathways. Table 24 shows the maximum likelihood estimates for the bidirectional pathways at each respective timepoint (e.g., baseline MCS, PCS, and PHQ-8; also see Table 17 for the full model). The eight of the 12 bidirectional timepoint pathways were statistically significant (see Table 24 and Figure 4). The bidirectional MCS-PHQ-8 pathways were statistically significant at each respective timepoint: baseline (-0.483; $p < .001$), three month (-0.719; $p < .001$), six month (-0.618; $p < .001$), and 12 month (-0.530; $p < .001$). The MCS-PHQ-8 bidirectional pathways had the largest bidirectional pathway estimates. The PCS-PHQ-8 bidirectional pathways accounted for three more statistically significant pathways at baseline (-0.224, $p < .001$), three months (0.266, $p < .001$), and six months (-0.242, $p < .01$). The MCS-PCS bidirectional pathway at 12 month (-0.233; $p < .05$) accounted for one of the eight statistically significant pathways. The remainder of the bidirectional pathways were not statistically significant.

The results of this model indicate that same timepoint depression had statistically significant bidirectional associations with mental HRQoL at every measurement. Physical HRQoL and depression at the same timepoint appears to be mutually influential at every measurement occasion, except at 12 months.

Table 24. HRQoL Bidirectional Maximum Likelihood Estimates for Resilience Total Score Model

Parameter	Unstandardized	SE	Standardized	SE
MCSB↔PCSB	4.589	5.673	0.047	0.057
MCSB↔PHQB	-27.379***	3.602	-0.483***	0.044
PCSB↔PHQB	-11.884***	3.117	-0.224***	0.054

Table 24. Continue

Parameter	Unstandardized	SE	Standardized	SE
MCS3↔PCS3	10.473	10.069	0.071	0.068
MCS3↔PHQ3	-55.346***	6.348	-0.719***	0.033
PCS3↔PHQ3	-17.867***	4.736	-0.266***	0.064
MCS6↔PCS6	4.627	5.863	0.060	0.076
MCS6↔PHQ6	-24.754***	3.592	-0.618***	0.047
PCS6↔PHQ6	-9.143**	2.993	-0.242**	0.073
MCS12↔PCS12	-11.538*	4.872	-0.233*	0.091
MCS12↔PHQ12	-15.685***	3.075	-0.530***	0.069
PCS12↔PHQ12	-2.170	2.285	-0.095	0.099

Note. PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6, PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12, PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Variances. Table 25 shows the variances and residual variances for the Resilience Total Score Model. The variances and residual variances for the variables were within acceptable ranges. The baseline HRQoL variables had the highest variance compared to other timepoints: PHQ-8 = 0.830, PCS = 0.804, and MCS = 0.845. The variance values progressively reduced as the time points proceeded, which may be due to the increasing number of variables explaining variables at later timepoints.

Table 25. Variances/Residual Variances for Resilience Total Score Model

Variable	Unstandardized	SE	Standardized	SE
PCSB	92.167	7.509	0.804	0.041
MCSB	105.162	8.552	0.845	0.038
PHQB	30.561	2.463	0.830	0.039
PCS3	128.145	12.491	0.899	0.037
MCS3	167.936	16.146	0.777	0.049
PHQ3	35.236	3.310	0.749	0.049
PCS6	72.437	8.021	0.481	0.054
MCS6	81.336	8.710	0.380	0.044
PHQ6	19.731	2.147	0.393	0.045
PCS12	38.171	5.299	0.236	0.039
MCS12	64.061	8.629	0.361	0.051
PHQ12	13.679	1.623	0.294	0.039

Note: Resilience = Resilience (CD-RISC 10 Total Score); Age = Age at Admission; Gender = Identified Gender (coded as male and female); PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12, PHQ-8 Total Score at 12 months.

Comparison of Resilience Latent Variable Model and Resilience Total Score Model

Model Fit Comparison

Table 26 shows the fit indices for each model respectively. The fit indices for both models indicate that both models are a good fit. Both models' Chi-Square Test of Model Fit was statistically significant ($p < .001$), though this may be influenced by the large sample size. The fit indices for the Resilience Total Score Model are likely affected by the saturation of the model causing it to seem to have a "perfect" fit to the data. It is difficult to compare whether the Resilience Latent Variable Model or the Resilience Total Score Model is better fit to the data due to the saturation noticed in the Resilience Total Score Model. However, overall, the fit indices appear to indicate that both models are a good fit to the data.

Table 26. Fit Indices for Resilience Latent Variable Model and Resilience Total Score Model

Model Fit Test	**Value**	***DF***	***p* Value**
Latent Variable Chi-Square Test of Model Fit	274.745	163	< .001
Total Score Chi-Square Test of Model Fit	0.000	0	< .001
	Estimate		
Latent Variable RMSEA	0.047	-	-
Total Score RMSEA	0.000	-	-
	Value		
Latent Variable CFI	.958	-	-
Total Score CFI	1.000	-	-
	Value	-	-
Latent Variable SRMR	.040	-	-

Table 27. Continued

Model Fit Test	Value	*DF*	*p* Value
Total Score SRMR	.000	-	-

Note: Latent Variable = Latent Resilience Variable (CD-RISC 10 Items Loaded) Longitudinal Model; Total Score = Resilience (CD-RISC 10 Total Score) Longitudinal Model; *DF*, Degrees of Freedom; RMESA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; SRMR = Standardized Root Mean Residual.

Model Estimate Comparison

The maximum likelihood estimates were similar for both models. There were no major differences noticed in either model (see Table 7 and Table 17). Table 27 shows the standardized estimates for the 38 statistically significant pathways for both models (also see Figures 3 and 4).

Table 27. Significant Standardized Maximum Likelihood Estimates for Resilience Latent Variable Model and Resilience Total Score Model

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
Resilience→PCSB	0.189**	0.054	0.168**	0.051
Resilience→MCSB	0.402***	0.052	0.393***	0.049
Resilience→PHQB	-0.424***	0.051	-0.409***	0.048
Resilience→PCS3	-0.212**	0.077	-0.192**	0.007
Age→PCSB	-0.377***	0.049	-0.379***	0.049
Age→PHQ6	-0.096*	0.049	-0.096*	0.049
PCSB→PCS3	0.215**	0.070	0.209**	0.070
PCSB→PCS12	0.180**	0.053	0.181**	0.053
PCS3→PCS6	0.546***	0.053	0.544***	0.053
PCS6→PCS12	0.739***	0.063	0.740***	0.062

Table 27. Continued

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
PCS6→PHQ12	-0.168*	0.073	-0.168*	0.074
MCSB→MCS3	0.147*	0.074	0.147*	0.073
MCSB→MCS6	0.155**	0.061	0.152*	0.060
MCSB→PCS12	-0.142*	0.064	-0.143*	0.064
MCSB→PHQ12	-0.127*	0.064	-0.127*	0.064
MCS3→PCS6	0.308**	0.089	0.310***	0.089
MCS3→MCS6	0.198*	0.078	0.197*	0.078
MCS3→MCS12	0.222*	0.105	0.222*	0.105
MCS6→PCS12	0.407***	0.115	0.407***	0.115
MCS6→MCS12	0.374**	0.139	0.376**	0.139
PHQB→PCS3	-0.194*	0.082	-0.189*	0.082
PHQB→MCS3	-0.347***	0.073	-0.348***	0.073
PHQB→PHQ3	0.465***	0.069	0.463***	0.068
PHQB→PCS6	-0.164*	0.076	-0.167*	0.076
PHQB→PHQ6	0.220**	0.065	0.218**	0.001
PHQ3→MCS6	-0.459***	0.081	-0.461***	0.081
PHQ3→PHQ6	0.510***	0.082	0.513***	0.082
PHQ3→PHQ12	0.285**	0.100	0.287**	0.100
PHQ6→PCS12	0.249*	0.113	0.249*	0.113
PHQ6→PHQ12	0.382***	0.104	0.382***	0.104
MCSB↔PHQB	-0.477***	0.045	-0.483***	0.044
PCSB↔PHQB	-0.213***	0.056	-0.224***	0.054
MCS3↔PHQ3	-0.720***	0.033	-0.719***	0.033
PCS3↔PHQ3	-0.263***	0.064	-0.266***	0.064
MCS6↔PHQ6	-0.617***	0.047	-0.618***	0.047
PCS6↔PHQ6	-0.243**	0.073	-0.242**	0.073
MCS12↔PCS12	-0.233*	0.091	-0.233*	0.091
MCS12↔PHQ12	-0.530***	0.069	-0.530***	0.069

Note: Resilience = Resilience Latent Variable (CD-RISC 10 Items 1-10) or Resilience (CD-RISC 10 Total Score); Latent Variable = Resilience Latent Variable Model; Total Score = Resilience Total Score Model; Age = Age at Admission; Gender = Identified Gender (coded as male and female); PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 =

PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Resilience. Table 28 shows the resilience variable standardized pathway estimates for both models. Resilience for both models had four statistically significant paths (see Table 27 and Figures 1 and 3): resilience to the PCS (0.189, $p < .01$; 0.168, $p < .01$), MCS (0.402, $p < .001$; 0.393; $p < .001$), and PHQ-8 (-0.424, $p < .001$; -0.409, $p < .001$) at baseline, and to the PCS at the 3rd month (-0.212, $p < .01$; -0.192, $p < .01$). The remainder of the resilience one-directional pathways were not statistically significant in either model.

The results of both models indicate that higher subjective resilience, as measured by the CD-RISC 10, was associated with better mental and physical HRQoL and lower depression at baseline, and with lower physical HRQoL at three months. However, resilience did not predict other HRQoL or depression at other times.

Table 28. Comparison of Standardized Resilience Estimates for Resilience Latent Variable Model and Resilience Total Score Model

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
Resilience→PCSB	0.189**	0.054	0.168**	0.051
Resilience→MCSB	0.402***	0.052	0.393***	0.049
Resilience→PHQB	-0.424***	0.051	-0.409***	0.048
Resilience→PCS3	-0.212**	0.077	-0.192**	0.007
Resilience→MCS3	0.021	0.072	0.022	0.066
Resilience→PHQ3	0.130	0.070	0.121	0.064

Table 28. Continued

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
Resilience→PCS6	0.073	0.066	0.063	0.060
Resilience→MCS6	-0.020	0.059	-0.010	0.054
Resilience→PHQ6	0.067	0.060	0.057	0.054
Resilience→PCS12	0.012	0.068	0.013	0.062
Resilience→MCS12	0.047	0.078	0.042	0.071
Resilience→PHQ12	-0.029	0.059	-0.036	0.053

Note: Resilience = Resilience Latent Variable (CD-RISC 10 Items 1-10) or Resilience (CD-RISC 10 Total Score); Latent Variable = Resilience Latent Variable Model; Total Score = Resilience Total Score Model; PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Age. Table 29 shows the age variable standardized pathway estimates for both models. Age was significantly predictive of the baseline PCS (-0.377, $p < .001$; -0.379, $p < .001$) and the PHQ-8 at the 6th month (-0.096, $p < .05$; -0.096, $p < .05$). The remainder of the age one-directional pathways were not statistically significant in either model.

The results of both models indicate that older age had a negative association with baseline physical HRQoL. Additionally, the results indicate that older adults had lower depression scores at six months. However, age was not associated with any additional HRQoL or depression outcomes at other time.

Table 29. Comparison of Standardized Age Estimates for Resilience Latent Variable Model and Resilience Total Score Model

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
Age→PCSB	-0.377***	0.049	-0.379***	0.049
Age→MCSB	-0.003	0.055	-0.010	0.054
Age→PHQB	-0.028	0.053	-0.021	0.053
Age→PCS3	0.049	0.069	0.050	0.069
Age→MCS3	0.038	0.063	0.038	0.064
Age→PHQ3	-0.035	0.061	-0.036	0.061
Age→PCS6	0.074	0.055	-0.074	0.055
Age→MCS6	0.091	0.049	0.091	0.049
Age→PHQ6	-0.096*	0.049	-0.096*	0.049
Age→PCS12	0.016	0.051	0.016	0.051
Age→MCS12	-0.005	0.060	-0.005	0.060
Age→PHQ12	-0.047	0.049	-0.047	0.049

Note: Latent Variable = Resilience Latent Variable Model; Total Score = Resilience Total Score Model; Age = Age at Admission; PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Gender. Table 30 shows the gender variable standardized pathway estimates for both models. Gender did not have any statistically significant pathways in either model (also see Table 27 and Figure 3), indicating that gender was not associated with any adjustment outcome at any time.

Table 30. Comparison of Standardized Gender Estimates for Resilience Latent Variable Model and Resilience Total Score Model

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
Gender→PCSB	0.091	0.091	0.091	0.053
Gender→MCSB	-0.003	0.054	-0.004	0.054
Gender→PHQB	-0.024	-0.024	-0.023	0.053
Gender→PCS3	0.088	0.064	0.089	0.064
Gender→MCS3	-0.031	0.059	-0.031	0.059
Gender→PHQ3	0.098	0.057	0.097	0.057
Gender→PCS6	-0.027	0.053	-0.028	0.053
Gender→MCS6	0.023	0.047	0.023	0.047
Gender→PHQ6	-0.005	0.048	-0.006	0.048
Gender→PCS12	-0.090	0.048	-0.090	0.048
Gender→MCS12	-0.051	0.055	-0.052	0.055
Gender→PHQ12	0.042	0.045	0.043	0.045

Note: Latent Variable = Resilience Latent Variable Model; Total Score = Resilience Total Score Model; Gender = Identified Gender (coded as male and female); PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3, PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-12 Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Depression. Table 31 shows the standardized pathway estimates for variables that had one-directional pathways to and from depression in both models (also see Table 27 and Figures 2 and 4). There were 21 total statistically significant pathways that involved depression. 11 were statistically significant pathways where depression was predicted by another non-depression variable. There were three statistically significant pathways to the baseline PHQ-8: resilience to the PHQ-8 at baseline (-0.424, $p < .001$; -

0.409, $p < .001$), the baseline bidirectional MCS-PHQ-8 pathways (-0.477, $p < .001$; -0.483, $p < .001$), and the baseline bidirectional PCS-PHQ-8 pathways (-0.213, $p < .001$; -0.244 $p < .001$). There were two statistically significant pathways to the three month PHQ-8: the three month bidirectional MCS-PHQ-8 pathways (-0.720, $p < .001$; -0.719, $p < .001$), and the three month bidirectional PCS-PHQ-8 pathways (-0.263, $p < .001$; -0.263 $p < .001$). There were three statistically significant pathways to the six month PHQ-8: Age to the PHQ-8 at six months (-0.096, $p < .05$; -0.096, $p < .05$), the six month bidirectional MCS-PHQ-8 pathways (-0.617, $p < .001$; -0.618, $p < .001$), and the six month bidirectional PCS-PHQ-8 pathways (-0.243, $p < .01$; -0.242 $p < .01$). There were three statistically significant pathways to the 12 month PHQ-8: the baseline MCS to PHQ-8 at 12 months (-0.127, $p < .05$; -0.127, $p < .05$), the six month PCS to the PHQ at 12 months (-0.168, $p < .05$; -0.168, $p < .05$), and the 12 month bidirectional MCS-PHQ-8 pathways (-0.530, $p < .001$; -0.530, $p < .001$).

10 of the 21 statistically significant pathways were pathways from the PHQ-8 to the mental and physical HRQoL variables at respective time points or same timepoint PHQ-8-HRQoL variable bidirectional pathways. There were five statistically significant pathways from the PHQ-8 at baseline to: the three month PCS (-0.194, $p < .05$; -0.189, $p < .05$), the three month MCS (-0.347, $p < .001$; -0.348, $p < .001$), the three month PHQ-8 (0.465, $p < .001$; 0.463, $p < .001$), the six month PCS (-0.164, $p < .05$; -0.167 $p < .05$), and the six month PHQ-8 (0.220, $p < .01$; 0.218, $p < .01$). There were three statistically significant pathways from the PHQ at three months to: the six month MCS (-0.459, $p < .001$; -0.461, $p < .001$) and the PHQ-8 (0.510, $p < .001$; 0.513, $p < .001$), and the PHQ-8

at 12 months (0.285, $p < .01$; 0.287, $p < .01$). There were two statistically significant pathways from the PHQ-8 at six months to: the PCS (0.249, $p < .05$; 0.249, $p < .05$) and the PHQ-8(0.382, $p < .001$; 0.382, $p < .001$) at 12 months. The remainder of the pathways to and from the PHQ-8 were not statistically significant in either model.

Table 31. Standardized Maximum Likelihood Estimates for Resilience Latent Variable Model and Resilience Total Score Model-Depression Symptoms (PHQ-8 Total Score)

Parameter	**Latent Variable Standardized**	**Latent Variable SE**	**Total Score Standardized**	**Total Score SE**
Resilience→PHQB	-0.424***	0.051	-0.409***	0.048
Age→PHQB	-0.028	0.053	-0.021	0.053
Gender→PHQB	-0.024	-0.024	-0.023	0.053
MCSB↔PHQB	-0.477***	0.045	-0.483***	0.044
PCSB↔PHQB	-0.213***	0.056	-0.224***	0.054
Gender→PHQ3	0.098	0.057	0.097	0.057
PCSB→PHQ3	-0.083	0.065	-0.079	0.065
MCSB→PHQ3	-0.084	0.072	-0.081	0.072
MCS3↔PHQ3	-0.720***	0.033	-0.719***	0.033
PCS3↔PHQ3	-0.263***	0.064	-0.266***	0.064
Resilience→PHQ6	0.067	0.060	0.057	0.054
Age→PHQ6	-0.096*	0.049	-0.096*	0.049
Gender→PHQ6	-0.005	0.048	-0.006	0.048
PCSB→PHQ6	-0.069	0.053	-0.065	0.053
MCSB→PHQ6	-0.037	0.061	0.034	0.061
PCS3→PHQ6	-0.041	0.053	-0.042	0.052
MCS3→PHQ6	-0.126	0.080	-0.124	0.080
MCS6↔PHQ6	-0.617***	0.047	-0.618***	0.047
PCS6↔PHQ6	-0.243**	0.073	-0.242**	0.073
Resilience→PHQ12	-0.029	0.059	-0.036	.053
Age→PHQ12	-0.047	0.049	-0.047	0.049
Gender→PHQ12	0.042	0.045	0.043	0.045
PCSB→PHQ12	-0.096	0.053	-0.097	0.053
MCSB→PHQ12	-0.127*	0.064	-0.127*	0.064

Table 31. Continued

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
PCS3→PHQ12	0.036	0.066	0.034	0.066
MCS3→PHQ12	0.097	0.082	0.097	0.082
PCS6→PHQ12	-0.168*	0.073	-0.168*	0.074
MCS6→PHQ12	-0.203	0.108	-0.202	0.108
MCS12↔PHQ12	-0.530***	0.069	-0.530***	0.069
PCS12↔PHQ12	-0.096	0.099	-0.095	0.099
PHQB→PCS3	-0.194*	0.082	-0.189*	0.082
PHQB→MCS3	-0.347***	0.073	-0.348***	0.073
PHQB→PHQ3	0.465***	0.069	0.463***	0.068
PHQB→PCS6	-0.164*	0.076	-0.167*	0.076
PHQB→MCS6	-0.116	0.067	-0.113	0.066
PHQB→PHQ6	0.220**	0.065	0.218**	0.001
PHQB→PCS12	-0.045	0.080	-0.044	0.079
PHQB→MCS12	0.089	0.092	0.087	0.092
PHQB→PHQ12	-0.106	0.064	-0.108	0.064
PHQ3→PCS6	0.051	0.097	0.054	0.096
PHQ3→MCS6	-0.459***	0.081	-0.461***	0.081
PHQ3→PHQ6	0.510***	0.082	0.513***	0.082
PHQ3→PCS12	0.048	0.096	0.049	0.096
PHQ3→MCS12	-0.170	0.118	-0.170	0.117
PHQ3→PHQ12	0.285**	0.100	0.287**	0.100
PHQ6→PCS12	0.249*	0.113	0.249*	0.113
PHQ6→MCS12	-0.110	0.135	-0.107	0.135
PHQ6→PHQ12	0.382***	0.104	0.382***	0.104

Note: Latent Variable = Latent Resilience Variable (CD-RISC 10 Items Loaded) Longitudinal Model; Total Score = Resilience (CD-RISC 10 Total Score) Longitudinal Model; Age = Age at Admission; Gender = Identified Gender (coded as male and female); PCSB = VR-12 Physical Health Composite Score at Baseline; MCSB = VR-12 Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-12 Physical Health Composite Score at three months; MCS3 = VR-12 Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-12 Physical Health Composite Score at six months; MCS6 = VR-12 Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-12 Physical Health Composite Score at 12 months; MCS12 = VR-

RAND Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

The results in both models were similar. Both models indicate that depression was the most consistent predictor of HRQoL and depression. Depression at any point in time was significantly associated with next assessment of depression, with varying magnitudes. Additionally, depression predicted subsequent depression to the following two timepoints at all measurement occasions (e.g., depression at baseline predicted depression at three and six months). Higher endorsement of depression at previous measurement occasions was significantly associated with higher depression at later assessments. These results also indicate that higher depression was significantly associated with lower mental HRQoL at directly subsequent assessments over the year (with the exception of mental HRQoL at the 12th month). The results of both models also indicate that same-time point depression and mental HRQoL had significant associations with each other at every measurement occasion. Both models also indicate that physical HRQoL and depression had a reciprocating relationship at every assessment period except at 12 months. Higher depression at baseline, in both models, was significantly associated with lower physical HRQoL at three and six months. These data also suggest that higher depression at six months was significantly associated with higher physical HRQoL at 12 months. Depression at baseline was not significantly associated with mental HRQoL at six months and physical and mental HRQoL and depression at 12 months. Additionally, depression at three months was not significantly

associated with physical HRQoL at six months and physical and mental HRQoL at 12 months. Depression at six months was also not significantly associated with mental HRQoL at 12 months.

Same-timepoint depression and physical HRQoL appear to have a significant bidirectional association in both models, with the exception of the 12th month measurement occasion. Same-timepoint depression and mental HRQoL appears to have a significant bidirectional association at every timepoint. Additionally, same-timepoint physical and mental HRQoL appears to have a significant bidirectional relationship at 12 months.

Mental Health Composite Score. Table 32 shows the standardized pathway estimates for variables that had one-directional pathways to and from the MCS at respective timepoints in both models (also see Table 27 and Figure 4). There were 12 total statistically significant one-directional pathways regarding the MCS at respective timepoints. Resilience was one statistically significant pathway to the baseline MCS (0.402, $p < .001$; 0.393, $p < .001$). The PHQ-8 at baseline was statistically significant with the MCS at three months (-0.347, $p < .001$; -0.348, $p < .001$). There was one statistically significant pathway from the PHQ-8 at six months to the MCS at three months (-0.459, $p < .001$; -0.458, $p < .001$).

Eight of the 12 statistically significant one-directional pathways were pathways from the MCS to the mental and physical HRQoL and depression variables at respective time points or same timepoint MCS-HRQoL or MCS-depression variable bidirectional pathways. There were five statistically significant pathways regarding the MCS at

baseline: the baseline bidirectional MCS-PHQ-8 pathways (-0.477, $p < .001$; -0.483, $p < .001$), the baseline MCS to the three month MCS (0.147, $p < .05$; 0.147, $p < .05$), the baseline MCS to the MCS at six months (0.155, $p < .05$; 0.152, $p < .05$), the baseline MCS to the PCS at 12 months (-0.142, $p < .05$; -0.143, $p < .05$), and the baseline MCS to the PHQ-8 at 12 months (-0.127, $p < .05$; -0.127, $p < .05$). There were three statistically significant pathways regarding the MCS at three months: the three month bidirectional MCS-PHQ-8 pathways (-0.720, $p < .001$; -0.719, $p < .001$), the three month MCS to the PCS at six months (0.308, $p < .01$; 0.310, $p < .001$), and the three month MCS to the MCS at 12 months (0.222, $p < .05$; 0.222, $p < .05$).

There were two statistically significant one-directional pathways regarding the six month MCS: the six month MCS to PCS at 12 month pathway (0.407, $p < .001$; 0.407, $p < .001$), and the six month MCS to the 12 month MCS pathway (0.374, $p < .01$; 0.376, $p < .01$). The remainder of the pathways to and from the MCS were not statistically significant in either model.

Table 32. Standardized Maximum Likelihood Estimates Resilience Latent Variable Model and Resilience Total Score Model-VR-12 Mental Health Composite Scores

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
Resilience→MCSB	0.402***	0.052	0.393***	0.049
Age→MCSB	-0.003	0.055	-0.010	0.054
Gender→MCSB	-0.003	0.054	-0.004	0.054
Resilience→MCS3	0.021	0.072	0.022	0.066
Age→MCS3	0.038	0.063	0.038	0.064
Gender→MCS3	-0.031	0.059	-0.031	0.059

Table 32. Continued

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
PCSB→MCS3	0.051	0.066	0.052	0.066
PHQB→MCS3	-0.347***	0.073	-0.348***	0.073
Resilience→MCS6	-0.020	0.059	-0.010	0.054
Age→MCS6	0.091	0.049	0.091	0.049
Gender→MCS6	0.023	0.047	0.023	0.047
PCSB→MCS6	0.065	0.053	0.063	0.053
PHQB→MCS6	-0.116	0.067	-0.113	0.066
PCS3→MCS6	0.044	0.051	0.044	0.051
PHQ3→MCS6	-0.459***	0.081	-0.461***	0.081
Resilience→MCS12	0.047	0.078	0.042	0.071
Age→MCS12	-0.005	0.060	-0.005	0.060
Gender→MCS12	-0.051	0.055	-0.052	0.055
PCSB→MCS12	-0.032	0.061	-0.030	0.061
PHQB→MCS12	0.089	0.092	0.087	0.092
PCS3→MCS12	0.020	0.080	0.019	0.079
PHQ3→MCS12	-0.170	0.118	-0.170	0.117
PCS6→MCS12	-0.003	0.094	-0.001	0.094
PHQ6→MCS12	-0.110	0.135	-0.107	0.135
MCSB→MCS3	0.147*	0.074	0.147*	0.073
MCSB→PHQ3	-0.084	0.072	-0.081	0.072
MCSB→PCS6	-0.084	0.068	-0.080	0.067
MCSB→MCS6	0.155**	0. 0.061	0.152*	0.060
MCSB→PHQ6	-0.037	0.061	0.034	0.061
MCSB→PCS12	-0.142*	0.064	-0.143*	0.064
MCSB→MCS12	0.104	0.075	0.106	0.074
MCSB→PHQ12	-0.127*	0.064	-0.127*	0.064
MCS3→PCS6	0.308**	0.089	0.310***	0.089
MCS3→MCS6	0.198*	0.078	0.197*	0.078
MCS3→PHQ6	-0.126	0.080	-0.124	0.080
MCS3→PCS12	-0.016	0.087	-0.016	0.087
MCS3→MCS12	0.222*	0.105	0.222*	0.105
MCS3→PHQ12	0.097	0.082	0.097	0.082

MCS6→PCS12	0.407***	0.115	0.407***	0.115
MCS6→MCS12	0.374**	0.139	0.376**	0.139
MCS6→PHQ12	-0.203	0.108	-0.202	0.108

Note: Latent Variable = Latent Resilience Variable (CD-RISC 10 Items Loaded) Longitudinal Model; Total Score = Resilience (CD-RISC 10 Total Score) Longitudinal Model; Age = Age at Admission; Gender = Identified Gender (coded as male and female); PCSB = VR-RAND Physical Health Composite Score at Baseline; MCSB = VR-RAND Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-RAND Physical Health Composite Score at three months; MCS3 = VR-RAND Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-RAND Physical Health Composite Score at six months; MCS6 = VR-RAND Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-RAND Physical Health Composite Score at 12 months; MCS12 = VR-RAND Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

Results were similar in both models. Mental HRQoL from directly prior to subsequent timepoints was a predictor of mental HRQoL throughout the 12 month period of both models. The results of both models also indicate that mental HRQoL at prior assessments was predictive of mental HRQoL at the next two time points. Higher mental HRQoL was significantly associated with higher mental HRQoL over time; however, baseline mental HRQoL was not significantly associated with mental HRQoL at 12 months. The results in both models also demonstrated that mental HRQoL at baseline is associated with lower ratings of depression and lower physical HRQoL at the 12 month timepoint. Higher mental HRQoL at three months was significantly associated with higher physical HRQoL at six months. Additionally, higher mental HRQoL at six months was significantly associated with higher physical HRQoL at 12 months. Same-timepoint mental HRQoL had a significant bidirectional association with depression at

every timepoint except at 12 months. Same-timepoint mental HRQoL only had a significant bidirectional association with physical HRQoL at 12 months.

Mental HRQoL at baseline was not significantly associated with physical HRQoL and depression at three months, physical HRQoL and depression at six months, and mental HRQoL at 12 months. Additionally, mental HRQoL at three months was not significantly associated with depression at six months, physical HRQoL and depression at 12 months. Mental HRQoL at six months was also not significantly associated with depression at 12 months.

Physical Health Composite Score. Table 33 shows the standardized pathway estimates for variables that had one-directional or bidirectional pathways with the PCS at respective timepoints in both models (also see Table 27 and Figure 4). There were 18 total statistically significant one-directional and bidirectional pathways regarding the PCS at respective timepoints. There was a total of nine statistically significant one-directional pathways from other variables to the PCS at various timepoints. Resilience had two statistically significant pathways to the PCS: resilience to the baseline PCS (0.189, $p < .01$; 0.168, $p < .01$) and resilience to the three month PCS (-0.212, $p < .01$; -0.192, $p < .01$). The age to the baseline PCS pathway was also statistically significant (-0.377, $p < .001$; -0.379, $p < .001$). There were two statistically significant pathways from the baseline PHQ-8 to the three month PCS (-0.194, $p < .05$; -0.189, $p < .05$) and the six month PCS (-0.164, $p < .05$; -0.167, $p < .05$). There was one statistically significant pathway from the PHQ-* at six months to the PCs at 12 months (0.249, $p < .05$; 0.249, $p < .05$). The three month MC3 to the six month PCS accounted for another

statistically significant pathway (0.308, $p < .01$; 0.310, $p < .001$). The baseline MCS to the 12 month PCS pathway was a statistically significant pathway (-0.142, $p < .05$; -0.143, $p < .05$). The six month MCS to the 12 month PCS pathway was statistically significant (0.407, $p < .001$; 0.407, $p < .001$).

Five of the 18 statistically significant pathways were pathways from the PCS to the PCS or depression variables at respective timepoints. There were two statistically significant pathways from the baseline PCS: the baseline PCS to the three month PCS (0.215, $p < .01$; 0.209, $p < .01$), and the baseline PCS to the 12 month PCS (0.180, $p < .01$; 0.181, $p < .01$). There was one statistically significant pathway from the three month PCS: the three month PCS to the six month PCS (0.546, $p < .001$; 0.544, $p < .001$). There were two statistically significant pathways from the six month PCS: the six month PCS to the 12 month PCS pathway (0.739, $p < .001$; 0.740, $p < .001$) and the six month PCS to 12 month PHQ-8 pathway (-0.168, $p < .05$; -0.168, $p < .05$).

Four of the 18 statistically significant PCS pathways were bidirectional: the baseline PCS-PHQ pathway (-0.213, $p < .001$; -0.224, $p < .001$), the three month PCS-PHQ pathway (-0.263, $p < .001$; -0.266, $p < .001$), the six month PCS-PHQ pathway (-0.243, $p < .01$; -0.242, $p < .01$), and the 12 month MCS-PCS pathway (-0.233, $p < .05$; -0.233, $p < .05$). The remainder of the pathways regarding the PCS were not statistically significant in either model.

Table 33. Standardized Maximum Likelihood Estimates for Resilience Latent Variable Model and Resilience Total Score Model-VR-12 Physical Health Composite Scores

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
Resilience→PCSB	0.189**	0.054	0.168**	0.051
Age→PCSB	-0.377***	0.049	-0.379***	0.049
Gender→PCSB	0.091	0.091	0.091	0.053
MCSB↔PCSB	0.035	0.058	0.047	0.057
PCSB↔PHQB	-0.213***	0.056	-0.224***	0.054
Resilience→PCS3	-0.212**	0.077	-0.192**	0.007
Age→PCS3	0.049	0.069	0.050	0.069
Gender→PCS3	0.088	0.064	0.089	0.064
MCSB→PCS3	-0.126	0.080	-0.133	0.080
PHQB→PCS3	-0.194*	0.082	-0.189*	0.082
MCS3↔PCS3	0.072	0.069	0.071	0.068
PCS3↔PHQ3	-0.263***	0.064	-0.266***	0.064
Resilience→PCS6	0.073	0.066	0.063	0.060
Age→PCS6	0.074	0.055	-0.074	0.055
Gender→PCS6	-0.027	0.053	-0.028	0.053
MCSB→PCS6	-0.084	0.068	-0.080	0.067
PHQB→PCS6	-0.164*	0.076	-0.167*	0.076
MCS3→PCS6	0.308**	0.089	0.310***	0.089
PHQ3→PCS6	0.051	0.097	0.054	0.096
MCS6↔PCS6	0.061	0.076	0.060	0.076
PCS6↔PHQ6	-0.243**	0.073	-0.242**	0.073
Resilience→PCS12	0.012	0.068	0.013	0.062
Age→PCS12	0.016	0.051	0.016	0.051
Gender→PCS12	-0.090	0.048	-0.090	0.048
MCSB→PCS12	-0.142*	0.064	-0.143*	0.064
PHQB→PCS12	-0.045	0.080	-0.044	0.079
MCS3→PCS12	-0.016	0.087	-0.016	0.087
PHQ3→PCS12	0.048	0.096	0.049	0.096
MCS6→PCS12	0.407***	0.115	0.407***	0.115
PHQ6→PCS12	0.249*	0.113	0.249*	0.113
MCS12↔PCS12	-0.233*	0.091	-0.233*	0.091
PCS12↔PHQ12	-0.096	0.099	-0.095	0.099
PCSB→PCS3	0.215**	0.070	0.209**	0.070

Table 33. Continued

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
PCSB→MCS3	0.051	0.066	0.052	0.066
PCSB→PHQ3	-0.083	0.065	-0.079	0.065
PCSB→PCS6	0.108	0.059	0.111	0.059
PCSB→MCS6	0.065	0.053	0.063	0.053
PCSB→PHQ6	-0.069	0.053	-0.065	0.053
PCSB→PCS12	0.180**	0.053	0.181**	0.053
PCSB→MCS12	-0.032	0.061	-0.030	0.061
PCSB→PHQ12	-0.096	0.053	-0.097	0.053
MCSB↔PCSB	0.035	0.058	0.047	0.057
PCSB↔PHQB	-0.213***	0.056	-0.224***	0.054
PCS3→PCS6	0.546***	0.053	0.544***	0.053
PCS3→MCS6	0.044	0.051	0.044	0.051
PCS3→PHQ6	-0.041	0.053	-0.042	0.052
PCS3→PCS12	0.038	0.064	0.038	0.063
PCS3→MCS12	0.020	0.080	0.019	0.079
PCS3→PHQ12	0.036	0.066	0.034	0.066
MCS3↔PCS3	0.072	0.069	0.071	0.068
PCS3↔PHQ3	-0.263***	0.064	-0.266***	0.064
PCS6→PCS12	0.739***	0.063	0.740***	0.062
PCS6→MCS12	-0.003	0.094	-0.001	0.094
PCS6→PHQ12	-0.168*	0.073	-0.168*	0.074
MCS6↔PCS6	0.061	0.076	0.060	0.076
PCS6↔PHQ6	-0.243**	0.073	-0.242**	0.073
MCS12↔PCS12	-0.233*	0.091	-0.233*	0.091
PCS12↔PHQ12	-0.096	0.099	-0.095	0.099

Note: Latent Variable = Latent Resilience Variable (CD-RISC 10 Items Loaded) Longitudinal Model; Total Score = Resilience (CD-RISC 10 Total Score) Longitudinal Model; Age = Age at Admission; Gender = Identified Gender (coded as male and female); PCSB = VR-RAND Physical Health Composite Score at Baseline; MCSB = VR-RAND Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-RAND Physical Health Composite Score at three months; MCS3 = VR-RAND Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-RAND Physical Health Composite Score at six months; MCS6 = VR-RAND Mental Health Composite Score at six months; PHQ6 =

PHQ-8 Total Score at six months; PCS12 = VR-RAND Physical Health Composite Score at 12 months; MCS12 = VR-RAND Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

The results of both models indicate that physical HRQoL from a directly previous timepoint was predictive of subsequent assessments of physical HRQoL. Higher physical HRQoL at directly previous timepoints were significantly associated with higher physical HRQoL at directly subsequent measurement occasions. Notably, physical HRQoL at the 6th month was the largest predictor of physical HRQoL at 12 months. Physical HRQoL had significant bidirectional associations with depression at baseline and three and six months as well as with mental HRQoL at 12 months. Physical HRQoL did not significantly predict other HRQoL and depression outcomes at other timepoints nor did it have a significant bidirectional association with depression at 12 months and mental HRQoL at baseline, three, and six months.

HRQoL and Depression Bidirectional Pathways. Table 34 shows the maximum likelihood estimates for the bidirectional pathways at each respective timepoint (e.g., baseline MCS, PCS, and PHQ-8; also see Table 17 for the full model). There were eight total statistically significant bidirectional pathways. The PHQ-8 accounted for seven of the bidirectional pathways with all the MCSs and PCSs at each timepoint except for the PCS at 12 months. The MCS and PCS bidirectional pathway accounted for one of the eight statistically significant pathways.

Table 34. HRQoL Bidirectional Standardized Maximum Likelihood Estimates for Resilience Latent Variable Model and Resilience Total Score Model

Parameter	Latent Variable Standardized	Latent Variable SE	Total Score Standardized	Total Score SE
MCSB↔PCSB	0.035	0.058	0.047	0.057
MCSB↔PHQB	-0.477***	0.045	-0.483***	0.044
PCSB↔PHQB	-0.213***	0.056	-0.224***	0.054
MCS3↔PCS3	0.072	0.069	0.071	0.068
MCS3↔PHQ3	-0.720***	0.033	-0.719***	0.033
PCS3↔PHQ3	-0.263***	0.064	-0.266***	0.064
MCS6↔PCS6	0.061	0.076	0.060	0.076
MCS6↔PHQ6	-0.617***	0.047	-0.618***	0.047
PCS6↔PHQ6	-0.243**	0.073	-0.242**	0.073
MCS12↔PCS12	-0.233*	0.091	-0.233*	0.091
MCS12↔PHQ12	-0.530***	0.069	-0.530***	0.069
PCS12↔PHQ12	-0.096	0.099	-0.095	0.099

Note. PCSB = VR-RAND Physical Health Composite Score at Baseline; MCSB = VR-RAND Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-RAND Physical Health Composite Score at three months; MCS3 = VR-RAND Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-RAND Physical Health Composite Score at six months; MCS6 = VR-RAND Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-RAND Physical Health Composite Score at 12 months; MCS12 = VR-RAND Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months; *$p < .05$; **$p < .01$, ***$p < .001$.

There were seven statistically significant bidirectional pathways with the PHQ-8: the baseline MCS-PHQ-8 pathway (-0.477, $p < .001$; -0.483, $p < .001$), the baseline PCS-PHQ-8 pathway (-0.213, $p < .001$; -0.244 $p < .001$), the three month MCS-PHQ-8 pathway (-0.720, $p < .001$; -0.719, $p < .001$), the three month PCS-PHQ-8 pathway (-0.263, $p < .001$; -0.263 $p < .001$), the six month MCS-PHQ-8 pathway (-0.617, $p < .001$; -0.618, $p < .001$), the six month PCS-PHQ-8 pathway (-0.243, $p < .01$; -0.242 $p < .01$), and the 12 month MCS-PHQ-8 pathway (-0.530, $p < .001$; -0.530, $p < .001$). The

remainder of the bidirectional pathways with the PHQ-8 were not statistically significant in either model.

There were four statistically significant same-timepoint bidirectional pathways with the MCS: the baseline MCS-PHQ-8 pathway (-0.477, $p < .001$; -0.483, $p < .001$), the three month MCS-PHQ pathway (-0.720, $p < .001$; -0.719, $p < .001$), the six month MCS-PHQ-8 pathway (0.617, $p < .001$; 0.617, $p < .001$), and the 12 month MCS-PCS pathway (-0.233, $p < .05$; - 0.233, $p < .05$). The remainder of the pathways regarding the MCS were not statistically significant in either model.

There were four statistically significant bidirectional pathways with the PCS: the baseline PCS-PHQ-8 pathway (-0.213, $p < .001$; -0.224, $p < .001$), the three month PCS-PHQ-8 pathway (-0.263, $p < .001$; -0.266, $p < .001$), the six-month PCS-PHQ pathway (-0.243, $p < .01$; -0.242, $p < .01$), and the 12 month MCS-PCS pathway (-0.233, $p < .05$; -0.233, $p < .05$). The remainder of the bidirectional pathways with the PCS were not statistically significant in either model.

Both models indicate that same timepoint depression and mental HRQoL had a significant bidirectional association at every measurement occasion. Additionally, physical HRQoL and depression at the same timepoint appears to have a significant bidirectional association at every measurement occasion except at 12 months. Physical HRQoL did not have a significant bidirectional association with mental HRQoL at every measurement occasion except at 12 months.

Model Variance Comparison

Table 35 shows the comparison of the standardized variance and residual variance estimates for both models. The CD-RISC 10 one-10 items' variance values were only in the Resilience Latent Variable Model as the items were used to create the latent variable. Consequently, those values are not in the included in the table. The variance and residual variance estimates had similar estimates for both models. The variances and residual variances for the variables were within acceptable ranges in both models. The baseline depression and HRQoL variables had the highest variance compared to other timepoints. The variance in both models reduced at future timepoints, which may be due to the increasing number of variables explaining variables at later timepoints. There were no major differences noticed in either model (also see Table 15 and Table 25).

Table 35. Comparison of Standardized Variances/Residual Variances for Resilience Latent Variable Model and Resilience Total Score Model

Variable	Latent Variable Standardized	SE	Total Score Standardized	SE
PCSB	0.801	0.041	0.804	0.041
MCSB	0.838	0.042	0.845	0.038
PHQB	0.819	0.043	0.830	0.039
PCS3	0.891	0.040	0.899	0.037
MCS3	0.776	0.049	0.777	0.049
PHQ3	0.746	0.050	0.749	0.049
PCS6	0.481	0.054	0.481	0.054
MCS6	0.379	0.044	0.380	0.044
PHQ6	0.391	0.045	0.393	0.045
PCS12	0.235	0.038	0.236	0.039
MCS12	0.360	0.051	0.361	0.051
PHQ12	0.293	0.039	0.294	0.039

Note: Resilience = Resilience Latent Variable (CD-RISC 10 Items 1-10) or Resilience (CD-RISC 10 Total Score); Latent Variable = Resilience Latent Variable Model; Total Score = Resilience Total Score Model; CD1-10 = CD-RISC 10 items by number; Age = Age at Admission; Gender = Identified Gender (coded as male and female); PCSB = VR-RAND Physical Health Composite Score at Baseline; MCSB = VR-RAND Mental Health Composite Score at Baseline; PHQB = PHQ-8 Total Score at Baseline; PCS3 = VR-RAND Physical Health Composite Score at three months; MCS3 = VR-RAND Mental Health Composite Score at three months; PHQ3 = PHQ-8 Total Score at three months; PCS6 = VR-RAND Physical Health Composite Score at six months; MCS6 = VR-RAND Mental Health Composite Score at six months; PHQ6 = PHQ-8 Total Score at six months; PCS12 = VR-RAND Physical Health Composite Score at 12 months; MCS12 = VR-RAND Mental Health Composite Score at 12 months; PHQ12 = PHQ-8 Total Score at 12 months.

CHAPTER V

SUMMARY AND CONCLUSIONS

This chapter will review of the major findings of this study, a discussion of their relevance in the context of existing literature, and, then the theoretical and practical implications. The end of this chapter will close by addressing the limitations of this work and directions for future research.

There is a limited number of longitudinal studies investigating resilience as a predictor of HRQoL after a traumatic event. Additionally, there is a relative dearth of longitudinal research concerning individuals discharged from Level 1 trauma centers. The current study may be one of the few to examine resilience, as measured by the CD-RISC 10, as a predictor of HRQoL over the first year post-discharge from a Level 1 trauma unit, while accounting for the potential associations with age and gender. The present study may also be one of the first to examine two models of resilience – one conceptualizing it as a latent variable, and the other relying on a total score as a single indicator – to predict HRQoL over time.

This present study had several goals. One goal was to examine the ability of self-reported resilience – assessed by the CD-RISC 10 – to predict HRQoL and depression reported by traumatic injury survivors at baseline and over time. Another was to examine whether a model utilizing the individual CD-RISC 10 items loading onto a latent variable or a model using the CD-RISC 10 total score would explain the data better. An additional aim was to examine whether the models could significantly predict longitudinal HRQoL and depression outcomes. The models also examined the

relationship of resilience to HRQoL and depression, taking into account participant age and gender.

Premorbid Diagnosis

The number of participants with moderate and severe depressive symptoms on the PHQ-8 was highest at three months (n = 53) and lowest at six months (n = 24). The mean scores at each time point was within the mild depressive symptom range with a standard deviation that was larger by 0.52 to 1.31 standard deviations than what was found by Kroenke et al. (2009; *SD* = 5.52). Information about the presence of depression and distress prior to the injury was not available in this study, nor was pre-injury information about HRQoL. However, these factors can be negatively associated with HRQoL after admission (McGiffin, et al. 2016). For example, previous mental health (e.g., other depressive disorders, other anxiety disorders, other trauma/stressor-related disorders) and medical diagnoses (e.g., traumatic brain injury, cancer, heart-related problems), perceived level of family support, and perceived discrimination regarding providers can impact HRQoL outcomes. Although this is difficult information to obtain, previous mental health-related data (e.g., prior mental and physical health diagnoses) may be critical to understanding the potential effects of pre-existing factors to resilience and adjustment following traumatic injury.

Timepoint Models

The model fit data for both models, the Resilience Latent Variable (CD-RISC 10 items loaded onto a latent variable) Model and the Resilience Total Score (CD-RISC 10 total score) Model, indicated that both models were a good fit to the data (see Tables 5,

16, and 26). The Resilience Total Score Model's (using the CD-RISC 10 total score) fit indices were likely affected by the saturation of the model, making it appear to have a "perfect" fit. It is difficult to compare the models as one was saturated, the Resilience Total Score Model, and one was not, the Resilience Latent Variable Model. The estimates for both models were very similar (see Tables 7, 17, and 27), and variances and residual variances were within acceptable ranges (see Tables 15, 25, and 35). Resilience, as measured by the CD-RISC 10, was the strongest exogenous variable predictor with four statistically significant pathways to all the baseline HRQoL and depression variables as well as to physical HRQoL at three months (see Table 27 and Figures 1 and 3). In contrast, age was only significantly predictive of physical HRQoL at baseline and depression at six months. Gender did not produce any statistically significant pathways within either model. Resilience, as measured by the CD-RISC 10, did not predict HRQoL and depression at all time points. HRQoL and depression were better predictors of future HRQoL and depression. Depression was particularly influential, predicting HRQoL and depression outcomes at subsequent measurement occasions (see Table 27 and Figures 2 and 4).

Theoretical and Methodological Considerations

Resiliency

Self-reported resilience (as measured by the CD-RISC 10) in both models had four statistically significant paths. Higher levels of resilience were associated with higher mental and physical HRQoL and lower depression at baseline and lower physical HRQoL at three months. Both models indicate that resilience, as measured by the CD-

RISC 10, predicts better mental and physical HRQoL and lower depression symptomology in a cross-sectional analysis. These associations may reflect theoretical properties that are presumed to be associated with resilience, generally, that may facilitate recovery from physical traumas.

The CD-RISC 10 was a predictor of HRQoL at baseline as seen in other studies (Galli & Gonzalez, 2015; Gucciardi et al., 2011; Walsh et al., 2016). Additionally, resilience, as measured by the CD-RISC 10 was able to predict physical HRQoL at three months at a statistically significant level. However, the CD-RISC 10 in both models was not able to predict, at a statistically significant level, mental HRQoL and depression at three months or HRQoL and depression at other timepoints. This finding seems to indicate that the measure has features that compromise its relationship with outcomes over time. The CD-RISC 10 may measure state resilience that reflects positive mood versus trait resilience that would account for proactive behavior (Farkas & Orosz, 2015).

It should also be noted that there may be additional influences on responses to the CD-RISC 10. For example, individuals may wish to represent themselves in a better light to assuage worries from family members or cover shame or guilt associated with their injury. This may reflect a socially desirable response set. Certain clinical issues may also occur. Numbing and avoidance are common reactions to traumatic events. These reactions may leave individuals unwilling to answer in an accurate manner due emotions or thoughts that they are not prepared to experience immediately after the trauma. The experience of negative emotions may have particular impact on the CD-RISC 10 if it is a measure of state resilience, which would reflect one's degree of

positive mood versus their ability to bounce back from a traumatic experience. Individuals may also inaccurately blame themselves for the traumatic event, that can result in a negative report of one's sense of resilience.

Age as a Predictor

Older age was associated with lower physical HRQoL at baseline and lower depressive symptoms at six months. Age in both models had two statistically significant negatively correlated pathways; age to physical HRQoL at baseline and age to depression at six months. The age to physical HRQoL had the largest estimate of the two statistically significant pathways. This indicated that age had a notable association with physical HRQoL at baseline. However, the results of this study indicated that age was not significantly associated with other HRQoL or depression outcomes at other timepoints. The association between older age and lower depressive symptomology at six months is similar to research that posits that older individuals may be more present-oriented, in relation to necessary tasks to achieve treatment goals, which impacts mental and physical health (Lo¨ckenhoff & Carstensen, 2004; Terrill et al., 2014), but this interpretation is attenuated by the lack of other significant paths from age to other outcomes, and by unmeasured issues that may have occurred over time with participant attrition.

Gender as a Predictor

Gender did not significantly predict HRQoL and depression at any timepoint. Individuals that identified as female had significantly lower physical HRQoL at baseline, consistent with existing work that finds women experience worse HRQoL outcomes

after trauma (Holbrook & Hoyt, 2004). Yet the inability of gender to prospectively predict any HRQoL outcome raises concerns about its value in understanding adjustment following traumatic injury. Although gender is often considered a clinically important variable in trauma research, there are other data suggesting that gender has a minimal role in explaining HRQoL outcomes (Frans, Rimmo, Aberg, & Fredrickson, 2005; Hetzel-Riggen & Robby, 2013).

Depression as a Predictor

Depression emerged as the most consistent predictor of HRQoL outcomes overtime. Depression at prior timepoints also was significantly predicted depression overtime with varying magnitudes. The results of the study indicate that depression at a prior time point predicted depression at the next two assessment periods throughout the course of this study. Higher depression scores were significantly associated with depression observed over time. Additionally, higher depression scores were significantly associated with lower mental HRQoL observed overtime with the exception of mental HRQoL at 12 months. Higher depression scores at baseline also predicted lower physical HRQoL at three and six months. This study also suggested that depression at six months was associated with higher physical HRQoL at 12 months. The results of the study suggested that depression is highly influential with health outcomes.

Higher depression at baseline, in both models, was significantly associated with lower physical HRQoL at three and six months. These data also suggest that higher depression at six months was significantly associated with higher physical HRQoL at 12 months. The results of both models also indicate that same-time point depression and

mental HRQoL have a significant association throughout the year of this study. Same timepoint physical HRQoL and depression also appear to have a significant association at every assessment period with the exception of the 12th month timepoint. Additionally, physical and mental HRQoL appears to have a significant association at 12 months. This may be due to the overlap in questions that relate to physical and somatic (e.g., fatigue, difficulty sleeping, and staying asleep) and emotional (e.g., feelings of depression, hopelessness, and difficulties concentrating) experiences of depression assessed by both instruments. However, it may be more parsimonious to conclude that depression has a detrimental effect on quality of life, generally, and the two concepts have a tautological relationship that becomes apparent in self-report measures.

Physical HRQoL as a Predictor

This study indicated that higher physical HRQoL was a significant predictor of higher physical HRQoL at subsequent measurement occasions. There was a general pattern of physical HRQoL estimates becoming larger as it was predicted by immediately prior timepoints overtime. Physical HRQoL was only significantly associated with depression at the 6th month assessment, in which higher physical HRQoL was significantly associated with lower depression. This finding may have been influenced by participant attrition, and it is possible that this reflects a chance occurrence. The results of the study suggest that physical HRQoL at prior timepoints is influential on future physical HRQoL outcomes. In general, it seems prudent to observe, although individual characteristics may affect HRQoL, self-reports of physical HRQoL may remain stable for some time following a traumatic injury.

Mental HRQoL as a Predictor

Higher rates of mental HRQoL were generally significantly associated with higher mental HRQoL over time. The results of this study indicate that prior mental HRQoL predicted mental HRQoL at the following two assessment periods throughout the year. Baseline mental HRQoL did not predict mental HRQoL at 12 months. Higher mental HRQoL at baseline was significantly associated with lower depression and lower physical HRQoL at 12 months. Lower mental HRQoL is often associated with lower physical HRQoL (e.g., inability or difficulties returning to work, fatigue, and higher endorsement of pain; Bourgeois et al., 2005; Lee et al. 1998; Pittman et al., 2011). As such, the results noticed in the 12th month of the study regarding higher mental health at baseline predicting lower physical HRQoL may be affected by the pronounced attrition noticed at the 12th month assessment.

In the current study pathway estimates were larger the closer the mental HRQoL was assessed to a subsequent mental HRQoL. The results of the study suggest that prior mental HRQoL is influential on mental HRQoL overtime.

SEM Limitations

A limitation of this study is that SEM is influenced by sample size. The 52% attrition rate noticed at the 12th measurement occasion may have adversely influenced the models. For example, both models appeared to have "statistical noise" problems (e.g., the baseline mental HRQoL being correlated with lower physical HRQoL at 12 months) that cannot be explained by theory or the literature. SEM, as any statistical analysis, is only able to create models based off the measures and variables utilized, and

the results are contingent upon the quality of these measures and the factors that may affect the quality of the responses to them.

Clinical implications

This study indicated that resilience, as measured by the CD-RISC 10, is positively associated with HRQoL outcomes at baseline and physical HRQoL at three months. Theoretical perspectives maintain that resilient individuals will find adaptive ways to cope. These results support that position. However, the significant relationships reflect cross-sectional relationships, and self-reported resilience did not significantly predict any other outcome variable over time. Theoretically, resilience should be inversely related to depression over time, but in both models this presumed association did not occur. As mentioned earlier, this may be due to the CD-RISC 10 possibly measuring state resilience that reflects positive mood versus trait resilience that would reflect proactive behavior (Farkas & Orosz, 2015). In the context of several other and clinically relevant variables, self-reported resilience did not demonstrate meaningful prospective relationships with important HRQoL outcomes, with the one exception that occurred with physical HRQoL at the 3rd month.

In contrast, depression was highly correlated with subsequent HRQoL and depression. This finding has several implications. It is apparently quite important to assess depression in the Level 1 trauma setting, as it appears to have considerable value in anticipating quality of life and emotional adjustment post-discharge. Individuals who are depressed in the acute trauma care setting may benefit from brief interventions that may be provided to those who consent (e.g., motivational interviewing, cognitive

behavioral therapy). Patient and family education may also include recommendations and referrals for mental health services that may be obtained in the community post-discharge. Patient and family education during hospitalization may also emphasize coping with distress. Clinical interventions provided in outpatient clinics and follow-up visits may facilitate HRQoL and adjustment to traumatic injury exposure.

Similar to depression, clinical interventions can be made to foster better HRQoL outcomes by utilizing mental health and medical integrative care (the combination of mental health and medical services that are delivered in one location). For example, the utilization of Motivational Interviewing by both mental health and medical providers can help individuals to find motivation to adhere to treatment protocols as it relates to their goals and values. Additionally, mental health providers may be able to provide therapy that can foster mental HRQoL as it relates to pain, social support, well-being, and depressive symptoms.

The results of this study indicate there are distressed patients who may need psychological services post-discharge. Psychological interventions that address common difficulties after traumatic injury (e.g., pain, sleep disturbance) may foster better HRQoL and depression outcomes. Ostensibly, these address physical health, but they also promote quality of life, adjustment and well-being. Such interventions may involve psychological therapies related to chronic pain management (e.g., cognitive behavioral strategies for pain management, sleep hygiene). The combination of psychological approaches in the acute trauma care setting may facilitate HRQoL outcomes.

Unfortunately, the implications concerning age and gender are limited. Age appears to have a tenuous relationship with HRQoL following trauma injury, but it is possible that the measures used in this study were not particularly sensitive to the concerns of older individuals who participated. Similarly, women had lower physical HRQoL at baseline than men, and this finding appears to have limited relevance to the issues women are known to experience following trauma, generally. Future studies could consider other indicators of quality of life that may be germane to women and their concerns following trauma.

Limitations and Future Directions

There are several issues that limited the quality of this study and circumscribe the interpretations of the results. The 52% attrition rate at the end of the study may have influenced the outcomes noticed at the 12th month assessment. Attrition is a problem that occurs often in settings that provide services to low-income and uninsured individuals (like the Level 1 trauma centers that provided these data). Future studies may benefit from utilizing a combination of phone and electronic (e.g., emails with links) methods to gather information from participants post-discharge. Although the research staff had telephone contacts for participants, this was insufficient to maintain contact over time with many patients following their return to the community.

There is also a possibility that attrition in this study may have been partially due to participant unwillingness to answer questions verbally as opposed to answering questions electronically which would not require interaction with another individual. Electronic options offer a greater ability to answer questions at the convenience of the

participant rather than making time to respond to inquiries at the moment a telephone call occurred.

Shame, guilt, or avoidance related to the traumatic event may also explain the attrition in this study. This may also relate to the development of PTSD (e.g., avoidance of speaking about the trauma, isolation, distrust of others, or guardedness) or depressive (e.g., isolation or fatigue) symptomology that can create barriers to verbally answer questions with another individual. Electronic methods of answering follow-up questions may help to eliminate those barriers and improve retention.

Other limitations concern the nature of the sample. The sample was predominately composed of individuals who identified as White or Caucasian males, which may mean that the results of this study may not be reflective in hospitals with more diverse populations. Additionally, this study only observed racial and binary gender (i.e., male or female) demographics. Adding ethnicity, sexual orientation, and self-identified gender identity (e.g., gender queer, gender non-binary, transgender, transgender female, and transgender male) will add additional information about HRQoL and depression outcomes that were not captured in this study. Sexual orientation and self-identified gender identity particularly may add information as sexual and gender minorities have different experiences related to trauma that is not captured in this study. For example, individuals identifying as transgender are noted to experience discrimination related to their gender identity that has resulted in assaults that would be considered interpersonal in nature (e.g., hate crimes) that can influence HRQoL and depression in addition to minority stress these individuals may already experience.

Gathering this information will add to the research base regarding culturally competent care in working with a diversity of patients.

The study also did not code traumatic events to include sexual trauma (e.g., rape). Individuals that experience sexual traumas are noted in some trauma research to have higher rates of self-reported distress compared to individuals who experience other types of traumas (Markowitz et al., 2017). Notably, research indicates that women experience higher rates of sexual assault and worse HRQoL outcomes after trauma (Holbrook & Hoyt, 2004).

This present study examined HRQoL and depression outcomes after trauma. The lack of information regarding prior diagnoses makes it difficult to determine if HRQoL and depression outcomes are a result of the exposure to a traumatic event or pre-existing and untreated conditions (e.g., PTSD or MDD) that may have been exacerbated by the exposure to the traumatic event. Future studies can benefit from gathering information on prior diagnoses during interviews; although, this can be influenced by an individual's willingness to disclose and knowledge that the condition exists.

This study also did not include information on substance abuse and type of injury. Including this information in studies can help to explain HRQoL and depression outcomes after trauma. Generally, having several unmeasured or unstudied variables could have affected results in unknown ways.

The CD-RISC 10 may have influenced the results of the model throughout the 12 month course of this study if it was more able to gather trait aspects of resilience (e.g., plasticity or openness, and extraversion) versus state elements (e.g., stability;

agreeableness, conscientiousness, and emotional stability; Farkas & Orosz; 2015). This current study is more of a demonstration of the CD-RISC 10's ability to longitudinally predict HRQoL and depression as opposed to the longitudinal outcomes noticed in Bonanno's (2004) study. It is pertinent for future research to develop self-report measures that are able to capture plasticity to better determine longitudinal outcomes for individuals who experience trauma.

It may take individuals time to be aware of their PTSD and MDD (e.g., numbing, avoidance, and shame), and, thus, may not accurately disclose their symptoms. Similarly, individuals may not be aware of their symptoms or development of a psychiatric disorder due to the notable rates of individuals that do not seek treatment after a traumatic event (33%; Bryant et al., 2010). Future studies can benefit from having trained professionals evaluate individuals at different time periods to determine whether a psychiatric disorder has developed.

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