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Establishing The Construct And Concurrent Validity Of Psychological Cumulative Stress And The Moderating Effect Of Protective Factors To Drinking Outcomes

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ESTABLISHING THE CONSTRUCT AND CONCURRENT VALIDITY OF

PSYCHOLOGICAL CUMULATIVE STRESS AND THE

MODERATING EFFECT OF PROTECTIVE

FACTORS TO DRINKING OUTCOMES

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Dedication

Dedicated to Estrella Soria Portillo, Carlos Portillo, Sr., Elma F. Portillo, and Erin M. Portillo.

Thank you for your love and support.

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by

CARLOS PORTILLO, JR., M.A.

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Abstract

Previous studies have examined the associations between types of psychological stress and alcohol consumption but have not adequately examined psychological stress from a cumulative perspective. The present study sought to examine if self-report measures representing chronic stress, acute stress, life events, traumatic life events, and daily hassles throughout one's lifetime were associated with drinking outcomes obtained from an online sample of at-risk drinkers reporting drinking patterns in the previous 90 days. Furthermore, the present study sought to examine if an index of protective factors moderate the effects of psychological stress on drinking outcomes. It was hypothesized that (1) the measures representing chronic stress, acute stress, life events, traumatic life events, and daily hassles would yield one latent construct defined as psychological cumulative stress, thus demonstrating construct validity, (2) the psychological cumulative stress latent construct represented by measures of chronic stress, acute stress, life events, traumatic life events, and daily hassles score would be positively associated with the average number of standard drinks per week, the maximum amount consumed on one occasion, and the frequency of binge drinking; drinking severity; and alcohol-related problems, thus demonstrating concurrent validity, (3) using linear regressions, the psychological cumulative stress index scores informed by the percentiles would be positively associated with the average number of standard drinks per week, the maximum amount consumed on one occasion, and the frequency of binge drinking; drinking severity; and alcohol-related problems, thus also demonstrating concurrent validity, and (4) a standardized cumulative score of protective factors (derived using posttraumatic growth scores, resilience scores, social support scores, positive childhood experiences scores, and uplifts) would moderate the effects of the psychological cumulative stress score on all drinking outcomes. Overall, the data did not support the proposed model (hypothesis 1; X^2 = N/A, p = N/A,

CFI = N/A, SRMR = N/A). Instead, the data supported a two-factor structure (X^2 = 107.763, $p <$ .001, CFI = .914, SRMR = .061). This two-factor structure, however, demonstrated sample mean standard errors that may not be representative of a population parameter. While model fit indices for the two-factor structure as they relate to drinking outcomes were stronger ($X^2(36)$ = 168.026, p < .001, CFI = .902, SRMR = .045), sample mean standard errors were also observed to high. As a result, the proposed models are interpreted with caution. However, in constructing the psychological cumulative stress based on a similar calculation first proposed by McEwen and Stellar (see Seeman et al., 1997), the index was associated with the Typical Number of Drinks consumed on drinking occasions (β = .408, p = .001), the Maximum Number of Drinks consumed on drinking occasions (β = .481, p = .023), the frequency of Binge Drinking episodes (β = .131, p = .021), the Volume per Week (β = 1.637, p = .041), Alcohol Use Disorders Identification Test (AUDIT) scores (β = 1.162, p < .001), and the Rutgers Alcohol Problem Index (RAPI) scores (β = 2.656, p < .001). This index was not associated with the frequency of drinking (β = -.010, p = .888). Lastly, the index of proactive factors informed by the posttraumatic growth scores, resilience scores, social support scores, positive childhood experiences scores, and daily uplifts scores did not moderate the effects of psychological cumulative stress scores on drinking outcomes. While the statistical models were not fully supported, the psychological cumulative stress score index was statistically significant and positively associated with six out of seven drinking outcomes. The evidence suggests there is support for examining multiple types of psychological stress throughout one's lifetime in the context of cumulative stress as opposed to relying on a single type of psychological stress as it relates to drinking outcomes.

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Chapter 1: Introduction

Background

The general term "stress" may be best defined as the body and brain's response to internal and/or external changes, threats, or pressures (often referred to as 'stressors') which one encounters (Selye, 1950). McEwen (2008) suggests the brain determines whether these changes are stressful which, in turn, are followed by the physiological and psychological responses. Stress differs from stressors such that stressors are the events or experience that causes a response (stress) to the stressors. A broad spectrum of examples in which stress may be induced include pressures from traumatic events (e.g., illness, serious injuries, war), life events (e.g., death of a loved one), daily routines (e.g., work, school) and recent traumatic events (The National Institute of Mental Health [NIMH], 2019). While stress is typically perceived negatively, stress is not only normal but also an essential physiological response. More specifically, the physiologic response allows for adaptation to occur to return to a balanced state (Selye, 1950). Unhealthy or unmanaged stress may have debilitating health consequences. Previous research indicates gender differences in psychological stress such that females are more likely to have higher levels of stress compared to males (Matud, 2004). As a result, it is important to understand the components that associated with stress and the relationship with health outcomes.

The biopsychosocial model of stress (Engel, 1977) has often been used as a potential theoretical framework to understand the stress-substance use relationship. The theoretical framework suggests that biological factors, psychological factors (e.g., cognitions, behaviors), and social factors (e.g., environmental, cultural) are essential to understanding health outcomes. In fact, Garland and colleagues (2011) argue that stressful situations may intensify consequences related to stress when positive resources are insufficient. In turn, these stressful events may cause

prolonged or repeated stress activation responses that exacerbate the wear and tear the body and brain undergo due to the reoccurring stress response activation (Garland et al., 2011). When positive resources are not deemed sufficient, alternative outlets are sought to minimize the effects of stress, such as alcohol, thus creating a negative reinforcement condition (Garland et al., 2011). Given the multiple components associated with the model, it is important to understand the effects of stress on the body and brain.

From a biological perspective, stress has been associated with impacting the functioning of various physiological systems, such as the respiratory system (Ritz et al., 2000), cardiovascular system (Torpy et al., 2007), neuroendocrine system (Miller & O'Callaghan, 2002), and reproductive system (Kalantaridou et al., 2004). Unregulated stress has been associated with various health issues such as headaches, joint pain, chest pain, breathing issues, mood changes, sleeping issues, and many others (The American Institute of Stress, 2020). Prolonged stress, also commonly referred to as chronic stress, has been observed to negatively impact the immune system by hindering its ability to respond to foreign agents and increasing one's susceptibility to contracting a viral infection (Salleh, 2008). Salleh (2008) suggests that unmanaged stress can restrict breathing particularly among asthmatics, can increase the risk of diabetes among overweight individuals, can produce ulcers, and may cause artery blockage among those with high-fat diets. Others suggest stress hormones can negatively impact the heart, cause heart rate and blood pressure variability, lead to heart failure, and may cause a stroke (Torpy et al., 2007). The overproduction of hormones, such as adrenalin and cortisol, can have a plethora of effects on various systems. For example, De Vente and colleagues (2003) suggests these hormones (often in conjunction with other hormones) can raise heart rate (cardiovascular

system) and cause blood vessels to dilate (circulatory system). Thus, regulating stress is an essential function to avoid various health problems.

STRESS AND SUBSTANCE USE

In addition to stress impacting the physiological systems, stress can also impact psychological functioning and well-being. From a psychological perspective, stress has been a well-established risk factor for developing a substance use addiction and increasing the likelihood of relapse among those with substance use disorders (Sinha, 2008). As stress increases and behavioral control decreases, impulsive behaviors may occur, thus, increasing susceptibility to engaging in risky behaviors (e.g., substance use and/or relapse; Hayaki et al., 2005; Fishbein et al., 2006; Verdejo-Garcia et al., 2007). Other research suggests that substance use as a stress response may serve as a mechanism to reduce stress. This stress may also be associated to substance use cravings and withdrawal (Russell & Mehrabian, 1975; Marlatt & Donovan, 2005). Given the relationship between stress and substance use (among many other associations), it is imperative to characterize psychological stress as it relates to addictive behaviors, such as hazardous alcohol use.

Given the many health issues associated with stress, one particular area of interest is the relationship between stress and alcohol use. According to the Centers for Disease Control and Prevention (CDC, 2019), alcohol is one of the leading causes of death in the United States. Research has documented the associations between stress (in general) and alcohol use. For example, research suggests those who drink may do so to cope with psychological stress (Conger, 1956). Alcohol also acts as a removing agent of negative emotions, thus giving the sensation that the stressor has subsided (also see Bradford et al., 2013). Other research has concluded that psychological stress is highly associated with alcohol use and alcohol-related problems (Cooper et

al., 1992). Specifically, Cooper and colleagues tested a model of stress-induced drinking in a sample of drinkers and observed that stressors were associated with drinking outcomes among men who used drinking to cope with psychological stress and avoid the negative emotions associated with psychological stress. Additionally, evidence suggests individuals that are drinking are drinking in larger quantities per occasion and are surpassing typical gender-specific binge drinking patterns (Hingson et al., 2017) which, in turn, are often associated with increased risk for disease onset and other alcohol related consequences. Historically, males have been observed to drink more alcohol compared to females (White, 2020). In addition to drinking in greater amounts, males have also reported greater alcohol related problems in comparison to females. Research findings reported by Peltier and colleagues (2019) observed that the likelihood of drinking among females to cope with psychological stress has also increased. With drinking associated with stress on the rise (Keyes et al., 2012), it is important to examine stress from both a biological and psychological perspective to further understand how stress may serve as a risk factor for hazardous alcohol use.

BIOLOGICAL STRESS MODEL

McEwen and Stellar (1993) first described the concept of allostatic load (AL) as the predisposition to disease due to the dysregulating function of the body and brain that takes place due to constant activation in response to stressful events. To understand the effects of these stressful events on the body and brain over time, McEwen conceptualized the AL model in which biological markers representative of various physiological systems may provide insights to potential physiological dysregulation (McEwen & Stellar, 1993). McEwen employed the model using data from the MacArthur study of Successful Aging (see Berkman et al.,1993; Seeman et al., 1997). Specifically, biological markers such as cortisol, norepinephrine,

epinephrine, dehydroepiandrosterone, systolic and diastolic blood pressure readings, ratio of waist-to-hip circumference, high density lipid (HDL) cholesterol, the ratio of total-to-HDL cholesterol, and blood glycosylated hemoglobin were compared across participants. Biological values that were in the 75th percentile were indicative of physiological dysregulation. Those meeting this threshold were assigned a value of one and were subsequently summed to form an overall index bound by zero and the total number of biological markers analyzed. Higher AL index values were indicative of greater physiological dysregulation due to constant activation of systems in response to stressful events. Further, this index was representative of biological cumulative stress. Overall, evidence suggested that higher index scores were associated with poor health outcomes, declines in both cognitive and physical functioning, and increased mortality rates (Seeman et al., 1997). The applicability of the AL model has been further applied to other health domains and has largely demonstrated strong associations. In particular, increased scores of AL have been associated with obesity, physical inactivity, increased substance use, and poor sleepy hygiene (see Suvarna et al., 2020). However, the relationship between AL and drinking (as opposed to substance use as a general outcome) remains less understood.

PRELIMINARY STUDIES

Similar to the research of Seeman and colleagues (1997), Portillo (2021) conducted a secondary data analysis of data from Zhang et al., (2020) to examine biological measures of cumulative stress in a case control study of males diagnosed with AUD and healthy male participants with no history of substance use disorders. Specifically, biological samples were analyzed for 48 males with an AUD and 17 abstinent males to create an index of AL. Biological markers included in the AL index were cortisol (neuroendocrine system); interluken-6 (IL-6), fibrinogen, tumor necrosis factor-alpha (TNFa), and C-reactive protein (CRP, immune system);

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glucose, insulin, and leptin (metabolic system); pulse, systolic blood pressure readings, and diastolic blood pressure readings (cardiovascular and circulatory system); and body mass index (BMI, anthropometric system). These biological markers were used to create an index of AL based on McEwen and Stellar's recommendations (1993) by employing a similar approach for creating the index described by Hampson and colleagues (2009). It was hypothesized that, given the striking differences in drinking patterns between the two groups, the mean index scores of AL would be higher among males with an AUD compared to the healthy male control group. However, this hypothesis was not supported as results indicated there was no statistically significant group mean difference between the two groups. The index was also found to not be associated with lifetime drinks per drinking day, lifetime total drinks, pre-treatment total drinks 6-months after study completion, and drinks per drinking day 3-months after study participation among the males with AUD. In comparison to related research, the research conducted by Zhang et al., (2020) and Portillo (2021) is noteworthy for its comprehensive measurement of biological measures of cumulative stress and its use of a gold standard measure of alcohol consumption and diagnosis of AUD. Overall, these findings were striking and indicate that, in the context of AUD status or alcohol consumption among participants diagnosed with AUD, AL may not be sensitive enough to distinguish group status.

In addition to obtaining biological measures, Zhang and colleagues (2020) also investigated the effects of psychological stress on the hypothalamic-pituitary-adrenal (HPA) axis reactivity in males diagnosed with an alcohol use disorder (AUD) determined by the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID; First et al., 1997) and healthy males after administering ovine corticotropin-releasing hormone to measure the reactivity. In their study, baseline biological samples were obtained, and participants were administered measures

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of psychological stress. Participants were administered the Timeline Followback (Sobell & Sobell, 1992) to measure drinking patterns. Participants were also administered the Childhood Adversity Interview (CAI; Dienes et al., 2006), the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1998), the UCLA Life Stress Interview (Hammen et al., 1995), and the Diagnostic Interview Schedule (DIS; Robins et al., 2000). Zhang and colleagues (2020) used a clustering procedure in which the CAI and CTQ scores were standardized and averaged to form a childhood adversity variable. The UCLA Life Stress Interview was standardized and referred to as the chronic stress variable. The DIS items were also standardized and used to create a lifetime stress score. Overall, results indicated that higher psychological stress levels were associated with less reactivity among the control group but not among males with an AUD. While providing support for the relationship between the psychological stress indices, the indices used did not assess the full range of psychological related stress or comprehensively capture psychological cumulative stress.

Adopting an approach similar to the parent study (Zhang et al., 2020) by using the three indices to create an overall index, Portillo (2021) examined the association of an index of psychological stress captured by measures of psychological stress. Results indicated that there were statistically significant group mean differences in the index of psychological stress scores such that those diagnosed with AUD had higher psychological stress scores compared to the healthy control participants. Thus, while the biological measure of cumulative stress was not associated with AUD, the psychological index was associated with AUD status in this case control study. This raised a question regarding the potential disconnect between the biological model McEwen first proposed and the psychological cumulative stress scored created in the Portillo (2021) study – especially due to the plethora of research findings suggesting AL is

associated with various negative health outcomes and substance use in general (see Suvarna et al., 2020).

Despite the AL index not being associated with AUD status while the index of cumulative life stress was associated with AUD status (Portillo, 2021), two overarching details became apparent. First, it became apparent that an appropriate psychological equivalent to the biological model of stress needs further exploration. Second (and most importantly), the method in which cumulative life stress was conceptualized in the Portillo (2021) study may have been misidentified based on more appropriate definitions of different types of psychological stress. Specifically, the UCLA Life Stress Interview was identified as chronic stress in the two studies but is more appropriately in line with cumulative life stress, according to Stress Measurement Network (n.d.). In essence, the index used in the two studies may have only used a cumulative life stress semi-structured interview and a combination of traumatic life events captured by the CAI, CTQ, and the DIS. This highlights the potential shortcomings and lack of representation of other types of psychological stress that can cumulatively assess the concept of psychological cumulative stress, thus warranting further exploration of a model to assess psychological cumulative stress using psychological measures.

CONCEPTUALIZING PSYCHOLOGICAL CUMULATIVE STRESS

In a recent article by Crosswell and Lockwood (2020), the authors argue that health research often inadequately conceptualizes psychological stress as it relates to health outcomes. Because of the complex nature of stress which often results in the inaccuracy of measuring stress, Crosswell and Lockwood (2020) detailed the types of psychological stress (captured by psychological measures) and best practices for measuring stress response and psychological stress exposure. Crosswell and Lockwood (2020) argue that psychological stress is a vague

construct which presents difficulty in accurately measuring it. In their article, Crosswell and Lockwood (2020) describe five types of psychological stress which entail chronic stress, acute stress, life events, traumatic life events (a sub-type of life events), and daily hassles. Also, Crosswell and Lockwood (2020) describe key issues to consider when measuring psychological stress, such as the timescale and life stage of a stressor, the time window the measurement refers to, and the stress response that occurs.

Timescale and Life Stage of a Stressor

While the term "stress" is commonly used, research has made strong advances in understanding the various types of psychological stress (e.g., chronic stress, acute stress, life events, traumatic life events (a sub-type of life events), and daily hassles). These conceptual differences have been used to explain time variation relative to psychological stress as well as the magnitude as to how these differing types of psychological stress have been attributed to various health outcomes. Crosswell and Lockwood (2020) state that the timescale of the stressors are important to distinguish between types of stress (e.g., ongoing stress [chronic stress], episodic events [life events]). However, it is noted that many stressful events rarely occur during a single timescale. For example, Crosswell and Lockwood (2020) describe arguments with a significant other as typically being an acute stressor. However, persistent arguments with one's significant other can develop into a source of chronic stress. Additionally, it is believed that the life stage in which the stressor was experienced is important to consider as this can have implications for long term health outcomes (Crosswell & Lockwood, 2020). The authors indicate that measuring psychological stress relevant to specific life periods can inform pathways between psychological stress experienced during a particular age (childhood, adulthood) and health risks.

Measurement Window

Related to a particular measure's assessment period, Crosswell and Lockwood (2020) indicate that latency is an essential component to consider as they relate to the definitions of psychological stress. For example, measures that restrict one's responses based on the previous 24 hours may be indicative of daily hassles. Similarly, episodic events that have occurred during the previous seven day may be more strongly associated with acute stress. It is noteworthy, however, that many of these experiences may develop over time and evolve into a different type of psychological stress based on definitions set forth by Crosswell and Lockwood (2020).

Stress Response

Lastly, Crosswell and Lockwood (2020) state stress responses differ from stress exposures such that stress responses are cognitive, emotional, and biological reactions that occur because of stressful exposures. As a result, stress responses are also important to assess in addition to measuring stressful events/exposures. It is stated that such responses may occur before, during, or after a stressful experience which may results in an emotional response (psychological response), a coping response (behavioral response), an appraisal of the experience (threat or a challenge [cognitive response]), and/or a neural response (physiologic response).

MEASURING PSYCHOLOGICAL CUMULATIVE STRESS

In understanding the effects of psychological stress on drinking, Keyes and colleagues (2012) state that the impacts of stress on drinking often depend on the type of psychological stress, when the experience occurred (e.g., childhood, recent), the duration of the stressful event, and the severity of that experience. However, given the difficulties in understanding and measuring psychological stress, different types of psychological stress ought to be defined in a distinguishable manner to understand the relationship between the specific type of psychological

stress and the health outcome of interest. Table 1 lists the types of psychological stress outlined

by Crosswell and Lockwood (2020) and also lists the appropriate definitions, verbatim, each of

which will be discussed in greater detail including their potential relationship to alcohol.

Table 1. Definitions of psychological stress outlined by Crosswell and Lockwood (2020)

Type of Stress	Definition
Chronic Stress	Chronic stressors are prolonged threatening or challenging circumstances that disrupt daily life and continue for an extended period of time (minimum of one month).
Acute Stress	Short-term, event-based exposures to threatening or challenging stimuli that evoke a psychological and/or physiological stress response, such as giving a public speech.
Life Events	Life events are time-limited and episodic events that involve significant adjustment to one's current life pattern, such as getting fired, being in a car crash, or the death of a loved one. Some life events can be positive (e.g. getting married, moving to a new place), and some become chronic (e.g. disability caused by car crash).
Traumatic Life Events	Traumatic life events are a subclass of life events in which one's physical and/or psychological safety is threatened.
Daily Hassles	Interruptions or difficulties that happen frequently in daily life such as minor arguments, traffic, or work overload, and that can build up overtime to create persistent frustration or overwhelm.

Chronic Stress

Chronic stress is defined as the constant and persistent psychological pressure that extend for periods longer than one month and may have debilitating effects (Crosswell & Lockwood, 2020). From a biological perspective, Goldstein and McEwen (2002) argue that chronic stress is one of two types (the second being acute stress) of stress that are crucial to understanding the negative impacts on health outcomes. Moreover, it is believed that the constant activations the body and brain undergo in response to adapting to demands (chronic stress) may increase the risk of disease, psychopathologies, and mortality and potentially exacerbate these risks (Marin et al., 2011). In general, stress has been associated with impacting the cardiovascular system. Gallo et al., (2014) suggests that chronic stress (measured using a psychological measure) may have observable biological effects on coronary heart disease and having a stroke. While chronic stress is often believed to occur as one begins to mature and enter adulthood, chronic stress can develop early during childhood as a result of repeated traumatic life experiences (e.g., physical/sexual assaults) and can evolve into chronic stress and elevate the risk for psychopathologies (Marin et al., 2011).

Related to substance misuse, Sinha (2008) suggests stress-inducing experiences may serve as a risk factor for developing a substance use addiction and increasing the likelihood of relapse (Sinha, 2001; Sinha, 2008). Sinha specifies in the review that chronic stress (measured biologically) is strongly associated with substance use addiction and attributes the increase in one's motivation to engage in these risky substance use activities under stressful situations. As such, the relationship between chronic stress (measured using psychological measures) and substance use must be given strong consideration when examining the overall effects on various health outcomes.

Acute Stress

In addition to chronic stress being a driving force of the effects on the body and brain, Goldstein and McEwen (2002) argue that acute stress is also a crucial component in the body and brain functioning. Crosswell and Lockwood (2020) define acute stress as, "short-term, event-based exposures to threatening or challenging stimuli that evoke a psychological and/or physiological stress response, such as giving a public speech." Research supports the association between acute stress responses and cardiovascular health (Chida & Steptoe, 2010). Specifically, Chida and Steptoe (2010) reported in their meta-analysis that acute stress (captured biologically and psychologically) may have adverse cardiovascular effects that may develop over time. Furthermore, Garfin and colleagues (2018) indicated in their systematic review that increased levels of acute stress (captured by psychological measures) are associated with increased risks of physical and mental health problems.

Related to alcohol use, Gordh and colleagues (2011) have also reported a positive association between acute stress and increased alcohol consumption particularly among participants reporting a family history of hazardous alcohol use (Gordh et al., 2011). These findings highlight the importance of family history as a potential risk factor when examining acute stress and alcohol use.

Life Events

Life events, as defined by Crosswell and Lockwood (2020), are defined as "…episodic events involving significant adjustment to one's routine." Events constituting as a life event include getting fired or the death of a loved one. The authors further note that some life events may be positive and list examples such as getting married. Notably, the effects of some life events, such as the aftermath of a car accident, may become chronic. For example, Crosswell and

Lockwood (2020) state that the effects of becoming disabled due to a car accident can develop into a chronic stressor over time.

Related to alcohol use and psychological stress experienced due to life events, Veenstra and colleagues (2006) identified four cross-sectional studies in their review that reported increased life events (measured using psychological measures) were associated with increased alcohol use. Specifically, the authors noted that specific life events (e.g., crime victim) were associated with increased alcohol use. Other life events such as divorce and financial problems were associated with both an increase and a decrease in drinking. Overall, Veenstra and colleagues (2006) concluded that the evidence seems to suggest a positive relationship between life events and alcohol use but noted that certain life events may display an opposite relationship or no relationship at all.

Traumatic Life Events

Crosswell and Lockwood (2020) state life events are defined as episodic events which require a degree of adjustment/adaptation in response to the episodic event (e.g., death, car accident, marriage, moving to a new place). The authors go on to specify that traumatic life events are a sub-type of life events in which physical and/or psychological well-being are threatened. Like life events, traumatic life events may occur at any time point during a person's life. Traumatic life events measured via psychological measures of stress are also associated with poorer health (Keyes et al., 2013) and mortality (Rosengren et al., 2004). In addition, research suggests traumatic life events are also associated with mental health issues (Ásgeirsdóttir et al., 2018; Holman et al., 2000) which, in turn, are associated with poor physical functioning and increased healthcare access (Holman et al., 2000). As previously mentioned, traumatic life events are not exclusive to adulthood as traumatic life events have been well-documented in childhood.

More specifically, Felitti and colleagues' (1998) study on adverse childhood experiences found that poorer health and mortality in adulthood were highly associated with increased adverse experiences during childhood.

Research conducted by Low and colleagues (2012) reported stressful life events (captured through a self-reported measure), such as family disruption, were positively associated with substance use among adolescents. This finding is particularly important as it is an indication of the impact psychological stress can have on substance use at any given time period, and, in this specific instance, during childhood. In a study conducted by Fetzner and colleagues (2011) using data from the National Epidemiologic Survey of Alcohol and Related Conditions, the authors found evidence suggesting a positive association between traumatic life events (also captured by a self-reported measure) and having an alcohol use disorder (AUD) among those without post-traumatic stress disorder (PTSD). The authors further state that the findings are particularly important as their findings were able to separate a complex relationship between AUD and traumatic life events among those without PTSD. Moreover, Fetzner et al., (2011) also reported childhood maltreatment and violent assaults were positively associated with the presence of AUD status among those with and without PTSD. All in all, Fetzner and colleagues (2011) conclude that increased traumatic life event exposure is positively associated with AUD status and may serve as a potential risk factor for developing AUD.

Daily Hassles

Daily hassles are defined as, "interruptions or difficulties that happen frequently in daily life such as minor arguments, traffic, or work overload, and that can build up overtime to create persistent frustration or overwhelm." Daily hassles measured by self-reported psychological measures have been identified as causing slight amounts of psychological stress, frustration, or

irritation (Kanner et al., 1987). Historically, daily hassles have been strongly associated with increased psychological distress (DeLongis et al., 1988). More recent research conducted by Booth and Anthony (2015) concluded that adolescents experiencing increased daily hassles were associated with increased substance use. Bailey and Covell (2011) found evidence suggesting daily hassles also captured psychologically were positively related to substance use (including alcohol use) in a sample of high school students. These findings have also been observed among adults, particularly in the use of opioids and cocaine (Preston et al., 2018). Thus, daily hassles, like other types of stressors, may serve as a risk factor for numerous health issues across various age groups.

Given the observed relationships between the types of psychological stress with health outcomes, it may be reasonable to infer that each type of stress may vary in the magnitude to which it may be associated with alcohol use. This may be attributed to two ideas. First, the precision in defining the type of psychological stress and the subsequent method in measuring the type of psychological stress may be imprecise. Second, it may be reasonable to infer that measuring psychological stress from an individual perspective, as opposed to measuring psychological stress from a cumulative perspective, may not be adequately explaining the compounding effects psychological stress on health outcomes overtime and may only be partially explaining the complex relationship between psychological stress and alcohol use. As a result, a more comprehensive approach in understanding psychological stress is warranted by examining multiple types of psychological stress.

PROTECTIVE FACTORS AGAINST INCREASED ALCOHOL USE

In contrast to the types of psychological stress described herein, counter measures (see Table 2) have been well documented which may correspond to the types of psychological stress.

For example, the Daily Hassles and Uplifts Scale (HUS; DeLongis et al., 1988) asks questions

related to what may be considered a daily hassle or inconvenience. However, the same 53

questions used to assess daily hassles are also used to measure how each of the items were

considered to be uplifts or positive daily experiences. Similarly, the opposite of adverse

childhood experiences are positive childhood experiences. Related to alcohol use, factors such as

posttraumatic growth, resilience, social support, positive childhood experiences, and daily uplifts

have been observed to have an inverse relationships with alcohol use and may potentially buffer

against hazardous alcohol use. However, these protective factors have not been used to examine

the potential moderating effects of psychological cumulative stress on alcohol use. Table 2 lists

the protective measures and the potential opposite of the protective measure which will be

elaborated on further.

Table 2. Types of psychological stress and counter measures to types of psychological stress.

Type of Psychological Stress	Protective Measure
Chronic Stress	Posttraumatic Growth
Acute Stress	Resilience
Life Events	Social Support
Traumatic Life Events	Positive Childhood Experiences
Daily Hassles	Daily Uplifts (from the HUS)

Posttraumatic Growth

Posttraumatic growth is theorized to be both a process and an outcome, according to

Tedeschi and colleagues (1998). The authors define posttraumatic growth as the experience of

positive changes, such as new possibilities, the ability to relate (better) to others, increases in

personal strength, appreciation of life, and/or spiritual/existential changes that result from a previous traumatic experience or event. Related to traumatic experiences, the DSM-V (APA, 2013) includes drug/alcohol dependence as a comorbid condition associated with posttraumatic stress disorder (PTSD). Maeng and Milad (2017) indicate that those with PTSD continuously relive the traumatic experience(s), thus living in a chronically stressed condition. In a study examining posttraumatic growth in a sample of homeless women, results indicated lower posttraumatic growth scores were associated with increased substance use severity (Stump & Smith, 2006). It should be noted that participants in the Stump and Smith (2006) study were identified as those who were at the time experiencing homelessness, thus posttraumatic growth was measured during the hardship rather than a later timepoint. Given the link between PTSD and the chronically conditioned state, it is reasonable to believe chronic stress and posttraumatic growth may be appropriate countermeasures thus making posttraumatic growth a potential protective factor.

Resilience

One way to define resilience is the ability to overcome adverse or stressful events (Richardson, 2002). Babíc and colleagues (2020) suggest that individuals with higher levels of resilience are associated with better overall health, may experience increased healing rates, and may prevent disease onset. DeNisco (2011) concluded that among a sample of type 2 diabetic females, those with higher levels of resilience were associated with lower glycosylated hemoglobin (HbA1c) levels, thus serving as a potential protective factor against negative health outcomes. In the context of alcohol use, Long and colleagues (2017) observed that resilience was strongly associated with a reduced risk for developing alcohol use disorders. Similarly, Wingo and colleagues (2014) also reported that higher resilience levels were associated with lower

lifetime alcohol use problems and drug use. In a recent study, Ye and colleagues (2020) found that resilience mediated the relationship between acute stress due to the COVID-19 pandemic and acute stress symptoms. As such, resilience may serve as a counter to acute stress and also serve as a protective factor against hazardous alcohol use.

Social Support

Social support is defined as help or support provided to a person coming from another person, a group of people, and/or larger body of people, such as one's community (Lin et al., 1979). Lin and colleagues (1979) reported that social support may buffer against the effects of life events that may be stressful in nature on illness symptoms. Ozbay and colleagues (2007) suggest the effects of strong, positive social support increase physical, mental, and emotional well-being and may also lessen the impacts of stress on health outcomes such as morbidity and mortality (Southwick et al., 2005). Conversely, Ozbay and colleagues (2007) indicate that isolation from social interactions and lower levels of social support are associated with increased morbidity, mortality, and negative health outcomes such as death due to cardiovascular disease (Berkman, 1997). Related to alcohol use, a recent study observed that increased social support during the COVID-19 pandemic was associated with decreased alcohol use (Lechner et al., 2020). As such, social support may serve as a protective factor against hazardous alcohol use.

Positive Childhood Experiences

Compared to negative childhood experiences (e.g., captured by the CTQ measured herein), positive childhood experiences target prosocial development experiences during the first 18 years of life (PCEs: Bethell et al., 2019). Research suggests increased PCEs are associated with lessened mental health issues into adulthood (Bethell et al., 2019). Kosterman and colleagues (2011) also indicated positive experiences endured during the childhood period are

associated with less substance use during the adolescent period and was also positively associated with healthier functioning during the early stages of adulthood. Given the importance of both positive and negative experiences during childhood, particularly those that take place during critical developmental periods, Bethell and colleagues (2019) suggest childhood experiences may have compounding effects that can develop and translate over time and into adulthood.

Daily Uplifts

Daily Uplifts, similar to Daily Hassles, are theorized to work "in tandem" as per Kanner et al., 1981. Specifically, uplifts, in contrast to hassles, are deemed to be positive daily experiences, such as receiving good news (Kanner et al., 1981). In addition, counter effects to hassles via uplifts have been theorized (Lazarus et al., 1980) – indicative of potentially offsetting or stabilizing effects for daily stressors expressed via daily hassles. Relatedly, uplifts have been associated with lower drinking rates (Ohannessian et al., 1994). More specifically, Ohannessian and colleagues (1994) observed that, among males with a family history of hazardous alcohol use, higher uplift scores were associated with decreased alcohol use. Despite the predisposition to hazardous alcohol use, uplifts may serve as a protective factor in the context of alcohol use.

SUMMARY

Based on the studies examining the types of psychological stress identified by Crosswell and Lockwood (2020), the relationships between types of stress with alcohol use, and the potential moderating effects of protective factors on the relationship between psychological stress and alcohol use, three overarching ideas became apparent. First, it became evident that measuring a single type of psychological stress through the use of any single self-report measure may not fully reflect the compounding effects of psychological stress on health outcomes

because different types of psychological stress occur at different life stages and vary in duration. As a result, it may be more appropriate to measure additional types of psychological stress that account for various life stages and durations to gain a better understanding of the compounding effects of psychological stress over the lifespan as they may better explain associations with various health outcomes compared to relying on a single type of psychological stress. Measuring psychological cumulative stress, thus, necessitates the simultaneous measurement of the various types of psychological stress in a manner consistent with the framework that McEwen provided for biological cumulative stress. Based on the preliminary findings by Portillo (2021), examining the relationship between psychological cumulative stress and alcohol use is warranted. Second, there is variability in the degree to which each type of psychological stress described herein can be captured by self-reported measures of stress. This may be attributed to the fact that psychological stress is often misidentified and consequently, inappropriately measured. As a result, it is important appropriately define the type of psychological stress which may assist in identifying an appropriate psychological measure. Finally, it became evident that there is a lack of research examining multiple types of protective factors that ought to be accounted for when examining the effects of stressful experiences (Epel et al., 2018) on health outcomes.

By applying Crosswell and Lockwood's (2020) conceptual framework for defining each type of psychological stress and appropriately identifying self-report measures that capture these, psychological cumulative stress can be more adequately assessed. To gain a stronger understanding of this relationship, the current study examined two conceptual models. First, total scores derived from each measure of psychological stress to determine if the data supports a latent construct defined as psychological cumulative stress was examined. Second, using a similar approach first described by McEwen and Stellar (1993) for constructing an index of

cumulative stress using biological data, the current study utilized a 75th percentile thresholds to construct an index of psychological cumulative stress based on the total scores of each measure of psychological stress from each participant.

From a biopsychosocial perspective (Engel, 1977), this study may elucidate the effects of psychological cumulative stress on health as it relates to stress responses (biological), behaviors in the context of alcohol use (psychological), and environmental factors during the lifespan (stressors). Furthermore, consistent with McEwen's theory that stress accumulates and compounds over the lifespan, the current study aimed to examine psychological cumulative stress based on the selection of self-report measures as they each represent a type of psychological stress defined by Crosswell and Lockwood (2020). By examining the concept of psychological cumulative stress, the current study aimed to understand the compounding effects of psychological stress as it relates to drinking outcomes rather than relying on a single type of psychological stress which may not capture the effects of other types of stress as defined by Crosswell and Lockwood (2020). As such, the current study aimed to examine the types of psychological stress described by Crosswell and Lockwood (2020) as they relate to alcohol use among a sample of drinkers. Lastly, the current study aimed to examine the effects of protective factors that potentially buffer the effects of psychological cumulative stress in relation to alcohol use. By measuring multiple types of psychological stress and subsequently creating a cumulative index, the current study aimed to elucidate the relationship between psychological cumulative stress and individual types of psychological stress with alcohol use and whether the harmful effects of psychological stress can be reduced by protective factors averaged to form an index that is potentially opposite of the measures of stressed described herein.

Based on the framework presented by Crosswell and Lockwood (2020) for defining the various types of stress, the purpose of the current study aimed to examine a model of psychological cumulative stress (as a latent construct) based on measures of chronic stress, acute stress, life events, traumatic life events, and daily hassles using self-report psychological measures best aligned with the definitions set forth by Crosswell and Lockwood (2020; Figure 1). Specifically, the Perceived Stress Questionnaire (PSS; chronic stress; Levenstein et al., 1993), the Perceived Stress Scale (PSS; acute stress; Cohen & Williamson, 1988), the Social Readjustment Rating Scale (SRRS; life events; Holmes & Rahe, 1967), the Childhood Trauma Questionnaire (traumatic life events during childhood; CTQ; Bernstein et al., 1998), the Adulthood Trauma Questionnaire (ATI; traumatic life events during adulthood; (Wittbrodt et al., 2020) and the hassles portion of the Hassles and Uplifts Scale (HUS; daily hassles; DeLongis et al., 1988) were used to examine the latent construct of psychological cumulative stress. These measures each represent a specific time point of a person's life, such as ongoing stress (chronic stress; PSQ), recent stress (acute stress; PSS), life events that may be stressful (lifetime/ever; SRRS), childhood stress (traumatic life events; CTQ), adulthood stress (traumatic life events; ATI), and daily inconveniences (daily hassles; HUS). As such, each measure representing the specific type of stress which occur at specific times during life may cumulatively reflect psychological cumulative stress previously outlined (see Table 1). The current study also aimed to construct an index of psychological cumulative stress informed by total scores from each measure using a similar approach first described by McEwen and Stellar (1993).

This study also sought to examine if the model of psychological cumulative stress (as a latent construct) was associated with the alcohol consumption patterns, alcohol use severity, and

alcohol related problems in a sample of online survey participants. Finally, the study also sought to examine if a cumulative index informed by scores of social support, positive childhood experiences, uplifts, resilience and posttraumatic growth moderated the effects of psychological cumulative stress captured by the index on alcohol use outcomes. To capture alcohol consumption, the recommended questions as per the National Institute on Alcohol Abuse and Alcoholism (NIAAA, 2003) quantity and frequency questions were used for the past three months. Specifically, the frequency of drinking days, the typical number of drinks consumed, the maximum number of drinks consumed on a drinking occasion, the frequency of binge drinking episodes, and the volume per week were calculated using this set of questions. Alcohol use severity was measured using the 10-item Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001). Alcohol related problems were assessed using the Rutgers Alcohol Problems Index-18 (RAPI-18; White & Labouvie, 1989). The following aims were pursued:

A1. Assess the construct validity of a model of the five types of stress as it relates to the concept of psychological cumulative stress. (Figure 1).

A2. Assess the concurrent validity of the proposed model of psychological cumulative stress via a structural equation model as it relates to the drinking outcomes (Figure 2).

A3. Construct an index of psychological cumulative stress using the 75th percentile as a cutoff for determining heightened levels of stress for each measure of stress. This index would be bound between 0 and 6 for the total number of measures reflecting each type of stress. The index would be used to assess the concurrent validity on drinking outcomes.

A4. Assess the moderating effects of protective factors against hazardous alcohol use on the relationships between the index of psychological cumulative stress on drinking outcomes (Figure 3).

It was hypothesized that:

1. The measures representing chronic stress, acute stress, life events, traumatic life events, and daily hassles would yield one latent construct defined as psychological cumulative stress, thus demonstrating construct validity (Figure 1).

2. The psychological cumulative stress latent construct represented by measures of chronic stress, acute stress, life events, traumatic life events, and daily hassles score would be positively associated with the frequency of drinking days, the typical number of drinks consumed, the maximum number of drinks consumed on a drinking occasion, the frequency of binge drinking episodes, and the volume per week; drinking severity; and alcohol-related problems, thus demonstrating concurrent validity (see Figure 2).

3. Using linear regressions, the psychological cumulative stress index scores informed by the percentiles would be positively associated with the frequency of drinking days, the typical number of drinks consumed, the maximum number of drinks consumed on a drinking occasion, the frequency of binge drinking episodes, and the volume per week; drinking severity; and alcohol-related problems, thus also demonstrating concurrent validity

4. A standardized cumulative score of protective factors (derived using posttraumatic growth scores, resilience scores, social support scores, positive childhood experiences scores, and uplifts) was hypothesized to moderate the effects of the psychological cumulative stress score on all drinking outcomes.

The current study is innovative in its comprehensive approach in defining different types of psychological stress and for examining the concept of psychological cumulative stress informed by self-report measures that capture the specific type of stress defined by Crosswell

and Lockwood (2020). The current study is also innovative for examining the relationship between psychological cumulative stress and alcohol use among drinkers and examining if an index of protective factors may buffer the effects of psychological cumulative stress on drinking. These findings may broadly outline a theoretical framework for conceptualizing and understanding psychological cumulative stress informed by self-report measures which may be applied towards understanding the relationship with other health outcomes in addition to alcohol use (e.g., sleep quality, obesity, cardiovascular health, etc.).

Chapter 2: Method

The purpose of the current study aimed to examine the construct and concurrent validity of psychological cumulative stress informed by measures of psychological stress that measure a unique type of psychological stress. The current study aimed to achieve this by surveying participants through an online recruitment platform among a sample of at-risk drinkers. In examining the concept of psychological cumulative stress as it relates to health outcomes, research may be better informed by taking a more comprehensive approach.

PARTICIPANTS

To be eligible for the current study, participants must have been between 18 and 64 years of age and engaged in at risk drinking in the previous 90 days. The NIAAA defines at-risk drinking as males consuming more than four drinks on any single day or more than 14 drinks in a week in the previous 90 days meet the criteria. To identify at-risk drinkers among females, NIAAA states that females reporting having consumed more than three drinks on any single day or more than seven drinks in a week in the previous 90 days meet the criteria. As it relates to binge drinking, participants who also reported having (males) five or more drinks/(females) four or more drinks in a two-hour period one day a month (or more frequently) were also considered. At-risk drinkers were selected for this study due to the likelihood that this particular group of drinkers include a wide range of drinkers (i.e., includes those without alcohol use disorder and also includes various levels of severity). As such, two separate screening surveys (one for males and one for females) were administered on the Prolific platform to screen for eligible participants in which the survey was only presented to participants that have already indicated their age being between 18 and 64 years of age, that their current country of residence was in the United States, and that they drank at least one drink per week on average (or more). Prolific asks all users prior

to study participation to answer various questions to include alcohol consumption. Participants indicate whether they are abstainers, consume one to four drinks per week, five to nine drinks per week, 10 to 13 drinks per week, or 14 or more drinks per week. The current study attempted to remove any potential abstainers beforehand in efforts to target current drinkers in the screening process. The prescreening surveys were not available to abstainers. Participants that met criteria were notified via their individual Prolific message center that they met the criteria to participate in a larger study in which they would be eligible to earn an additional five dollars for their additional participation. The unique Prolific ID codes that are assigned to all users were cross verified between the eligible list obtained from the screening survey lists and the Prolific ID that was provided in the second survey. Seven attention checkers were included throughout the survey to ensure participants were actively paying attention to the survey. Participants that failed more than one attention checker were omitted from analyses and were not subsequently compensated.

PROCEDURE

Participants provided online consent to participate in the study. Participants were compensated $0.15 for one minute of their time to complete the screener and $5.00 for 30 minutes of their time to complete the main survey. For the male screener, 500 males were screened. For the female screener, 440 females were screened.

MEASURES

Demographics

Questions assessing demographic constructs will include age, biological sex assigned at birth identification, ethnicity identification, relationship status, employment status, educational attainment, household size, household income, military status, and political views. In addition to

these demographic questions, health questions such as 'Have you ever had a heart-attack?', 'Have you ever had a stroke?' 'Have you ever been diagnosed with cardiovascular issues (e.g., hypertension)?', 'What is your height and weight?', 'Do you have diabetes?', "Do you currently smoke tobacco products?', 'Do you currently suffer from joint pain?', 'Do you have vision problems?', 'Do you have hearing problems?', 'Do you suffer from headaches?', 'Do you exercise more or less than 150 minutes a week?', and family history of hazardous alcohol use will be asked.

MEASURES OF PSYCHOLOGICAL CUMULATIVE STRESS

Crosswell and Lockwood (2020) list steps for choosing appropriate stress measures of psychological stress.

- Determine the type(s) of stress based on the research question and the uniqueness of the sample.

- Determine the timescale of the stressor exposure and how objective exposure will be captured.

- Identify which types of stress responses that will be assessed in the study design (e.g., psychological, behavioral, cognitive, physiological).

- Determine the life stage in which the stressor occurs and choose a measure appropriate for that particular life stage.

- Consider the measurement assessment window and select measures that are specific to the time frame of exposure and/or response.

- Look for well-validated scales that capture these aspects. It is common to use multiple scales to capture different aspects of the stress exposure and stress response, and the range of stress types that might be relevant to the sample.

Based on the criteria set forth by Crosswell and Lockwood (2020) for determining appropriate measures in addition to the definitions of each type of stress, Table 3 provides an overview of the types of stress and corresponding measures that will be used in the current study. In sum, the current study will utilize appropriate definitions for defining each type of psychological stress. This, in turn, allows for appropriate selection of validated measures that capture each type of psychological stress within the appropriate time point (e.g., chronic stress ought to persist for greater than one month) that reflects how long each type of psychological stress ought to persist for and the life stage (e.g., childhood, adulthood, lifetime) of the participant in which they ought to refer to as it relates to each type of psychological stress.

Table 3. Types of stressors and corresponding measures

Stressor	Measure	Time Point	Score Range
Chronic Stress	Perceived Stress Questionnaire	Last 12 months	0 - 1
Acute Stress	Perceived Stress Scale	Last month	0 - 40
Life Events	Social Readjustment Rating Scale	Lifetime/Ever	0 - 600
Traumatic Life Events	Childhood Trauma Questionnaire	Childhood (0 – 18 years)	25 - 125
Traumatic Life Events	Adulthood Trauma Inventory	After the age of 18	0 - 16
Daily Hassles	Daily Hassles and Uplifts Scale	Today	0 - 159

MEASURES OF STRESS

Chronic Stress: Perceived Stress Questionnaire

The Perceived Stress Questionnaire (PSQ; Levenstein et al., 1993) is a 30-item measure assessing chronic stress within the last 12 months – indicative of prolonged, ongoing stress. Each

item uses a four-point Likert scale ranging from 1 (Almost) to 4 (Usually). A total score can be calculated ranging from 0 to 1 with higher scores indicative heightened levels of chronic stress. The measure was first administered to individuals at an outpatient clinic seeking health services, inpatient participants, healthcare workers at a healthcare facility, and a group of college students (Levenstein et al., 1993). An example item includes: '*You have too many worries.*' The PSQ has previously demonstrated strong internal consistency ($\alpha = 0.90 – 0.92$) and demonstrated construct validity among participants in the study in which the PSQ was compared to five other measures of chronic stress (Levenstein et al., 1993).

Acute Stress: Perceived Stress Scale

The Perceived Stress Scale (PSS; Cohen & Williamson, 1988) is a 10-item appraisal measure assessing stress responses within the last month. Each item uses a five-point Likert scale ranging from 0 (Never) to 4 (Very Often). The authors created the measure with the intention of applying it to community samples with at least a middle school education (Cohen et al., 1994). A total score can be calculated with higher scores indicative heightened levels stress response. An example item includes: 'In the last month, how often have you felt that you were unable to control the important things in your life?' The PSS has previously demonstrated adequate internal consistency ($\alpha = 0.78$) and moderate concurrent validity with stress during an average week ($r = .39$, $p < .001$; Cohen & Williamson, 1988).

Life Events: Social Readjustment Rating Scale (SRRS)

The Social Readjustment Rating Scale (SRRS; Holmes & Rahe, 1967) is a 43-item list of stressful life events answered on a Yes/No response set. The authors specify that each event in the list is a "Life Change Unit" in which each unit corresponds to a weight (score) associated with a degree of stress. As the list continues, the weight associated with each unit decreases in

stress level. As such, the higher the overall score and the higher the weight associated with each unit, Holmes and Rahe (1967) indicate the person may be at risk for poorer health outcomes. There are three score thresholds. The lowest threshold specifies that scores ranging from 11 to 150 are associated with the lowest amount of stress and have the lowest risk level of becoming ill in the near future. The second threshold indicates that scores ranging from 151 to 299 have a moderate to high amount of life events stress and the person has a moderate to high chance of becoming ill in the near future. The last threshold ranges from 300 to 600 points and puts a person at the highest risk of becoming ill in the near future due to the endorsement of stressful life events. An example item (and weight) and includes: *'Personal injury or illness (53 points).'* Gerst and colleagues (1978) reported that the SRRS demonstrated strong rank order consistency for healthy adults ($r = 0.89 - 0.96$) and for adults within a clinical sample ($r = 0.70 - 0.91$).

Traumatic Life Events

Childhood Trauma Questionnaire – Short Form (CTQ). The Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998) is a 28-item measure that asks questions related to experiences growing up as a child and a teenager. The measure was initially administered to drug or alcohol dependent participants (Bernstein et al., 1994). Each item uses a five-point Likert scale ranging from 1 (Never True) to 5 (Very Often True). Each of the five subscales produce a scale score ranging from five to 25 with higher scores indicative of severity. The remaining three items can also produce a score ranging from zero to three. Previous work has computed a total score of the five subscales ranging from 25 to 125 with higher scores indicative of overall severity (Bevilacqua et al., 2012). The CTQ has previously demonstrated strong internal consistency ($\alpha = 0.79 - 0.94$; Bernstein et al., 1994). Bernstein and colleagues (1994) report the

measure demonstrated strong convergence reliability with the Childhood Trauma Interview –
indicative of stability over time as it relates to abuse and neglect.

Adulthood Trauma Inventory – Short Version (ATI-SV). The Adulthood Trauma
Inventory – Short Version (ATI-SV; Wittbrodt et al., 2020) is a 16-item measure that assesses
trauma experienced after the first 18 years of age. The measure was administered to a large
sample of participants with various health conditions such as those who had a myocardial
infarction in the previous eight months and participants without coronary disease (Wittbrodt et
al., 2020). The inventory uses a yes/no response set that yields a total score by summing the
number of 'yes' responses. In addition, a frequency scale can be used based on the responses that
were endorsed using a five-point Likert scale (1, 2-3, 4-5, 6-10, more than 10 times). The ATI-
SV has previously demonstrated adequate internal consistency ($\alpha = 0.77$) and convergent validity
with other trauma-related items (Willbrodt et al., 2020).

Daily Hassles: The Hassles and Uplifts Scale (HUS)

The Hassles and Uplifts Scale (HUS; DeLongis et al., 1988) is a 53-item measure used to
evaluate negative and positive experiences occurring daily. Participants were married couples
with at least a middle school education (DeLongis et al., 1988). Participants are asked, *'How
much of a hassles was this item for you today?'* and *'How much of an uplift was this item for you
today?'* As a result, each item is scored twice to yield a hassle score and an uplift score using a
four-point Likert scale ranging from 0 (None or Not Applicable) to 3 (A Great Deal). Scores are
then summed to form two total scores. Higher scores on the hassles portion are indicative of
greater daily stressors while higher scores on the uplift portion are associated with less stress
related to the daily stressors. Example items include: *'Rising costs of common goods'* and *'Being
lonely.'* The Hassles portion previously demonstrated high test-retest reliability ($r = .79, p < .05$)

while the Uplifts portion also demonstrated high test-retest reliability ($r = .72$, $p < .05$).

Psychological Cumulative Stress Index

Given that psychological cumulative stress has not been extensively examined and, therefore, has not been calculated using measures of self-report psychological measures of stress, calculating such an index remains complex. However, in the context of biological cumulative stress, various methods have been proposed to calculate an index. For example, McEwen described using the 75th percentile method for constructing an index of AL (see Seeman et al., 1997). Specifically, biological values of various biological markers belonging to participants in the study were compared amongst each other. Values that were in the 75th percentile (or greater) were given a value of one and deemed as heightened in comparison to participants below the 75th percentile threshold. All other participants were assigned a value of zero for that specific biological marker until all biological markers were examined. Others have taken an alternative approach by examining values that were either in the 25th percentile or 75th percentile and argue that biological marker values in the 25th percentile represent low physiological dysregulation while values in the 75th percentile were indicative of heightened physiological dysregulation (see Hampson et al., 2009). After identifying values that were indicative of physiological dysregulation, the values (0s and 1s) were summed to create an overall composite score bound between 0 and the number of biological markers examined. However, in the context of the current study, using the 25th percentile to examine data obtained from self-report psychological measures of stress is not justifiable. Specifically, as it relates to biological data, lower values are not always healthy and may be abnormal. For example, individuals with low measures of blood pressure (hypotension) may experience symptoms such as dizziness, breathing problems, and/or fainting (American Heart Association, 2016). Related to data obtained from self-report measures

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of psychological stress, lower scores are often perceived as being less stressed and rarely indicate abnormalities. As such, the current study adopted a similar approach by employing the 75th percentile method for calculating the index of psychological cumulative stress.

In utilizing this calculation method, the current study aimed to reduce equating a lessor stressor (e.g., daily hassle; social commitments) to other, more severe stressors such as sexual abuse experienced during childhood (CTQ). By also utilizing this method for creating the index, scores obtained from each measure were not compared or equated with any other types of stress scores obtained from other measures. For example, scores from the CTQ were not compared or equated to daily hassles scores as it may be argued that psychological stress experienced during childhood (may be sexual in nature) is not comparable to stress captured by daily hassles which are often minor in nature and are rarely debilitating. Instead, scores from the CTQ were compared across other participants' CTQ scores.

MEASURES OF PROTECTIVE FACTORS AS MODERATORS ON THE EFFECT OF STRESS ON HEALTH

Posttraumatic Growth Inventory (PTGI-SF)

The Posttraumatic Growth Inventory (PTGI-SF; Cann et al., 2010) is a shortened 10-item version of the original 21-item version (Tedeschi & Calhoun, 1996) used to measure posttraumatic growth after experiencing a traumatic event among adults. The scale uses a six-point Likert scale ranging from 0 (I did not experience this change as a result of my crisis) to 5 (I experienced this change to a very great degree as a result of my crisis). A total score can be derived in which higher scores are indicative of greater PTG. An example item includes: *'I changed my priorities about what is important in life.'* The PTGI-SF has previously demonstrated strong internal consistency ($\alpha = 0.90$; Cann et al., 2010). Research suggests there is

good construct validity ($r = .69$) as responses are often verified and corroborated by others close to the participants (see Weiss, 2002).

Brief Resilience Scale (BRS)

The Brief Resilience Scale (BRS; Smith et al., 2008) is a six-item measure assessing one's resilience to adverse experiences. The scale uses a five-point Likert-scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). An overall score is calculated by obtaining the overall average of the six items. An example item includes: *'I tend to bounce back quickly after hard times.'* The BRS has previously demonstrated good to strong internal consistency ($\alpha = 0.80 – 0.91$). The measure has demonstrated discriminant validity as it was compared to measures of perceived stress, anxiety, depression, negative affect, and physical symptoms with correlations all negatively related to the BRS (Smith et al., 2008).

Multidimensional Scale of Perceived Social Support (MSPSS)

The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988) is a 12-item scale. The scale contains three subscales, measuring social support sources from family, friends, and a significant other. An overall score can also be calculated by obtaining the overall mean. The MSPSS uses a seven-point Likert scale ranging from 1 (Very Strongly Disagree) to 7 (Very Strongly Agree). An example item includes: *'There is a special person with whom I can share my joys and sorrows.'* The MSPSS has previously demonstrated good to strong internal consistency ($\alpha = 0.84 – 0.92$; Zimet et al., 1990) The MSPSS demonstrated good construct reliability between the three subscales and the depression and anxiety subscale from the Hopkins Symptom Checklist (Zimet et al., 1990).

Positive Childhood Experiences (PCEs)

The Positive Childhood Experiences (PCEs; Bethell et al., 2019) is a seven-item scale that asks about positive experiences during the first 18 years of life. The scale uses a Yes/No response set for each question and subsequently employs a total score by summing the number of 'Yes' responses. An example item includes: *'Felt able to talk to family about feelings.'* The PCEs has previously demonstrated adequate internal consistency ($\alpha = 0.77$) and convergent validity (Bethell et al., 2019).

Table 4. Protective Factors as Moderators on the Effect of Stress on Health

Measure	Corresponding Stressor	Time Point	Score Range
Posttraumatic Growth Inventory	Chronic Stress	Following a traumatic event	0 - 50
Brief Resilience Scale	Acute Stress	Following a stressful event	6 - 30
Multidimensional Scale of Perceived Social Support	Life Events	Adulthood	12 - 84
Positive Childhood Experiences	Traumatic Life Events	Before the age of 18	0 - 7
Daily Uplifts (from the HUS)	Daily Hassles	Today	0 - 159

Protective Factors Index

To calculate the over index of protective factors, the current study employed a similar method first described by Zhang et al., (2020) and constructed in Portillo (2021). Specifically, all total scores obtained from each measure of protective factors were standardized and then

averaged to create an overall protective factor score based on the five protective measures described herein.

ALCOHOL USE MEASURES TO ESTABLISH PREDICTIVE VALIDITY OF PSYCHOLOGICAL CUMULATIVE STRESS

Alcohol Consumption

To assess alcohol consumption, the six-question set recommended by the Task Force on Recommended Alcohol Questions of the National Institute on Alcohol Abuse and Alcoholism (NIAAA, 2003) were used for the past three months to obtain the frequency of drinking days, the typical number of drinks consumed, the maximum number of drinks consumed on a drinking occasion, and the frequency of binge drinking episodes.

Alcohol Use Severity

To assess alcohol use severity, the 10-item Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001) was administered. The AUDIT assesses three domains such as Hazardous Alcohol Use, Dependence Symptoms, and Harmful Alcohol Use. Total scores range from 0 to 40. Those with a score of 0 are considered abstainers. Scores ranging from 1 to 7 are indicative of low-risk consumers. Scores ranging from 8 to 14 are indicative of hazardous or harmful consumption. Scores of 15 or greater are indicative of potential alcohol dependence. The AUDIT has previously demonstrated adequate to strong internal consistency, depending on the target population (e.g., substance users, primary care patients; $\alpha = 0.59 – 0.97$; Patel, 2008).

Alcohol-Related Problems

To assess alcohol-related problems, the Rutgers Alcohol Problem Index (RAPI-18; White & Labouvie, 1989) was used. This 18-item measure assessed problems related to alcohol that may have occurred in the previous three years. The items use a five-point scale ranging from 0

(Never) to 4 (More than 10 times). The scores for each item can then be summed to obtain a total

score ranging from 0 to 72 in which higher scores are indicative of more alcohol-related

problems. An example item includes: '*Felt physically or physiologically dependent on alcohol.*'

The measure has previously demonstrated good internal consistency ($\alpha = 0.88$; White &

Labouvie, 1989).

APPROACH TO ANALYSIS

First, a series of independent sample t-tests and crosstabulations were conducted to

identify any potential covariates given the known gender differences in drinking and stress.

These variables were subsequently controlled for in the linear regressions. To account for biases

associated with conducting multiple (21) independent samples *t*-tests, the *p*-value threshold was

divided by the total number of *t*-tests conducted. This resulted in the new associated *p*-value

equaling $p = .0023$.

To examine the construct validity (H1 and H2) that the measures representing chronic

stress, acute stress, life events, traumatic life events, and daily hassles would yield a latent

construct defined as psychological cumulative stress, a confirmatory factor analysis using Mplus

statistical software (version 8.7; Muthén & Muthén, 2021) was conducted (Figure 1). Model fit

was determined by the chi-square statistic, the associated *p*-value, the CFI statistic (values equal

to .90 or greater are indicative of strong model fit), and the SRMR statistic (values less than or

equal to .08 are indicative of strong model fit). As per Kenny et al., (2015), the RMSEA model

fit index was not utilized given the proposed model and associated degrees of freedom. As a

general guide, standard error values of the sample mean that are closer to 0 are indicative of

more accurate estimates of the population parameter.

To examine the construct validity of the that the latent construct of psychological cumulative stress would be supported by the individual measures of psychological stress, an exploratory factor analysis was conducted (Figure 1).
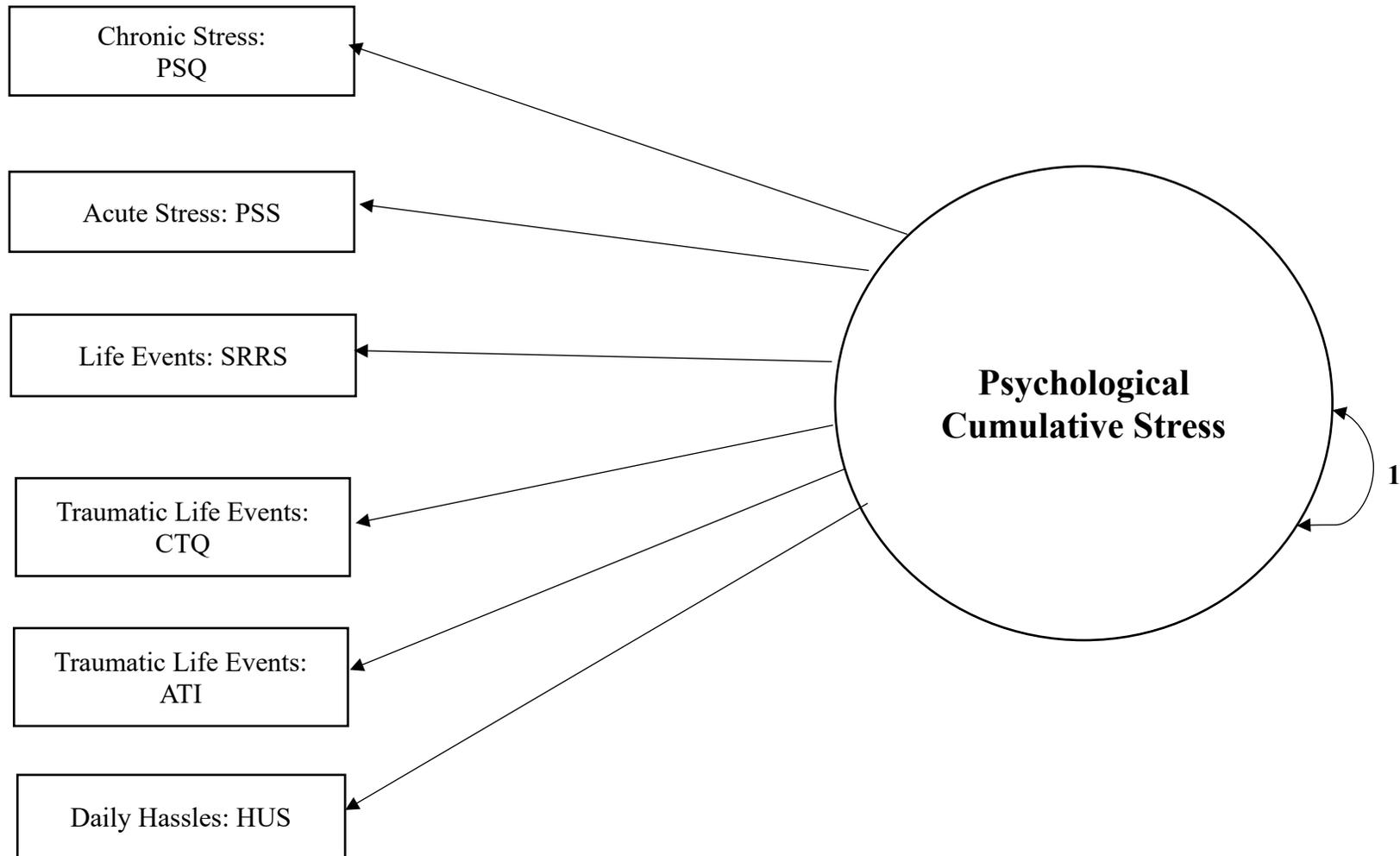
Figure 1. Proposed model of psychological cumulative stress among all participants.

To examine the concurrent validity that psychological cumulative stress latent construct represented by measures of chronic stress, acute stress, life events, traumatic life events, and daily hassles would be positively associated with the frequency of drinking days, the typical number of drinks consumed, the maximum number of drinks consumed on a drinking occasion, the frequency of binge drinking episodes, the volume per week, drinking severity (AUDIT); and alcohol-related problems (RAPI), a single path analysis was utilized using Mplus (Figure 2).
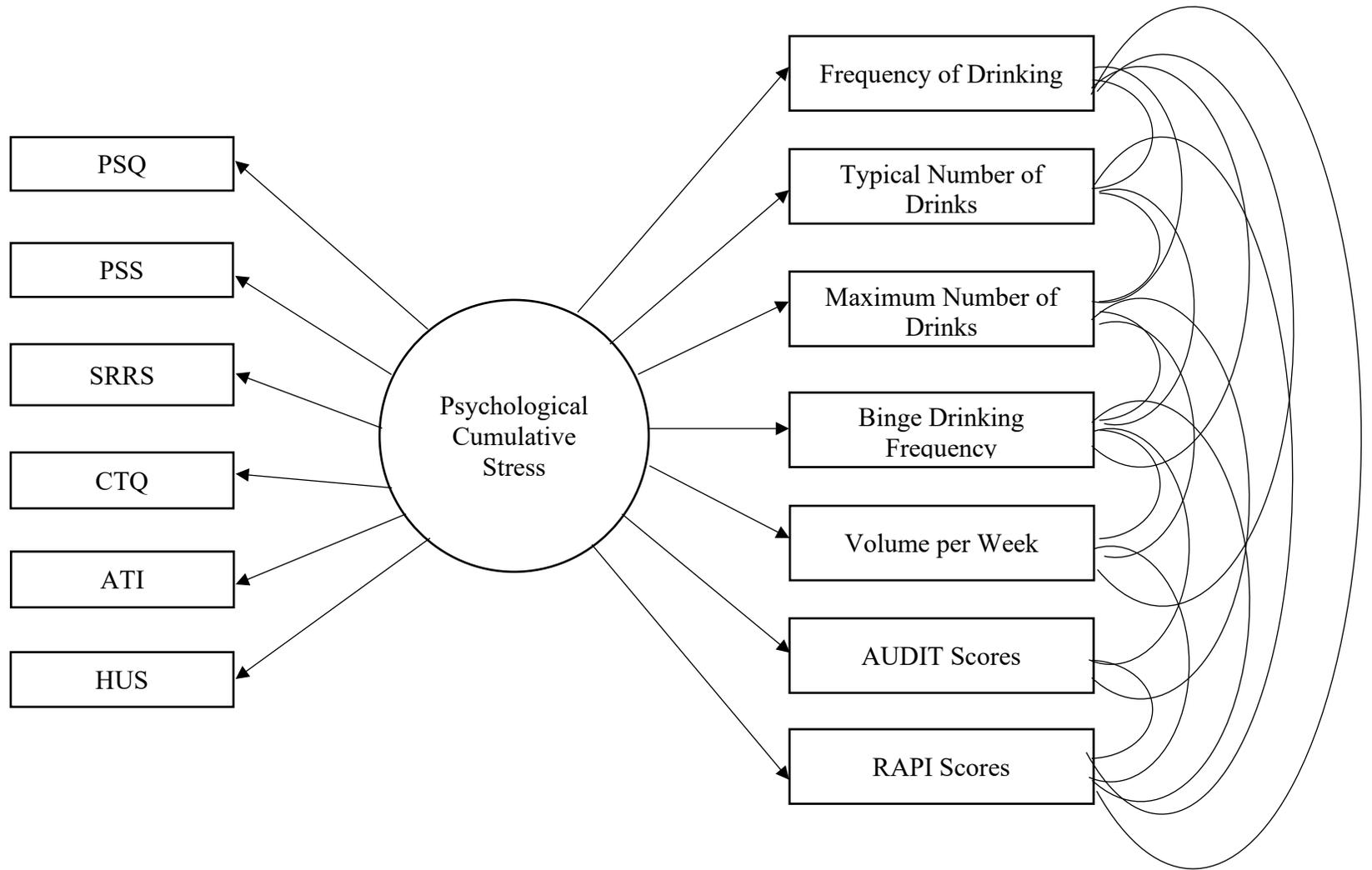
Figure 2. Proposed model predicting drinking outcomes.

To examine the relationships between the index of psychological cumulative stress scores with the drinking outcomes, linear regressions were conducted in SPSS.

To examine the moderating effects of the protective factors on the relationship between the index of psychological cumulative stress on drinking outcomes, separate moderation analyses were conducted in SPSS to examine the effects of the protective factors index on the relationship between the index of psychological cumulative stress and drinking outcomes.

POWER ANALYSIS

A Monte Carlo power analysis in Mplus (version 8.7; Muthén & Muthén, 2021) was conducted to estimate the needed sample size to achieve 90% power. Using the model in Figure 1, the chronic and acute stress factor loadings were each estimated to be 0.35 (residual variance equal to 0.877) given that McEwen and Stellar hypothesize that both chronic and acute stress are the driving force between the wear and tear of the body and brain. The remaining four types of stress were each assigned a 0.30 factor loading estimate (residual variances each equal to 0.910). The six types of stress are hypothesized to load onto a latent construct defined as psychological cumulative stress. The latent construct was assigned a variance of 1. All intercepts were estimated to be 0. The Monte Carlo power analysis was simulated 25,000. The Monte Carlo power analysis determined 330 participants were needed to achieve 90% power. As per Muthén & Muthén (2002), parameter estimates, standard error estimates, and standard deviation estimates were within 5%. Additionally, coverage estimates were between the recommended 91% and 98% threshold.

Chapter 3: Results

SAMPLING

Of the 500 males screened, 228 (45.6%) males met eligibility criteria. Of the 440 females

screened, 233 (53.0%) females met eligibility criteria. All 461 participants were invited to

complete the main survey. Of the 461 eligible participants, 344 (74.6%) participants completed

the main survey. However, eight participants were not compensated as they were found to have

failed more than one attention check. As a result, their responses were omitted from analyses,

thus, data from 336 participants were analyzed comprised of 178 (53.0%) males and 158 (47.0%)

females.

MEASUREMENT INTERNAL CONSISTENCY

Internal consistency for each measure in the current study ranged from adequate to

strong. As it relates to the measures of psychological stress, the PSQ ($\alpha = 0.96$), PSS ($\alpha = 0.92$),

SRRS ($\alpha = 0.86$), CTQ ($\alpha = 0.93$), and the daily hassles ($\alpha = 0.95$) demonstrated strong internal

consistency. The ATI demonstrated the lowest internal consistency of the psychological stress

measures ($\alpha = 0.66$). Moreover, the protective factor measures also demonstrated a similar

internal consistency range of adequate to strong. The PTGI ($\alpha = 0.90$), BRS ($\alpha = 0.93$), MSPSS

($\alpha = 0.94$), and the daily uplifts ($\alpha = 0.96$) yielded strong internal consistency. In contrast, the

PCEs demonstrated the lowest internal consistency of the protective factor measures ($\alpha = 0.78$).

Lastly, as it relates to the drinking measures, the AUDIT demonstrated good internal consistency

($\alpha = 0.83$) while the RAPI demonstrated strong internal consistency ($\alpha = 0.90$).

DESCRIPTIVE STATISTICS

Crosstabulations and independent sample *t*-tests (see Table 5) by biological sex were

conducted for descriptive purposes. Demographic characteristics such as age, race, relationship

status, employment status, educational attainment, income, household size, drinking outcomes, and stress measures were analyzed by gender. These analyses were conducted for descriptive purposes and to identify any potential control variables in subsequent linear regression analyses. Results indicated differences existed in employment status among males and females. Specifically, males were more likely to be employed full-time ($X^2(4) = 23.27$ $p < .001$). Moreover, there were difference observed in age ($t(311.12) = 3.260$, $p = .001$) between males ($M = 36.85$, $SD = 9.54$) and females ($M = 33.14$, $SD = 11.13$) such that males were observed to be older than females. Because of these findings, biological sex, age, and employment status were controlled for in subsequent linear regression analyses (hypothesis 3).

In addition, other gender differences emerged. Specifically, males reported higher typical number of drinks ($t(325.61) = 4.713$, $p < .001$) as well as higher maximum number of drinks ($t(307.59) = 5.356$, $p < .001$) compared to females. Related to stress measures, gender differences emerged such that females scored higher on the Perceived Stress Questionnaire ($t(333) = 3.924$, $p < .001$), the Perceived Stress Scale ($t(334) = 3.637$, $p < .001$), and the Childhood Trauma Questionnaire ($t(303.12) = 3.383$, $p < .001$) compared to males. Lastly, gender differences emerged such that males yielded higher Daily Uplifts scores compared to females ($t(324.58) = 3.212$, $p = .001$).

Table 5. Baseline Characteristics of the Study Sample by Biological Sex ($N = 336$)

Stressor Criteria			
	Female (n = 158)	Male (n = 178)	
Categorical Variables			
	n (%)	n (%)	
Race/Ethnicity			$X^2(3) = 3.84, p = .279$
White	132 (83.5)	142 (79.8)	
Black	7 (4.4)	8 (4.5)	
Hispanic	6 (3.8)	16 (9.0)	
Other	13 (8.2)	12 (6.7)	
Education			$X^2(6) = 4.04, p = .614$
Middle School	2 (1.3)	0 (0.0)	
High School Diploma/GED	43 (27.2)	49 (27.5)	
Trade School	10 (6.3)	15 (8.4)	
Bachelor's Degree	77 (48.7)	88 (53.3)	
Master's Degree	18 (11.4)	15 (8.4)	
Doctoral Degree (MD, PhD, JD, etc.)	4 (2.5)	7 (3.9)	
Other	4 (2.5)	4 (2.2)	
Employment			**$X^2(4) = 23.27\ p < .001$**
Unemployed	21 (13.3)	24 (13.5)	
Part-Time	25 (15.8)	11 (6.2)	
Full-Time	68 (43.0)	117 (65.7)	
Retired	2 (1.3)	3 (1.7)	
Other	42 (26.6)	23 (12.9)	
Income			$X^2(11) = 19.21, p = .057$
Less than $10,000	11 (7.0)	9 (5.1)	
$10,000 - $19,999	14 (8.9)	7 (4.0)	
$20,000 - $29,999	14 (8.9)	14 (7.9)	
$30,000 - $39,999	10 (6.3)	21 (11.9)	
$40,000 - $49,999	13 (8.2)	13 (7.3)	
$50,000 - $59,999	10 (6.3)	21 (11.9)	
$60,000 - $69,999	16 (10.1)	11 (6.2)	
$70,000 - $79,999	12 (7.6)	12 (6.8)	
$80,000 - $89,999	16 (10.1)	9 (5.1)	
$90,000 - $99,999	6 (3.8)	9 (5.1)	
$100,000 - $149,999	25 (15.8)	24 (13.6)	
$150,000 or More	11 (7.0)	21 (11.9)	

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Marital Status			$X^2(3) = 7.00$, $p = .072$
Single (never married)	46 (29.1)	66 (37.1)	
In a Relationship (not married)	55 (34.8)	41 (23.0)	
Married	47 (29.7)	63 (35.4)	
Divorced, Separated, Widowed	10 (6.3)	8 (4.5)	
Continuous Variables	Female *M* (SD)	Male *M* (SD)	
Age	33.14 (11.13)	36.85 (9.54)	***t*(311.12) = 3.260, *p* = .001**
AUDIT Total Score	5.62 (3.04)	6.41 (2.72)	*t*(333) = 1.999, *p* = .046*
RAPI Sum	10.65 (13.34)	13.74 (13.28)	*t*(334) = .078, *p* = .469
Frequency	3.43 (2.07)	3.77 (2.14)	*t*(334) = 1.495, *p* = .136
Typical Number of Drinks	4.61 (3.06)	6.45 (4.06)	***t*(325.61) = 4.713, *p* < .001**
Maximum Number of Drinks	8.23 (4.59)	11.66 (7.04)	***t*(307.59) = 5.356, *p* < .001**
Binge Drinking Frequency	1.18 (1.49)	1.31 (1.69)	*t*(334) = .749, *p* = .454
Volume per Week	15.47 (16.87)	25.11 (26.80)	***t*(302.33) = 3.991, *p* < .001**
Perceived Stress Questionnaire	0.51 (0.20)	0.42 (0.21)	***t*(333) = 3.924, *p* < .001**
Perceived Stress Scale	19.59 (7.44)	16.52 (7.97)	***t*(334) = 3.637, *p* < .001**
Social Readjustment Rating Scale	583.16 (250.51)	546.79 (229.33)	*t*(334) = 1.390, *p* = .166
Childhood Trauma Questionnaire	45.87 (17.97)	39.78 (14.65)	***t*(303.12) = 3.383, *p* < .001**
Adulthood Trauma Inventory	9.13 (6.08)	9.90 (6.40)	*t*(334) = 1.138, *p* = .256
Daily Hassles	30.97 (20.44)	29.71 (22.39)	*t*(334) = .539, *p* = .590
Psychological Cumulative Stress Index	1.82 (1.60)	1.37 (1.55)	*t*(334) = 2.594, *p* = .005*
Posttraumatic Growth	2.00 (1.22)	2.01 (1.17)	*t*(334) = .093, *p* = .926
Brief Resilience Scale	3.09 (0.91)	3.31 (1.02)	*t*(334) = 2.104, *p* = .036*
Multidimensional Scale of Perceived Social Support	5.21 (1.36)	5.16 (1.31)	*t*(334) = .331, *p* = .741
Positive Childhood Experiences	4.24 (2.21)	4.74 (1.99)	*t*(334) = 2.181, *p* = .030*
Daily Uplifts	29.54 (21.76)	38.51 (29.19)	***t*(324.58) = 3.212, *p* = .001**
Protective Factor Index (Standardized)	-0.08 (0.60)	0.07 (0.70)	*t*(334) = 2.198, *p* = .029*

Note. Boldface indicates statistical significance at ***p* = .0023**. AUDIT = Alcohol Use Disorder Identification Test, RAPI = Rutgers Alcohol Problem Inventory. Bias Correction = .05/21 = ***p* = .0023**.

Hypothesis 1

To test the first hypothesis that the measures representing chronic stress, acute stress, life events, traumatic life events, and daily hassles would yield one latent construct defined as psychological cumulative stress (thus demonstrating construct validity; Figure 1), a confirmatory factor analysis was conducted. However, results indicated that the total scores for each measure did not fit the proposed model (X^2 = N/A, p = N/A, CFI = N/A, SRMR = N/A). Moreover, results suggested a potential relationship may exist between the Perceived Stress Questionnaire and the Perceived Stress Scale (r = .968, p < .001). Thus, an exploratory factor analysis was conducted to examine alternative factor structures.

In examining the exploratory factor analysis, results indicated that the data best supported a two-factor model (Figure 3). The first factor was reflected by the PSQ and PSS. The factor loading for the PSQ was .49 (SE = 1.124) while the factor loading for the PSS was 1.97 (SE = 4.573). The second factor was best supported by the SRRS (.40, SE = .055), CTQ (.52, SE = .097), ATI (.92, SE = .105), and HUS (.47, SE = .103). Model fit for the two-factor model demonstrated strong model fit (X^2 = 107.763, p < .001, CFI = .914, SRMR = .061) despite the chi-square statistic and associated p-value being statistically significant. However, while the standard errors for the SRRS (.055), CTQ (.097), ATI (.105), and HUS (.103) on second factor were acceptable, the standard errors observed for the PSQ (SE = 1.124) and the PSS (SE = 4.573) on the first factor indicate the observed mean scores from the sample in the current study may not be accurately representing the population mean scores the respective measures.
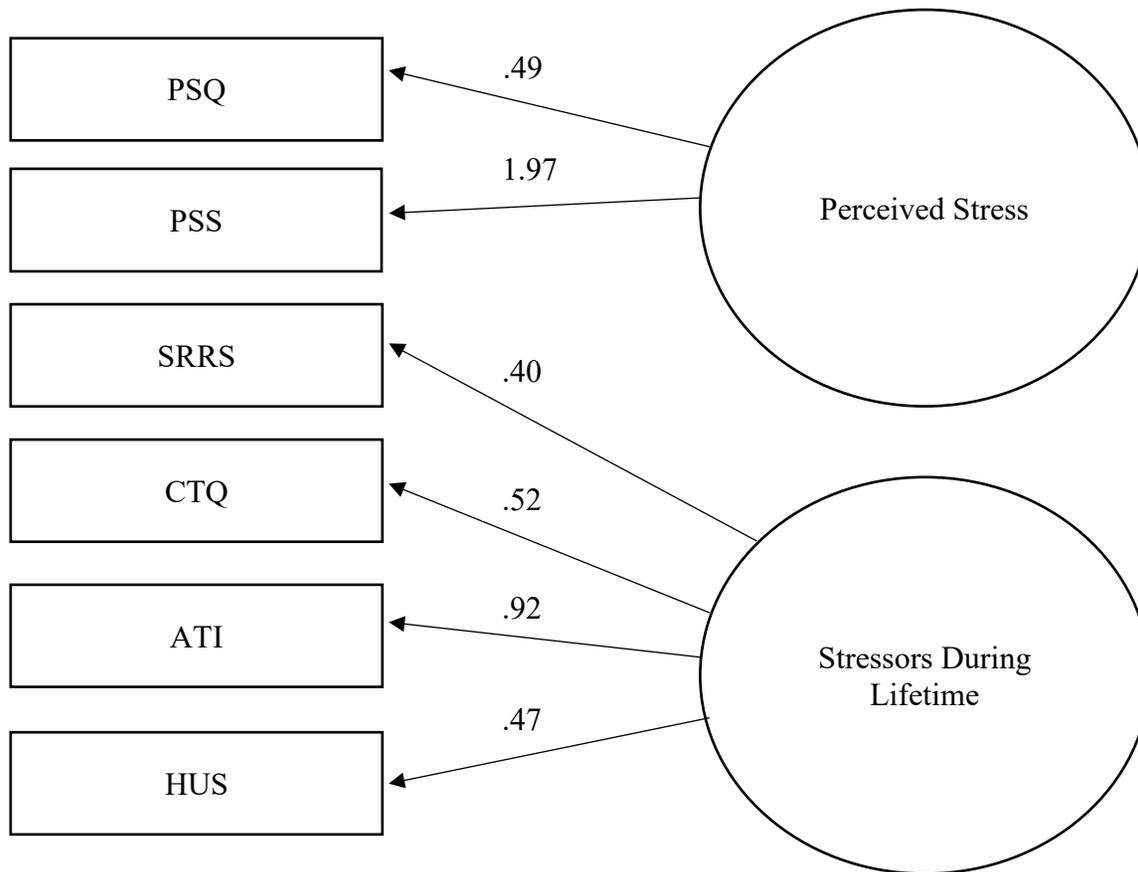
Figure 3. Alternative model suggested by the data.

Hypothesis 2

To evaluate the second hypothesis that the psychological cumulative stress latent construct represented by measures of chronic stress, acute stress, life events, traumatic life events, and daily hassles score would be positively associated with the average number of standard drinks per week, the maximum amount consumed on one occasion, and the frequency of binge drinking; drinking severity; and alcohol-related problems (demonstrating concurrent validity; Figure 2), a CFA was conducted. Results indicated poor model fit which suggests the data does not support the proposed model (X^2 = N/A, p = N/A, CFI = N/A, SRMR = .136).

Based on the results suggesting a two-factor structure (Figure 4), the model was then used to examine the relationship with the seven drinking outcomes. While results indicated stronger model fit ($X^2(36)$ = 168.026, $p < .001$, CFI = .902, SRMR = .045; parameter identification/specification increases fit, e.g., correlations), standard errors were also abnormal. Specifically, standard errors for the PSS (SE = 3.468) on factor 1, the SRRS (SE = 19.342) on factor 2, the CTQ (SE = 1.088) on factor 2, and the daily hassles (SE = 1.315) on factor 2 demonstrated sample means that may not be accurately representing the population mean scores.
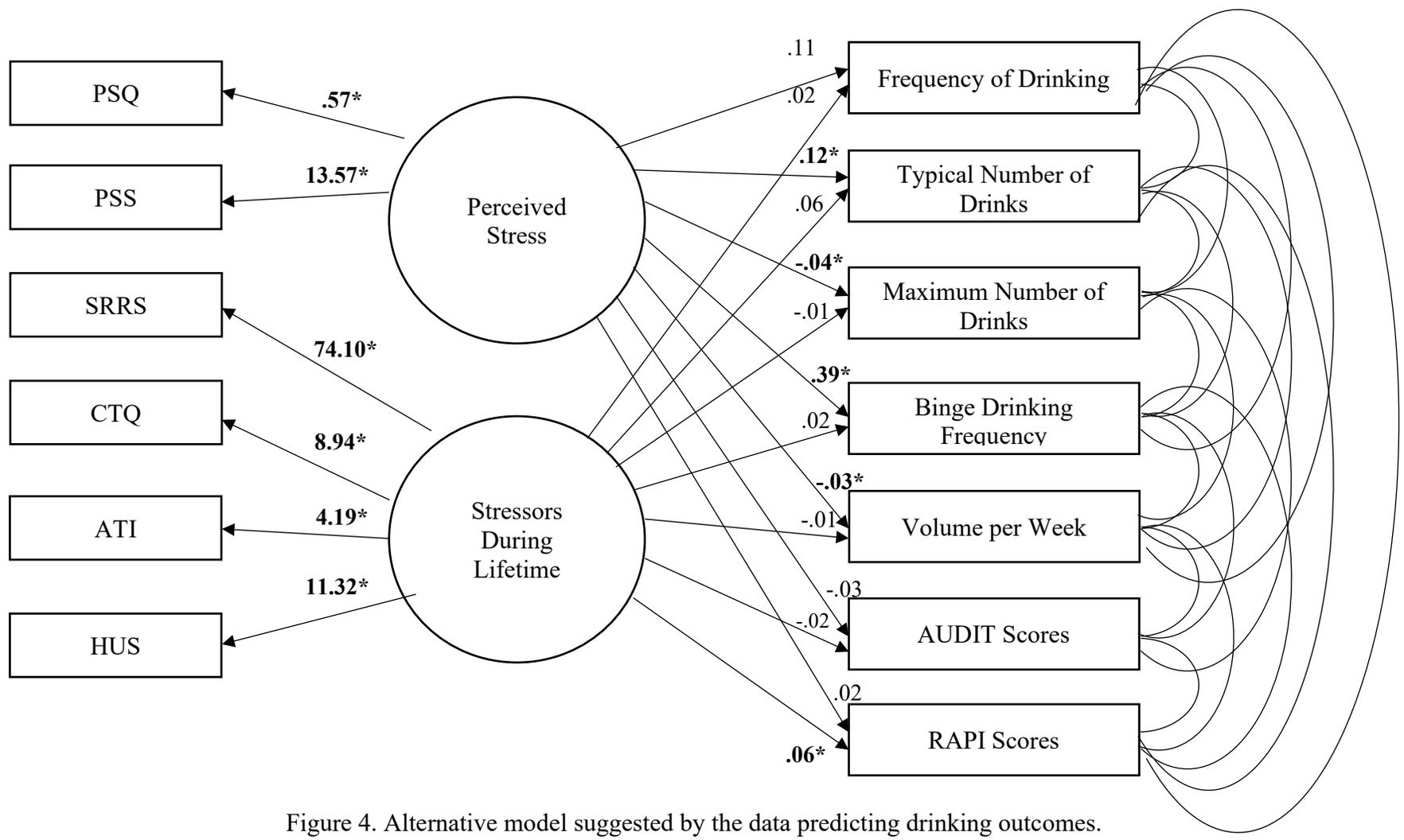
Figure 4. Alternative model suggested by the data predicting drinking outcomes.

Note. **Boldface*** indicates statistical significance at $p < .05$.

Hypothesis 3

To derive the psychological cumulative stress score, frequency and distribution characteristics were conducted (Table 6). The overall 75th percentile psychological cumulative stress score index was bound between 0 and 6 (for the total number of measures representing each stress domain), with higher scores indicative of higher psychological cumulative stress. In the current sample, the lowest observed psychological cumulative stress score was 0, while the highest observed score was 6 (Table 7). To evaluate the third hypothesis that the psychological cumulative stress index score informed by the percentiles would be positively associated with all seven drinking outcomes (demonstrating concurrent validity), the index was entered into the second step of a linear regression after controlling for biological sex, age, and employment status (step 1) to examine the effects of the psychological cumulative stress scores index on drinking outcomes above and beyond the effects of biological sex, age, and employment status.

Table 6: Stress measure score characteristics across all participants ($N = 336$)

Stress Measure	Range	75th Percentile Cutoff	Total Meeting Cutoff
PSQ	.02 - .97	.62	86 (25.7%)
PSS	0 – 40.00	23.00	103 (30.7%)
SRRS	0 – 1,187.00	726.00	84 (25.0%
CTQ	25.00 – 111.00	51.00	85 (25.3%)
ATI	0 – 32.00	14.00	85 (25.3%)
Hassles	0 – 96.00	43.00	88 (26.2%)

Table 7: PCS index score frequencies across all participants ($N = 336$)

PCS Score	Frequency
0	112
1	80
2	52
3	49
4	21
5	16
6	6

Note. PCS = Psychological Cumulative Stress

Frequency of Drinking. The first drinking outcome based on the NIAAA drinking questions during the last 90 days was "During the last 3 months, how often did you usually have any kind of drink containing alcohol?" In step 2 of the model, the psychological cumulative stress index (β = -.010, p = .888) was not statistically significantly associated with frequency of drinking, after holding biological sex, age, and employment status constant.

Typical Number of Drinks. The second drinking outcome was "During the last 3 months, how many alcoholic drinks did you have on a typical day when you drank alcohol?" In step 2 of the model, the psychological cumulative stress index (β = .408, p = .001) was statistically significant and positively associated with the typical number of drinks, holding biological sex, age, and employment status constant.

Maximum Number of Drinks. The third drinking outcome was "During the last 3 months, what is the largest number of drinks containing alcohol that you drank within a 24-hour period?" In step 2 of the model, the psychological cumulative stress index (β = .481, p = .023) was statistically significant and positively associated with the maximum number of drinks, holding biological sex, age, and employment status constant.

Binge Drinking Frequency. The fourth drinking outcome was "During the last 3 months, how often did you have (5 for males)/(4 for females) or more drinks within a two-hour period?" In step 2 of the model, the psychological cumulative stress index (β = .131, p = .021) was statistically significant and positively associated with binge drinking frequency, holding biological sex, age, and employment status constant.

Volume per Week. The fifth drinking outcome was calculated by multiplying the first and second NIAAA drinking questions. In step 2 of the model, the psychological cumulative stress

index ($\beta = 1.637$, $p = .041$) was statistically significant and positively associated with volume per week, holding biological sex, age, and employment status constant.

Alcohol Use Severity: AUDIT. The sixth drinking outcome was the AUDIT. In step 2 of the model, the psychological cumulative stress index ($\beta = 1.162$, $p < .001$) was statistically significant and positively associated with AUDIT scores, holding biological sex, age, and employment status constant.

Alcohol-Related Problems: RAPI. The last drinking outcome was the RAPI. In step 2 of the model, the psychological cumulative stress index ($\beta = 2.656$, $p < .001$) was statistically significant and positively associated with RAPI scores, holding biological sex, age, and employment status constant.

Table 8. Linear regressions using PCS to predict drinking outcomes

Predictor	Frequency of Drinking		Typical Number of Drinks		Maximum Number of Drinks		Binge Drinking Frequency		Volume per Week		AUDIT		RAPI	
	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.095		.071		.090		.015		.053		.022		.014	
Age		.060		-.021		-.048		.009		.184		.034		-.004
Sex		.088		2.019		3.678		.119		8.903		1.579		.165
Unemployed		-.078		-.801		-1.357		-.428		-3.122		.621		3.558
Part Time		.129		-.695		-.998		-.037		.232		1.193		.847
Full Time		.222		-.744		-.638		-.112		.471		-.558		.016
Retired		-1.126		.419		-3.237		.565		-5.402		.501		2.928
Step 2	.000		**.028***		**.014***		**.016***		**.012***		**.072***		**.150***	
PCS Index		-.010		**.408***		**.481***		**.131***		**1.637***		**1.162***		**2.656***

Note. *p < .05.; Employment Status: Other = Referent Condition; PCS = Psychological Cumulative Stress

Hypothesis 4

To evaluate the fourth hypothesis that a standardized cumulative mean score of protective factors (derived using posttraumatic growth scores, resilience scores, social support scores, positive childhood experiences scores, and uplifts) would moderate the effects of the psychological cumulative stress score on all drinking outcomes (Figure 3), the index was entered into SPSS Process (v4.0; Hayes, 2022). Due to the psychological cumulative stress score index being associated with only six of the seven drinking outcomes, moderation analyses were limited to those six drinking outcomes only. Based on the results, the protective factor index score was not observed to moderate the relationship between the psychological cumulative stress score index with (1) the typical number of drinks (F (1, 326) = 1.142, p = .286), (2) the maximum number of drinks (F (1, 326) = .464, p = .496), (3) binge drinking frequency (F (1, 326) = .496, p = .482), (4) volume per week (F (1, 326) = 2470, p = .117), (5) AUDIT scores (F (1, 325) = 3.852, p = .051), or (6) RAPI scores (F (1, 326) = .953, p = .330).

Post-Hoc Analyses – Psychological Measure of Stress to Predict Drinking Outcomes

Based on the results obtained in the CFA and EFA for hypothesis 1 and hypothesis 2 that the individual scores pertaining to each measure of psychological stress did not load onto a single common factor and, subsequently, was not associated with the seven drinking outcomes, additional analyses were conducted to examine the relationship of each total score of the psychological measures of stress measured herein. More specifically, each measure was entered into a linear regression to understand if each measure varied in contribution to the drinking outcomes of interest. Each total score was entered into the second step of a linear regression after controlling for biological sex, age, and employment status. Because the PSQ and PSS measures were highly correlated (r = .884), the PSQ and PSS were compared to identify which models

yielded the greatest variance explained in the absence of one of the variables. The PSS scores yielded the greatest variance (ΔR^2 = .004) across all models compared to the PSQ scores and was subsequently retained in further post-hoc analyses (Table 9).

Frequency of Drinking. For the first drinking outcome, no individual type of psychological stress was associated with the drinking outcome, after holding biological sex, age, and employment status constant.

Typical Number of Drinks. In the second drinking outcome model, no measures of psychological stress were associated with typical drinks after holding biological sex, age, and employment status constant. Notably, however, the variables in the second step yielded a statistically significant change in variance explained increase despite none of the variables being statistically significant.

Maximum Number of Drinks. Related to the largest number of drinks containing alcohol that a participant drank within a 24-hour period, no individual type of psychological stress was associated with the drinking outcome, after holding biological sex, age, and employment status constant. The change in variance explained from step 1 to step 2 was not statistically significant.

Binge Drinking Frequency. Related to binge drinking frequency in the previous 90 days, the CTQ (β = .015, p = .021) and the daily hassles (β = .014, p = .006) were statistically significant and positively associated with binge drinking frequency, holding biological sex, age, and employment status constant. That is, high CTQ and daily hassle scores were associated with increased binge drinking frequency.

Volume per Week. Related to volume per week in the previous 90 days, the SRRS score (β = -.015, p = .020) was statistically significant and negatively associated with the drinking

outcome, holding biological sex, age, and employment status constant. Higher SRRS were associated with decreased weekly drinking volumes.

Alcohol Use Severity: AUDIT. In examining the AUDIT scores as a drinking outcome, the PSS scores (β = .152, p = .008) and the daily hassles scores (β = .058, p = .005) were statistically significant and positively associated with the drinking outcome, holding biological sex, age, and employment status constant. Increased PSS and daily hassle scores were associated with higher alcohol use severity scores as measured by the AUDIT.

Alcohol-Related Problems: RAPI. Lastly, as it related to the RAPI scores, the PSS scores (β = .306, p < .001) and the daily hassles scores (β = .095, p = .002) were statistically significant and positively associated with RAPI scores, holding biological sex, age, and employment status constant. As PSS and daily hassle scores increased, alcohol-related problems increased.

Table 9. Linear regressions using each psychological measure of stress

	Dependent Variables: Drinking Outcomes													
	Frequency of Drinking		Typical Number of Drinks		Maximum Number of Drinks		Binge Drinking Frequency		Volume per Week		AUDIT		RAPI	
Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.096		.071		.090		.015		.053		.022		.014	
Age		.060		-.021		-.048		.009		.184		.034		-.004
Sex		.088		2.019		3.678		.119		8.903		1.579		.165
Unemployed		-.078		-.801		-1.357		-.428		-3.122		.621		3.558
Part Time		.129		-.695		-.998		-.037		.232		1.193		.847
Full Time		.222		-.744		-.638		-.112		.471		-.558		.016
Retired		-1.126		.419		-3.237		.565		-5.402		.501		2.928
Step 2	.021		**.032***		.029		**.060***		**.034***		**.124***		**.205***	
PSS		.026		.001		-.045		-.016		.089		**.152***		**.306***
SRSS		-.001		-.001		.001		-.001		**-.014***		.000		.002
CTQ		.005		.013		.023		**.015***		.085		.032		.044
ATI		-.018		.066		.139		-.011		.217		-.005		.143
Hassles		.002		.011		.001		**.014***		.070		**.058***		**.095***

Note. *$p < .05$.; Employment Status: Other = Referent Condition; PSQ removed – highly correlated with PSS ($r = .884$)

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Post-Hoc Analyses – Psychological Measure of Stress and Protective Factors Predicting

Drinking Outcomes

In addition, the present study also examined the main effects of each protective factor and measure of psychological stress on all drinking outcomes (Table 10). Given the multicollinearity observed in the previous models, the PSQ score was omitted from these analyses. Demographic characteristics such as biological sex, age, and employment status were controlled for in the first step. The psychological measures of stress scores and the protective factor scores were entered in the second step.

Frequency of Drinking. For the first drinking outcome, no protective factor or measure of psychological stress were associated with the frequency of drinking outcome after holding all else constant. The addition of the variables in step 2 did not result in a statistically significant change in variance explained.

Typical Number of Drinks. In the second drinking outcome model, posttraumatic growth scores were statistically significant and negatively associated ($\beta = -.486$, $p = .037$) with typical number of drinks, holding all else constant.

Maximum Number of Drinks. Related to the largest number of drinks containing alcohol that a participant drank within a 24-hour period, the posttraumatic growth scores were statistically significant and negatively associated ($\beta = -.946$, $p = .014$) with the maximum number of drinks while daily uplift scores were statistically significant and positively associated ($\beta = 1.068$, $p = .017$) with the maximum number of drinks, holding all else constant.

Binge Drinking Frequency. Related to binge drinking frequency in the previous 90 days, the CTQ ($\beta = .020$, $p = .013$) and the daily hassles ($\beta = .013$, $p = .025$) were statistically significant and positively associated with binge drinking frequency, holding all else constant.

Volume per Week. Related to volume per week in the previous 90 days, the posttraumatic growth scores (β = -3.521, p = .016) were statistically significant and negatively associated with volume per week, holding all else constant.

Alcohol Use Severity: AUDIT. Related to the AUDIT scores as a drinking outcome, the daily hassles score (β = .069, p = .003) was statistically significant and positively associated with the drinking outcome, holding all else constant.

Alcohol-Related Problems: RAPI. Finally, as it relates to the RAPI scores, the PSS scores (β = .240, p = .026) and daily hassles score (β = .090, p = .010) were statistically significant and positively associated with the drinking outcome, holding all else constant.

Table 10. Linear regressions using each protective measures and psychological stress measure

| | Dependent Variables: Drinking Outcomes | | | | | | | | | | | | | |
| | Frequency of Drinking | | Typical Number of Drinks | | Maximum Number of Drinks | | Binge Drinking Frequency | | Volume per Week | | AUDIT | | RAPI | |
Predictor	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
Step 1	.095		.071		.090		.015		.053		.022		.014	
Age		.060		-.021		-.048		.009		.184		.034		-.004
Sex		.088		2.019		3.678		.119		8.903		1.579		.165
Unemployed		-.078		-.801		-1.357		-.428		-3.122		.621		3.558
Part Time		.129		-.695		-.998		-.037		.232		1.193		.847
Full Time		.222		-.744		-.638		-.112		.471		-.558		.016
Retired		-1.126		.419		-3.237		.565		-5.402		.501		2.928
Step 2	.036		**.058***		**.060***		**.073***		**.053***		**.145***		**.231***	
PSS		.036		.006		.039		-.013		.207		.089		**.240***
SRRS		-.001		-.001		.002		.000		-.010		.001		.004
CTQ		.007		.029		.043		**.020***		.133		.052		.076
ATI		-.021		.071		.131		-.011		.236		-.002		.152
Hassles		.006		.010		-.008		**.013***		.057		**.069***		**.090***
PTGI		-.172		**-.486***		**-.946***		-.158		**-3.521***		-.696		**-1.221***
BRS		.241		-.314		.642		-.032		.536		-.597		-1.065
MSPSS		-.043		.346		-.143		-.027		.196		-.151		-.771
PCE		.091		.194		.399		.138		.727		.818		1.411
Uplifts		-.034		.444		**1.068***		.152		2.948		-.056		.950

Note. *$p < .05$.; Employment Status: Other = Referent Condition; PSQ removed – highly correlated with PSS ($r = .884$)

Post-Hoc Analyses – Psychological Measure

Based on the two-factor model suggested by the data, a post-hoc power analysis was conducted using the following factor loadings and residual variances: PSQ = .49 (.745), PSS = 1.97 (-2.882), SRRS = .40 (.840), CTQ = .52 (.734), ATI = .92 (.155), and the Hassles portion of the HUS = .47 (.781). While the factor loadings and residual variances for the four total scores loading onto the second factor were estimated to be 100% powered, the PSQ and the PSS were each estimated to only be 69% powered to detect an effect if one truly existed in the population.

Chapter 4: Discussion

The purpose of the current study was to examine if (1) measures representing chronic stress, acute stress, life events, traumatic life events, and daily hassles loaded onto a single common factor referred to as psychological cumulative stress; (2) if the same measures that loaded onto the single common factor were associated with drinking outcomes; (3) if an index of psychological cumulative stress was positively associated with drinking outcomes; and (4) if measures of protective factors used to create an index moderated the effects of the psychological cumulative stress measure on drinking outcomes. It was hypothesized (H1) that the measures representing each type of psychological stress would load onto a single common factor (psychological cumulative stress). It was also hypothesized (H2) that the model would then be positively associated with drinking outcomes such that higher levels of psychological stress would be associated with greater drinking consumption, high levels of alcohol use severity, and greater alcohol-related problems. Furthermore, it was hypothesized (H3) that an index of psychological cumulative stress informed by the measures of psychological stress would be positively associated with all drinking outcomes. Lastly, it was hypothesized (H4) that an index of protective factors scores informed by multiple (complimentary to the types of psychological stress) would lessen the effects of psychological cumulative stress on all drinking outcomes. Overall, the data did not support the proposed models, and the index of protective factors did not influence the relationship between the psychological cumulative stress index on the drinking outcomes. However, the index of psychological cumulative stress was positively associated with six of the seven drinking outcomes such that higher scores were associated with increased drinking rates, increased drinking severity, and increased alcohol-related problems. Thus,

psychological stress captured by self-report psychological measures may be an appropriate way to operationalize psychological cumulative stress in the context of drinking patterns and problems.

The findings observed in the current study may be attributed to multiple factors. First, as it relates to Figure 1 (and, subsequently, Figure 2), the data supported a two-factor structure in which chronic stress and acute stress loaded onto a common factor while the remaining four measures representing life stress (1), traumatic life stress (2), and daily hassles (1) loaded onto a second common factor. The first factor may be best described as perceived stress while the second factor may be better in line with McEwen's theory which states that stress over time compounds and affects health outcomes over time. The measures in the second factor, overall, generally refer to stressors experienced at different timepoints of one's life. Thus, there appears to be preliminary support for McEwen's theory which postulates that stress compounds over time – furthering the argument for the need to examine stress more comprehensively (e.g., allostatic load, psychological cumulative stress). However, standard errors for the PSQ and the PSS in the two-factor model indicated that the sample mean scores may not reflect the population mean scores thus potentially indicating the need of additional participants to further examine the concept of psychological cumulative stress.

An additional interpretation as it relates to standard errors may be that the measures selected to represent the types of psychological stress may be more closely related than previously theorized. It may be reasoned that, for example, stressors experienced during childhood may manifest into chronic stress (Miller et al., 2011; Rohleder, 2019) or some repeated acute stressor may develop into chronic stress (Rohleder, 2019). The argument may also be made for daily hassles evolving into acute or chronic stress (e.g., the relationship with one's spouse (a daily hassle) may also be a source of acute/chronic stress for those in an abusive relationship). It may

be reasonable to infer that some measures of psychological stress may be associated with one another. However, allowing the measures to correlate with one another presents a statistical limitation as it relates to model overidentification and degrees of freedom. As a result, understanding the full nature of psychological stress and, subsequently, psychological cumulative stress from a statistical approach (Figure 1) is not yet fully understood. Additionally, the poor model fit, and the large standard errors observed in the sample indicate that the method in which psychological cumulative stress was operationalized based on the framework may not be appropriate. Lastly, the single factor and two-factor models did not indicate strong model fit with the drinking outcomes as suggested by model fit indices. Thus, it may be reasonable to infer that (1) alternative measures that capture the various types of psychological stress warrant future investigation, (2) alternative models of psychological cumulative stress may exist, (3) alternative conceptualizations for measuring psychological cumulative stress warrant further exploration, and (4) understanding and capturing psychological cumulative stress using measures of self-report measures of psychological stress remains complex.

Despite the statistical models not being supported by the data, the constructed index (an alternative approach to understanding psychological cumulative stress) appeared to be supported as it relates to drinking outcomes. Specifically, when constructing the psychological cumulative stress score and examining the relationship with drinking outcomes, the index was positively associated with six of the seven drinking outcomes thus suggesting strong support for the conceptualization of the psychological cumulative stress index based on McEwen's original method for calculating allostatic load. While the psychological cumulative stress index was not associated with the frequency of drinking, this may be attributed to type of drinker recruited for the current study. The current study focused on at-risk drinkers defined by the NIAAA. Results

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for this drinking outcome suggests that the participants in the current study may not drink frequently but when one does, the amount consumed may be higher than what is typically safe (as per NIAAA guidelines). This is evident by the amount consumed when drinking and the volume per week variables calculated in the present study. Furthermore, the method in which psychological cumulative stress was measured appears to be strongly supported. To the knowledge of the author, no other study had previously used multiple self-report measures of psychological stress capturing a specific type of stress to examine the concept of psychological cumulative stress (including obtaining a measure similarly calculated to allostatic load) in the context of drinking. The method in calculating psychological cumulative stress employed in the current study has previously been used to obtain a measure of allostatic load (see Hampson et al., 2009; Hu et al., 2007; Portillo, 2021; Seeman et al., 1997) informed by biological markers. While it may be argued that the number of psychological measures used in the current study may have been too few, studies using biological markers to construct an index of allostatic load have used as few as six biological markers (see Chen et al., 2015; Doan et al., 2014). Moreover, the selection of measures in the current study is notable for following a conceptual framework for defining and selecting appropriate measures to capture various types of psychological stress (Crosswell & Lockwood, 2020).

In addition to finding support for the psychological cumulative stress score index, the index is notable for the in-group comparison of scores from each participant to identify high level of stress for each measure. In doing so, this type of comparison prevents equating scores such as those obtained in the CTQ to measures of daily hassles in which stress endured during childhood may be perceived as more severe in nature compared to minor inconveniences endured on a particular day. Lastly, using the 75th percentile method to measure psychological cumulative

stress also eliminated the multicollinearity issue previously observed and also reduced standard error coefficients previously observed in prior models.

In the current study, the first two hypotheses were not supported. Additionally, the fourth hypothesis that the protective factor index would moderate the relationship between psychological cumulative stress and drinking outcomes was also not supported. The measures of protective factors selected in the current study each corresponded to a specific type of psychological stress as its counter measure. However, this index was not found to moderate any of the six relationships in which the psychological cumulative stress index was statistically significant. More interestingly, the index of protective factors were positively associated with the drinking outcome of interest. These findings are counterintuitive and not in the expected direction. Coupled with multiple protective factors that may also buffer against hazardous alcohol use, this finding is particular noteworthy as it may indicate that psychological cumulative stress measured herein may more strongly contribute to drinking outcomes and outweigh the benefits of the protective factors that may potentially buffer against both the specific type of psychological stress measured herein and drinking. The current findings may suggest there are essentially no protective effects against hazardous alcohol use.

While the results observed in the crosstabulations and independent samples t-tests were conducted for descriptive purposes and to identify any potential covariates, some findings are noteworthy. First, males were more likely to work full-time. This is consistent with a global statistic suggesting there are more males than females in the workface (International Labor Organization, 2022). Further research is warranted to examine if the gender difference gap in employment is increasing psychological stress among females. As it relates to the independent samples t-tests, alcohol use severity scores as measured by the AUDIT demonstrated gender

differences at the $p < .05$ (irrespective to the bias correction) such that males yielded higher scores compared to females. This is not particularly surprising given that males tend to drink more than females. This finding was further supported by the statistically significant differences in the typical number of drinks consumed, the maximum number of drinks consumed, and the volume per week consumed. Notably, however, there were no differences in binge drinking frequency. This may indicate that males and females are engaging in binge drinking episodes at similar rates as they relate to the gender thresholds. In and of itself, future research is warranted examining binge drinking patterns among males and females and the potential risk factors associated with binge drinking. As it relates to scores of psychological measures of stress, findings in the current study confirmed that females typically have higher levels of stress compared to males. This was supported by the significant differences observed in the PSQ (chronic stress), PSS (acute stress), and the CTQ (traumatic life events during the first 18 years of life). This finding was further supported by the gender differences observed in the psychological cumulative stress index measured herein. In contrast, males were observed to have statistically significantly higher resilience scores, positive childhood experience scores, daily uplifts scores, and an overall cumulative protective factor index score compared to females. Taken altogether, future research examining the effects of psychological stress experiences throughout the lifetime and the role of protective factors are warranted to further understand how psychological stress is internalized and managed over time.

Post-Hoc Analyses: Individual Measures of Stress Related to Drinking Outcomes

Based on the results indicating the protective factors index did not moderate the relationship between the psychological cumulative stress index and drinking outcomes, additional analyses were conducted. First, the present study examined the main effects of each measure of

psychological stress on the drinking outcomes as it relates to the main effects of the measures of psychological stress on drinking outcomes (Table 7) only, daily hassles was observed to be statistically significant and positively associated with binge drinking frequency, AUDIT scores, and RAPI scores. While daily hassles may be perceived as a minor stressor, previous research has reported that increased levels of daily hassles are associated with declines in health (Asselmann et al., 2017; Segal & VanderVoort, 1993). In addition, the current study observed a positive association between PSS scores with AUDIT and RAPI scores, respectively. Also observed in the present study was the positive association between the CTQ scores and binge drinking frequency. This is consistent with previous findings reported by Baiden and colleagues (2022) as it relates to childhood stressors and binge drinking engagement. However, one finding observed in the present study that was not in the expected direction was the relationship between Social Readjustment Ratings and volume per week. The present study observed that, as Social Readjustment Ratings increase, volume per week decreased, holding all else constant. This suggests that life events may be associated with reductions in the weekly volume consumption. Previous research conducted by Mason and colleagues (2016) reported life stress measured by the SRRS as being positively associated with hazardous alcohol consumption. Thus, findings in the present study are unexpected and not in accordance with prior research.

The present study also examined the main effects of each protective factor and each measure of psychological stress on the drinking outcomes. In contrast, when examining the main effects for all types of psychological stress and protective factors on drinking outcomes, posttraumatic growth was negatively associated with four of the drinking outcomes. These findings are in the expected direction. On the other hand, daily uplifts was observed to be positively associated with the maximum number of drinks consumed. This finding was not in the

expected direction. However, Mereish and colleagues (2018) previously reported that, among a sample of heavy drinkers, daily positive events were associated with increased alcohol use. The present study differs from the findings reported in Mereish et al., (2018), however, in that participants in the present study were at-risk drinkers as defined by the NIAAA and not heavy drinkers. Thus, further research is warranted examining daily uplifts as it relates to at-risk drinkers.

Limitations

The current study is not without limitations. First, the current study comprised of participants that largely self-identified as White (81.5%). As a result, the findings in the current study may not be generalizable to other ethnoracial groups thus warranting future research with better representation of minority groups. Additionally, while the present study used the recommended questions set forth by the NIAAA for measuring drinking, other, more precise measures for measuring drinking rates should be employed in future work such as the Timeline Followback (Sobell & Sobell, 1992). Also, while the present study identified measures of psychological stress that best matched the definitions set forth by Crosswell and Lockwood (2020), alternative measures of psychological stress may have been more appropriate in comparison to the measures selected herein. Also, while Crosswell and Lockwood (2020) identify the UCLA Life Stress Interview (Hammen et al., 1995) as a measure of "cumulative stress," it is important to note that inconsistencies may arise in the measure such that participant rating scores and researcher rating scores may differ. It is also important to note that the UCLA Life Stress Interview is a semi-structured interview and requires training to appropriately apply it with participants. Lastly, the present study did not collect biological samples to analyze biological

markers associated with stress to understand the relationship between stress captured biologically and psychologically.

Despite these potential limitations, this present study is notable for being the first study to examine the concept of psychological cumulative stress using self-report measures of psychological stress that represent a wide array of stress measures reflecting different timepoints and severity set forth by Crosswell and Lockwood (2020). The current study is also significant for employing the calculation method first set forth by McEwen (see Seeman et al., 1997). Additionally, the present study is notable for the use of an online sample of at-risk drinkers in the United States. Although retrospective in nature, the present study's examination of multiple life stages and time frames (as it relates to psychological stress) and the examination of multiple protective factors as it relates to alcohol use is notable. Also, the findings from the current study argue for a more thorough examination of psychological stress endured during one's lifetime rather than relying on a single type of psychological stress that may not adequately capture the compounding stressors endured over time. Lastly, the present study is noteworthy for employing a conceptual framework and establishing the foundation of a theoretical framework for psychological cumulative stress to examine the relationship with alcohol consumption.

Future Directions

Based on current findings, future research is warranted examining other ethnocultural groups. The current study comprised mostly of White participants. As a result, the current findings may not be generalizable to other ethnocultural groups in the United States – particularly among those who experience psychological stress due to ethnoracial issues. Additionally, future research is warranted in which biological samples are collected in addition to measures of psychological stress. This may further the understanding of the relationship between stress

captured by biological samples (allostatic load) and stress captured by measures of psychological stress (psychological cumulative stress). This is particularly of interest based on previous findings reported in Portillo (2021) of the lack of correlation between an index of AL and cumulative life stress. Future research may wish to also examine clinical samples to further understand the impacts of psychological cumulative stress and drinking. Similar to Portillo (2021), a similar index may then be created to examine if the index is sensitive enough to detect potential group differences between those diagnosed with an AUD and healthy control participants. Future research may wish to examine psychological cumulative stress and the relationship with other health outcomes such as obesity, exercise, and other health problems. Such research may further strengthen the current state of research findings are they relate to AL scores and health status. Finally, future research establishing appropriate measures of psychological stress to use to calculate psychological cumulative stress is warranted as this concept remains largely unexplored.

Conclusions

The current findings of psychological cumulative stress suggests that the relationship with drinking and psychological cumulative stress may be positively associated. Studies examining the relationship between alcohol use and psychological cumulative stress informed by self-report measures is currently limited. Moreover, multiple protective factors used to create a separate index may not be appropriate or sensitive enough to counter the effects of psychological cumulative stress on drinking. As previously observed in Zhang et al. (2020) and Portillo (2021), the method in which stress is measured may play a vital role in understanding the effects of perceived stress measured by psychological measures of stress and the effects of stress perceived by the body measured by biological markers. As a result, drinking motives may play an important role as it relates to lifetime stress.

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Vita

Carlos Portillo, Jr, was born and raised in El Paso, Texas. While at The University of Texas at El Paso, he was awarded the BUILDing SCHOLARS scholarship, funded by the National Institutes of Health, under the mentorship of Dr. Craig Field. He earned his bachelor's of science degree in Psychology from The University of Texas at El Paso. In the fall of 2017, he enrolled in the doctoral program in Psychology to pursue a master's degree in Clinical Psychology. He earned his master's degree in Clinical Psychology in the spring of 2021. He continued to work under the mentorship of Dr. Craig Field.

His first-year project was a secondary data analysis focusing on psychological cumulative stress in a sample of men diagnosed with an alcohol use disorder. Throughout his time working with Dr. Theodore Cooper, Carlos earned a publication as a second author published in the *Journal of Ethnicity in Substance Abuse*. Carlos currently has multiple manuscripts in preparation/under review under Dr. Craig Field's mentorship. He has also collaborated on numerous poster presentations.

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