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Coping with College Stress: Does Sense of Coherence Influence the Use of Alcohol and OTC Medication?

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Abstract

The combination of stress and psychological symptoms (e.g., anxiety, depression) have been associated with alcohol consumption and the nonindicated use of over the counter (OTC) medications. However, some people have personal resources that contribute to a successful management of the stress response. Antonovsky's (1987) salutogenic theory proposes that a person's sense of coherence (SOC) buffers the relationship between stress appraisal and stressor-induced reactions. This study examined the SOC in relation to associations of stress-related indices with substance-related coping behaviors. One hundred and sixty-five college student participants completed questionnaires that assessed their demographics, stressors, perceived stress, SOC, psychological/physical symptoms, as well as their past thirty-day use of alcohol and OTC cold/pain medications. Path analyses of these data yielded some reasonably fitting models, with mixed support for study hypotheses. Results from these analyses showed that college students may consume alcohol for reasons unrelated to the reported stress experience. Results also showed that students use OTC cold and pain medications in response to stressors and psychological symptoms. Although there is limited evidence for gender differences among the variables in this study, findings showed that when experiencing stress, males tended to consume more alcohol and OTC medications relative to females. The clinical and educational implications of these findings are discussed.

COPING WITH COLLEGE STRESS: DOES SENSE OF COHERENCE INFLUENCE THE USE OF ALCOHOL AND OTC MEDICATION?

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Coping with College Stress: Does Sense of Coherence Influence the Use of Alcohol and OTC Medication?

Arnett (2000) described the period between ages 18-25 as "emerging adulthood," a time when young adults are experiencing dramatic shifts in their relationships, risk taking behavior, insight, worldviews and identity. Coincident with these psychological and behavioral transitions are changes in brain anatomy. According to Dr. Giedd, the Chief of Brain Imaging at the National Institutes of Mental Health, the dorsal lateral prefrontal cortex, a region of the brain responsible for inhibiting impulses, weighing consequences of decisions, prioritizing, and strategizing, does not fully develop until the ages of 23 to 25 (Giedd, 2004). This line of research suggests that individuals who are between the ages of 18 to 25, in contrast to older adults, have a decreased ability to contemplate and plan actions, evaluate consequences of behaviors, assess risk, and think strategically. These factors related to self-regulation are coincident with the age when most young adults attend college.

A report from the U.S. Department of Education (2012) shows that the number of individuals attending college has risen from approximately 15 million in 2000 to 21 million in 2010. Of these 21 million students, approximately nine million students were between the ages of 18 to 24. By the year 2020, attendance is predicted to increase by 11 percent for students in this age range. These statistics project a growing young adult population in pursuit of a college education. However, their endeavor is fraught with a variety of challenges including separation from family, negotiating the transition to academia, learning to balance multiple roles, changes in social support, financial pressures, interpersonal development, and academic concerns (Schulengberg & Maggs, 2002). While some students are able to manage stressors in healthy and effective ways, others have more difficulty dealing with such challenges (cf. Jorgensen,

Frankowski, & Carey, 1999). Failure to deal with these demands can contribute to high levels of stress, which, in turn, can lead to a variety of health, psychological, and behavioral problems such as substance abuse (Adlaf, Gliksman, Demers, & Newton-Taylor, 2001; American College Health Association, 2011; D'Zurilla & Sheedy, 1991; Ellard, Barlow, & Mian, 2005; Nerdrum, Rustøen, & Rønnestad, 2006).

Because the stress experience is a ubiquitous byproduct of the college student culture, it is important to determine the mechanisms that influence the stress-coping process. Thus, the primary objective of this study was to examine the role of personal resources (i.e., SOC; Antonovsky, 1987) on the relationship between life stressors, perceived stress, and the use of alcohol and OTC medications as coping mechanisms within this population.

Stress, Mental Health, and College Students

Cohen, Burt, & Bjorck (1987) point out that populations in a developmental transition, such as college students, are especially vulnerable to experiencing acute and chronic stressors which can increase their perception of stress and experience of stress-related symptoms. According to a report from the American College Health Association (N = 90,666) the number of college students reporting 'higher than average' (43%) and 'tremendous' (10%) levels of perceived stress has increased from previous years (ACHA, 2012). Other studies have documented moderate perceived stress levels in 75% to 80% of college students and severe perceived stress levels in 10% to 12% of students (Abouserie, 1994; Pierceall & Keim, 2007). The experience of stress can induce a variety of problems including general distress (Compas, Wagner, Slavin, & Vanatta, 1986), depression and anxiety (McEwen, 2000; Roos & Cohen, 1987), substance use (McEwen, 2000), and health problems (Bailey & Miller, 1998; Dyson & Renk 2006; Lumley & Provenzano 2003; Pritchard, Wilson, & Yamnitz, 2007).

Along with increasing stressors and overall stress levels, the prevalence of psychiatric disorders among college students is also rising (Gallagher, 2009). The ACHA report (2012) indicated that the number of students reporting symptoms of depression and anxiety has grown from 11% in 2008 to 12% in 2012 and from 18% in 2008 to 20% in 2012, respectively. Consistent with ACHA findings, a recent meta-analytic study (N = 63,706) examining generational differences between the years 1938 to 2007 reported a 70% increase in measured psychopathology in today's student population compared with those from the 1930s and 1940s (Twenge et al., 2010). Additionally, Rawson, Bloomer, & Kendall (2001) examined the relationship between stressful life experiences, anxiety, depression, and illness in college students and found significant and positive correlations between illness and anxiety as well as depression and stressful experiences. A more recent study (Dyson & Renk, 2006) found that increased college stressors were directly related to higher levels of depressive symptoms. Further, the 2008 Associated Press-mtvU poll examined 2,253 students, aged 18 to 24, and showed that 85% of the sample reported experiencing emotional stressors and 57% reported that these stressors have impacted their mental health. These statistics clearly document that increased stressors and poor mental health is not only a prevalent problem for college students, but that this problem is increasing.

Self-Medication and College Students

Theories of self-medication (Conger, 1956; Khantzian, 1985, 1997; Leshner, 1997; Willis & Shiffman, 1985) propose that individuals use substances to reduce dysphoric mood states. Of particular concern to this study is the frequently reported use of substances as coping strategies to alleviate emotional (e.g., anxiety, depression) or psychosocial stressors in college students (see Ham & Hope, 2003 for a review). This method of self-medication has been documented by

Weitzman (2004) in her investigation of mental health and drinking patterns of 27,409 students at 119 colleges. Study results showed that approximately 5% of students reported having poor mental health and, of this group, 81.7% reported using alcohol as a method of coping and 78% reported experiencing high levels of harm (e.g., poor grades, unsafe sex, vandalizing property) in relation to their alcohol use. Additionally, O'Hare and Sherrer (2000) conducted a study on 315 college students and found that those with at least a moderate level of stressors exhibited greater increases in problem drinking and marijuana use in the previous 3 months than did students reporting lower levels of stressors. These findings highlight the notion that individuals with poor coping skills are more likely to self-medicate. Although using substances to self-medicate may provide a temporary respite, this method of coping can also enhance symptoms and lead to a pattern of increased and/or chronic substance use (Cooper, Frone, Russell, & Mudar, 1995; Degenhardt & Hall, 2001; Hittner, 1995; Hutchinson, Patock-Peckham, Cheong, & Nagoshi, 1998; Park, Armeli, & Tennen, 2004; Weinberger & Bartholomew, 1996; Yokoyama, Nishikitani, & Araki, 1999).

Alcohol as a Coping Behavior

According to the National Center on Addiction and Substance Abuse (CASA, 2007), alcohol is preferred by college students because it is a readily available, socially acceptable, and minimally enforced substance. Large-scale surveys have shown that 80% to 90% of college students drink alcohol (Barnes & Welte, 1983; Barnes et al., 1992; Engs & Hanson, 1985; Johnson, Leonard, & Jacob, 1989; Wechsler & Isaac, 1992; Wechsler & McFadden, 1979), and a significant number (20%-25%) drink excessive amounts (Berkowitz & Perkins, 1986). Although many students report using alcohol to increase socialization (Stewart, Zeitlin, & Samoluk, 1996), others report using alcohol to reduce stress, anxiety, depression or feelings of low self-worth, and

to get drunk (CASA, 2007; Weitzman, 2004). For example, Perkins (1999) found that more than 50% of undergraduates identified stressors as a motivation for drinking for both males and females. In addition, Kidorf and Lang (1999) showed support for the stressor–alcohol relationship by demonstrating that, relative to female undergraduates, male undergraduates drank more in response to delivering a speech on their most undesirable characteristic than when seated in a room consuming alcohol in their usual manner. Reduction of stress-related symptoms or mood enhancement by means of alcohol consumption also has been associated with future and/or prolonged use of this substance (Fenzel, 2005; Hussong et al., 2001; Hutchinson et al., 1998; Kidorf & Lang, 1999; Kushner & Sher, 1993; Kushner, Sher, Wood, & Wood, 1994; McCreary & Sadava, 1998; O'Hare & Sherrer, 2000; Sadava & Pak, 1993; Wechsler et al., 1994).

OTC Medications as a Coping Behavior

Along with alcohol, OTC medications also are a readily available, socially acceptable, and minimally enforced class of substances. Although these medications are intended to treat to physical symptoms, they are often 'misused' (used for nonindicated purposes) for self-medication and recreational purposes.

A variety of sources indicate that use (and misuse) of OTC medications is on the rise. For example, a national survey conducted in 2002 on 451 health professionals (e.g., physicians, nurses, and pharmacists) by the National Council for Patient Information & Education (NCPIE) and Harris Interactive indicated that nearly 80% reported concern about the inappropriate use of OTC medications among the public, with 73% believing that consumers are taking more OTC products than 5 years ago. This poll also assessed OTC use (6 months prior) among 1,011 adult Americans and found that the most commonly used OTC medications were for treatment of pain (78%) and/or a cough, cold, or sore throat (52%). In addition, significant numbers (33%) of

Americans report that they have taken more than the recommended dose of a nonprescription medicine in order to make the medicine more effective. Of these consumers, 69% reported taking more than the recommended dose at a single time; 63% report taking the next dose sooner than instructed; and 44% reported taking more than the recommended number of doses in a day. Because these medications are generally available and frequently misused, the increase in their use has created a public health concern (Levy, 2004). This concern is especially germane for at-risk groups such as college students who have poor self-regulation skills (Giedd, 2004).

Concern for Public Health over OTC Medication Misuse

In response to the increasing use and potential for misuse of OTC medications, the National Consumers League (NCL) and the Food and Drug Administration (FDA) have declared the issue a threat to public health. In 2004, these agencies launched "Take with Care", a public education campaign designed to increase awareness about the misuse of OTC medications. Specifically, the campaign documented the risks associated with overusing or combining OTC preparations (Levy, 2004). Additionally, the NCPIE and the Surgeon General, Dr. Richard Carmona, initiated the national "Be MedWise" campaign, which promoted safe use of OTC medicines among consumers. Furthermore, The Partnership for a Drug-Free America with support from the Consumer Healthcare Products Association (2006) created a comprehensive, multi-year prevention and education campaign to alert the public of the risks associated with OTC abuse. More recently, the Consumer Healthcare Products Association (CHPA) has joined with the Community Anti-Drug Coalitions of American (CADCA), Drug Abuse Resistance Education (D.A.R.E America), and the Pharmaceutical Research and Manufacturers of America (PhRMA) to implement various programs targeted at educating young people and parents about the dangers of abusing OTC medications (CHPA, 2010). These campaigns not only warn of the

dangers of OTC medication use but also of the potentially dangerous interactions of OTCs with alcohol consumption. For example, in response to FDA stipulations, Tylenol manufactures have listed associated risks to the product label: "*Alcohol Warning: If you consume 3 or more alcoholic drinks every day, ask your doctor whether you should take acetaminophen or other pain relievers/fever reducers. Acetaminophen my cause liver damage. Do not use with other products containing Acetaminophen*." Moreover, acetaminophen is used as an additive to the antitussive agents (e.g., cough suppressants) found in many cough/cold medications, with excess amounts of these ingredients posing serious health risks (Williams & Kokotailo, 2006). However, despite concerted efforts to warn consumers, public health agencies have been unable to curb the rising use of OTC medications (Bryner et al., 2006; Diener, Schneider, & Aicher, 2008; Johnston, et al. 2006; Wilcox, Cryer, & Triadafilopoulos, 2005).

Risks Associated with OTC Medication Misuse

The use or misuse of OTCAs is especially harmful in concert with other substances, such as alcohol (Diener et al., 2008; Roumie & Griffin, 2004). Individually, these medications typically are taken to relieve minor aches and pains associated with headaches, arthritis, toothaches, menstrual cramps and fevers, or as an additive agent to cough and cold medications. The most common OTCAs used by Americans are acetaminophen (e.g., Tylenol) and non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin (e.g., Bayer, Bufferin), ibuprofen (e.g., Motrin, Advil) and naproxen (e.g., Aleve) (Kaufman, Kelly, Rosenberg, Anderson, & Mitchell, 2002; NCPIE, 2002; Paulose-Ram, Hirsch, Dillon, & Gu, 2005; Slone Epidemiology Center, 2006). In the 2009 *Health Bulletin: Use Caution with Pain Relievers,* the FDA noted that excessive use of analgesics can lead to gastrointestinal bleeding (acetaminophen and NSAIDs), liver damage (acetaminophen), and kidney damage (NSAIDs) and if combined with alcohol,

these conditions can worsen. Excessive use of OTCAs, such as NSAIDs, can also have side effects such as medicine-induced headaches, myocardial infarction, and death (Abbott & Fraser, 1998; Dyb, Holmen, & Zwart, 2006; Hawton et al., 1995; Matzke, 1996; Nakahura, Griswald, & Lamire, 1998; Perneger, Whelton, & Klag; 1994; Thomas, Straus, & Bloom, 2002; Zwart, Dyb, Hagen, Svebak, & Holmen, 2003).

The excessive use or misuse of OTC cold/cough medications has also been associated with harmful side effects and/or health risks. For instance, some first generation antihistamines (e.g., Benadryl, Vicks NyQuil, Alka-Seltzer) contain the ingredient diphenhydramine, which can significantly impair a person's alertness and cognitive function. When used in excess, these medications can cause more serious problems related to vision, gastrointestinal, and cardiovascular problems including hypotension, tachycardia, and palpitations (Young, 2008). Moreover, some decongestants (e.g., Dimetapp, Sudafed) contain the ingredients of pseudoephedrine and phenylephrine, which have been associated with side effects related to the central nervous system (CNS) activation, including nervousness, dizziness, and sleeplessness (Young, 2008). Other health concerns related to the excessive use of products containing these ingredients include stroke, heart palpitations, transient hypertension, ocular irritation, and urinary retention (Young, 2008). Further, some antitussive (cough suppressant) medications (e.g., Alka-Seltzer, Coricidin, Dimetapp, Robitussin, Sudafed, TheraFlu, Tylenol, NyQuil) contain the ingredient dextromethorphan (DXM), which can cause side effects including confusion, excitation, nervousness, and irritability (Young, 2008). High doses of DXM may cause intoxication and/or disorientation, depersonalization, confusion, impaired coordination, agitation, distortions of speech or motion, and dissociative anesthesia (Schwartz, 2005; Young, 2008). Over time, heavy use of DXM may cause psychosis, dependence, and physical withdrawal

(Lessenger & Feinberg, 2008). Clearly, prolonged or excessive use of OTC medications can cause serious health problems; however, despite these contraindications, individuals continue to misuse and overuse these substances.

Prevalence of OTC Medication Use

Several studies and two nationwide surveys have documented the increasing prevalence of OTC use, primarily NSAIDs (Diener et al., 2008; Kaufman et al., 2002; Roumie & Griffin, 2004; Wilcox et al., 2005). Wilcox et al., (2005) analyzed data from two extensive surveys, inclusive of over 9,000 participants and concluded that rates of OTCA use have risen dramatically from 17% in 1997 to 83% in 2002 with ibuprofen-based products being the most frequently used medication (Roper Starch Wordwide Proprietary Telephone Research Center 1997; Harris interactive NCL survey, 2002). Several studies of college student populations also show high and increasing rates of OTC medications and especially NSAID use (Acocella, 2005; Burak & Damico 2000; French & James, 2008; Floyd, 1991; Hanoch, Katsikopoulos, Gummerum, & Brass, 2007; Stasio, Curry, Sutton-Skinner, & Glassman, 2008; Vener, Krupka, & Climo, 1982). This rather extensive body of research indicates quite clearly that OTC medication use in both the general and the college student populations is widespread and growing. The frequent use of OTC medications has also lead to increased misuse in which the student takes these medications in excess or for symptoms that are not consistent with the manufacturer's indications (Brass, 2001; Murray & Brewerton, 1993).

Misuse of OTC Pain Medications

Misuse is the use of OTC analgesics for nonindicated purposes. Several studies have examined the misuse of OTC pain medications in the general population. For example, a study of 3,282 individuals in Finland found that daily OTCA misuse was related to having a depressed

mood and experiencing stressors such as being unemployed (Turunen, Mantyselka, Kumpusalo, & Ahonen, 2005). Additionally, Svarstad (1983) found that 84% of women and 79% of men misused OTCAs to manage high levels of stressors compared to 60% of women and 41% of men who used OTCAs and reported no life stress. Another study examining 25-44 year olds (N = 4, 739) participating in a national cross-sectional survey in Denmark found a significant graded association between reported levels of perceived stress and OTCA misuse. The odds ratio for OTCA misuse was 1.36 (CI = 1.19 – 1.55) among participants who sometimes felt stress, and 1.91 (CI = 1.58 – 2.30) among participants who often felt stress, compared with participants without stress (Koushede, Holstein, Andersen, Ekholm, & Hansen, 2010). These studies show that increased stressors and a heightened perception of stress are associated with increased OTCA use, which, in turn, may increase the risk of health problems.

Although several studies have documented the use of OTCAs for reducing pain (e.g., headaches) (Abbott & Fraser 1998; Antonov & Isacson, 1998; Porteous, Bond, Hannaford, & Sinclair, 2005) or misuse in overcoming daily stressors and/or coping with negative affect states; only a few have investigated nonindicated use in the college student population. One study investigating OTCA use in female college students with stress-related headaches found that OTC analgesics were misused primarily for reducing anxiety (Hansen, Hansen, & Holstein, 2008). Additionally, Hart and Hill (1997) studied the influence of premenstrual distress on the use of OTCAs in female undergraduates. The authors found that the relationship between premenstrual distress and OTCA use could generalize beyond premenstrual symptoms to misusing these medications for stress-related symptoms such as autonomic reactions and negative mood. Another study that examined the relationship between anxiety and the misuse of OTCAs in male and female college students (N = 201) found that increased doses of ibuprofen were positively

related to reported anxiety (Stasio et al., 2008). All of these studies suggest that college students take OTC medications not only to reduce physical symptoms but also for relief of psychological discomfort.

Misuse of OTC Cold Medications

There is also a dearth of research examining the misuse of OTC cold medications in college students. The majority of published studies have targeted adolescents or young adults from the general population. Additionally, these studies have focused primarily on misuse of OTC cold medications that contain DXM, and not on other types of OTC cold medications. For example, the 2008 National Survey on Drug Use and Health (NSDUH), estimated that in 2006, more than 3 million people from the general population (aged 12 to 25) misused an OTC cold medication (e.g., NyQuil, Robitussin) containing DXM to get high at least once in their lifetime and nearly 1 million had in the past year. Further analyses of these data showed that lifetime misuse of these products was higher in young adults aged 18 to 25 compared with youths aged 12 to 17 (6.5% versus 3.7%). Further, Ford's (2009) subsequent analysis of the NSDUH data (N = 18,314) found that there was a greater likelihood of misusing OTC cough/cold medications among older adolescents (participants between the ages of 12 and 17) who rated their overall health as fair or poor, reported having a major depressive episode, and/or reported heavy drinking. Several studies examining DXM misuse in high school students show similar findings. For example, the University of Michigan's Monitoring the Future Survey (N = 48,460) and the Dayton Area Drug Survey (N = 4,176) assessed the misuse of DXM among high school students (Falck, Li, Carlson, & Wang, 2006; Johnston, O'Malley, Bachman, & Schulenberg, 2006). These surveys showed that the highest rate of DXM misuse occurred in older as compared to younger students. In addition, a study analyzing data from 1999 to 2004 reported by the California Poison

Control System (CPCS), American Association of Poison Control Centers (AAPCC), and Drug Abuse Warning Network (DAWN) revealed 7-to-10-fold increases in DXM abuse cases (Bryner et al., 2006). Furthermore, the 2006 DAWN report conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA) estimated that that DXM accounted for 16,858 emergency department visits in 2004. Of note, alcohol was a coingestant in approximately 41% of the visits for those aged 18 to 20.

These studies indicate that although the misuse of OTC medications may begin in adolescence, it increases throughout the young adult years. Further, for many students, the college experience tends to normalize and encourage rather than restrict substance use. The vast availability and acceptability of alcohol and OTC medications combined with the student's newfound autonomy, an environment that encourages experimentation, and a desire to escape from mounting stressors or psychological symptoms via self-medication creates conflict for the underdeveloped mind of a college student. Although the above studies document the rising trend for the misuse of OTC medications (e.g., self-medicate negative moods, feelings, or psychological problems) in the teenage or general population, few have examined this trend in college students. Therefore, a primary focus of this study is to assess the use and misuse of substances in this at risk population.

Alternative Coping Responses to Stress: The Salutogenic Model

Although stressors are ubiquitous, and for many, create a variety of consequences (Dohrenwend & Dohrenwend, 1974; Kirsch et al., 1990; Largo-Wight et al., 2005; Rabkin & Struening, 1976; Sax, 1997), the way a person manages such stressors largely determines those consequences (Antonosky, 1987). The literature on alcohol and OTC medication use has focused

largely on usage rates, risk factors, negative consequences, and/or disease without examining factors that may buffer the effects of stressors.

Antonovsky (1979), proposed a model that emphasizes resilience or health-promoting personal attributes. That is, his theory of salutogenesis emphasizes the positive attributes linked to individuals' successfully adapting to life stressors. This theory differs from the traditional pathogenic approach of identifying risk factors for disease; instead, the goal is to promote the role of protective and health-promoting factors within the stress-disease relationship. In the salutogenic theory, health or disease mark the endpoints of a health continuum (Antonovsky, 1979), which represents the interplay of opposing forces between internal/external environmental stressors and the individual's actions in response to health or disease. The presence of stressors (e.g., biological, chemical, physical, or psychosocial stimuli that are perceived as threats) creates tension, which produces either a pathogenic, neutral, or salutogenic outcome. Antonovsky (1987) argued that individuals who typically perceive stressors as non-threatening and have adequate resources to manage these demands will be more likely to resolve the mounting tension. However, those who typically perceive stimuli as threatening and have inadequate resources to manage the demands will be less effective at resolving the tension and, as a result, will be more likely to experience poor health outcomes.

Sense of Coherence

The salutogenic model summarizes a broad assortment of factors that influence stress, coping, and health. Although Antonovsky (1979) relied upon these frameworks to construct the salutogenesis theory, he advanced the model by creating the concepts of generalized resistance resources (GRRs) and sense of coherence (SOC). Antonovsky described a GRR as a "physical/biochemical, artifactual-material, cognitive, emotional, valuative-attiduinal,

interpersonal-relational, or macro-socio-cultural characteristic of an individual, primary group, subculture, or society that is effective in avoiding and/or combating a wide variety of stressors" (Antonovsky, 1979, p. 103). The GRRs can be found within people as internal resources (genetics, cognitive ability, problem solving skills) or within their material (money, housing, food, clothing, education) and non-material (situational factors, social support/integration) environment. Thus, the GRRs emphasize the influence of emotional, physical, psychological, and social characteristics in coping with stressors, health, and psychological well-being. Antonovsky (1979, 1991) asserted that life experiences as well as access to and the use of GRRs determines whether a person perceives his or her world as coherent, which, in turn shapes outcomes, such as overall health.

Sense of coherence is a personality disposition that is shaped by life experiences and stabilizes in early adulthood (Sagy, Antonovsky, & Adler, 1990). Antonovsky defined SOC as: "…a global orientation that expresses the extent to which one has a pervasive, enduring, though dynamic feeling of confidence that (1) the stimuli deriving from one's internal and external environments in the course of living are structured, predictable, and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges, worthy of investment and engagement," (Antonovsky, 1987, p. 19). These three components of the theory are: *comprehensibility*, *manageability*, and *meaningfulness*. Comprehensibility refers to the degree to which a person is able to cognitively comprehend perceived stimuli (external or internal). Individuals who score high on this item typically perceive stimuli as ordered, consistent, and understandable. If this individual experiences unexpected stimuli, he or she will attempt to interpret the stimuli as orderly and explicable (Antonovsky, 1987). High manageability is the perception that one has adequate resources, either

on his or her own or through a legitimate other such as a spouse, friend, colleague, or a physician, to handle the challenges of stimuli. Low manageability is the feeling of being unfairly treated or victimized (Antonovsky, 1987). Finally, meaningfulness refers to the extent to which a person is able to assign emotional value to perceived stimuli. High meaningfulness is associated with commitment and engagement to stimuli that are considered as challenges and worthwhile investments (Antonovsky, 1987). Essentially, SOC represents one's use of internal and external resources as a means to identify, understand, and cope with tension (stress) in an effective, health-promoting manner.

Sense of Coherence and Correlates of Psychological Health

A plethora of studies has verified the stress-buffering effects associated with sense of coherence. For example, Antonovsky (1993) summarized the findings of 42 studies of SOC and health. Eriksson and Lindstrom (2006) compiled a summary of results from 458 papers and 13 doctoral theses published across the years of 1992 to 2003. In general, these authors concluded that examinations of the relationship between SOC and psychological health or wellness produced stronger associations than did those of SOC and physical health. In addition, studies examining college student stress showed that SOC was significantly related to psychological health and inversely related to stress (Baker, 2003; Darling, McWey, Howard, & Olmstead, 2007). These findings support Antonovsky's (1987) assertion that the development of a salutogenic orientation is important for the maintenance of mental health throughout the life cycle.

Other studies examining psychological health have shown that SOC is also negatively correlated with anxiety (e.g., Frenz, Carey, & Jorgensen, 1993; Hittner, 1994; Strümpfer, Gouws, & Viviers, 1998). Although some researchers argue that SOC may be mainly a proxy measure

for negative affect (e.g., anxiety) (Hittner, 1994; Korotkov, 1993); others maintain a broader conceptualization of the SOC measure. For example, Strümpfer et al. (1998) propose that SOC and anxiety are on opposite ends of a continuum, whereas SOC quantifies the impact of health and measures of trait anxiety focus on reactions to stressors. Furthermore, Schnyder, Büchi, Sensky, & Klaghofer (2000) suggest that SOC is not merely a proxy measure of negative affectivity, but rather a partially independent, general measure of a person's world view. In order to help clarify the relationship between the measure of SOC and psychological symptoms, such as trait anxiety, these variables were included in this study.

Sense of Coherence, Stress, and Substance Use

Because psychological and physiological symptoms derive from the experience of stress and because SOC has been associated with each of these factors, it is reasonable to suggest that SOC may moderate stress-related behaviors. Specifically, if college students use alcohol and OTC medications to cope with life stressors and if SOC moderates their reaction to these stressors, then SOC may also moderate their decision to use/misuse these substances. Unfortunately, only a few studies have explored aspects of the relationship between stressors, SOC, and/or alcohol or OTC medicine use and these studies have produced contradictory findings.

Studies examining SOC and drinking behavior in the general population have produced mixed results. For example, Allison, Adlaf, Ialomiteanu, & Rehm (1999) examined data from 1,395 Canadians (ages 20 to 24) participating in the 1994 National Population Health Survey. Results showed that SOC and alcohol consumption were unrelated; however, a significant and positive relationship between chronic stressors and heavy drinking was present. Conversely, Midanik & Zabkiewicz (2009) used data from the 2000 U.S. National Alcohol Survey (N =

7,612) to assess the relationship of SOC and alcohol dependence in adults (18 years and older) residing in all 50 states. For those categorized as drinkers (N = 4,630), results showed a strong and positive relationship between SOC and the likelihood of not meeting DSM criteria for alcohol dependence. Results from this study also showed that men with a high SOC were more likely than women with a high SOC to not meet the criteria for alcohol dependence. Additionally Midanik, Soghikian, Ransom, & Polen (1992) studied a sample of older adults and found significantly lower SOC scores in male participants who reported heavy drinking patterns than in males with moderate alcohol consumption or females with moderate or heavy alcohol consumption. Further, Badura, Gorczyca, Tomalczyk, and Matysiakiewicz (2000) conducted a study of male and female patients (ages 21 to 53) suffering from alcohol dependence syndrome versus healthy persons (ages 21 to 44). These authors found that SOC was significantly lower for male drinkers when compared to both healthy participants and female drinkers.

Further, a review of the literature revealed only two studies that examined the relationship between SOC and drinking in college students specifically. One study (Frenz, Carey, & Jorgensen, 1993) examined the psychometric properties of SOC in relation to perceived stress, negative affect, and drinking in a college student population. These authors found no relationship between SOC and alcohol consumption. Another study (Kuuppelomäki & Utriainen, 2003) investigated SOC and drinking in students attending a Finnish polytechnic school also found no associations between drinking and the strength of SOC. Clearly, the bulk of the literature has focused on the general population and this line of research has produced inconsistent findings. Relatively little research has examined the buffering effect of SOC on stressors and alcohol use in college students.

Findings from studies on SOC and OTC medications have been more consistent, although none of these studies involved college students and none examined the relationship between SOC and OTC cold medication. A review of the literature on OTC pain medication revealed a cross-sectional epidemiological study that investigated the relationship between SOC and self-reported OTC analgesic use for headaches in 1,393 Danish adolescents (Koushede & Holstein, 2009). Results showed that both males and females who scored high on SOC tended to use less medication than those who scored low on SOC. More recently, Koushede et al. (2010) examined the use of OTC analgesics, perceived stress, and stress-related pain or discomfort in Danish adults (N = 4,739) who ranged in age from 25-44 years old. The authors found a significant and graded association between perceived stress, pain/discomfort, and OTCA use for both males and females. Koushede, Holstein, Anderson, & Hansen (2011) furthered this inquiry by examining whether SOC modified the association between perceived stress and analgesic use for headaches in another sample of Danish adults aged 25-44 (N = 990). The authors found that SOC modified the association between perceived stress and medicine use for both genders. However, this association was stronger in females than males. Findings from these studies show that a high SOC moderates the effects of stress on OTC misuse in adolescents and adults; however, this effect has not been investigated in the college student population.

A common finding in studies of SOC and alcohol use is that either of these variables may differ markedly for males and females. Some studies have shown that gender has either no association (Allison et al., 1999; Frenz et al., 1993; Kuuppelomäki & Utriainen, 2003) or a significant association (Badura et al., 2000; Midanik & Zabkiewicz, 2009; Midanik et al., 1992) with SOC and alcohol use. Mixed findings have also been reported in studies on OTC medication use (Koushede & Holstein, 2009; Koushede et al., 2010; Koushede et al., 2011).

These studies indicate that gender does influence the relationship between SOC and OTC medication use; however, this relationship is inconsistent and it is therefore important to evaluate it further.

Purpose of Study

The increasing prevalence of stress, illness, and substance use within the college student population is a serious problem (Stewart-Brown et al., 2000) and a major issue for campus health services and mental health policy-making (Royal College of Psychiatrists, 2003). Understanding this phenomenon is important because it affects a student's potential for educational attainment, future occupational achievement, and overall quality of life (Kessler, Foster, Saunders, & Stang, 1995). Tosevski et al., (2010) and Voelker, (2003) emphasized the need for nationwide health promotion programs that target mental health and stress reduction to improve the overall well-being of college students. As discussed above, these individuals may pursue alternative and sometimes risky strategies for managing the deleterious effects that stress can have on their mental and physical health. Although the use of alcohol as a coping agent in college students is widely studied, the study of college students' use of OTC medications as a means of coping is scarce. Because excessive use of either or both of these substances can cause serious health problems, it is important to investigate their prevalence in college students. It is equally important to investigate the factors that may protect students from engaging in these negative health behaviors. A combined focus on substance use and protective mechanisms may inform the development of a SOC based training programs or intervention strategy for these at-risk students.

The primary purpose of this study was to examine the role of salutogenic factors on the stress-coping process. In the context of a hypothesized relationship between stress and health, SOC is thought to influence the students' perception of stress and thereby their use or misuse of

substances. In this study, the SOC construct is viewed as a personal resource that moderates the relationship between stressful life events, perceived stress, and consumption of alcohol and/or OTC medication.

Study Hypotheses

Previous studies have shown an intercorrelation among a number of variables including Sense of Coherence (SOC), Perceived Stress, Alcohol use, and OTC medication use. This study included a more in-depth examination of the extent to which SOC moderates and Perceived Stress mediates the relationship between Level of Stressor and Alcohol, OTC Cold/Pain medication, or All Substance (combination of alcohol and OTCs) use in college students. Figure 1 provides a visual summary of the expectations that the current study tested in a path analytic format.

Hypothesis 1: Research has shown that substance use correlates significantly with stressors, (e.g., Ham & Hope, 2003; O'Hare and Sherrer, 2000), perceived stress (Koushede et al, 2010), and SOC (Koushede et al., 2011; Midanik & Zabkiewicz, 2009; Midanik et al., 1992). Thus, it was hypothesized that Alcohol, OTC Cold/Pain medication, and All Substance use would be significantly related to Perceived Stress, Level of Stressors, and SOC.

Hypothesis 1a: Additionally, because research has shown that OTC medications are used to treat physical symptoms (Kaufman et al., 2002; Paulose-Ram et al., 2005) or misused to treat psychological symptoms (Hansen et al., 2008; Stasio et al., 2008), this hypothesis also predicted significant paths from Psychological and Physical symptoms to the outcome measures of OTC Cold/Pain medication use.

Hypothesis 2: Antonovsky (1987) posited that SOC is shaped by life experiences (e.g., stressors) and the strength of one's SOC at a given time can influence the coping process. Thus,

the second hypothesis proposed a moderating effect from the interaction term of Stressor/SOC (c4) to the OTC Cold/Pain medications, Alcohol, and All Substance use outcome variables.

Hypothesis 3: According to Antonovsky (1987), the initial stage of the stress-coping process involves appraising the threat of the stressor(s). This early evaluation of stressors is thought to influence the latter stages of the coping process, which Antonovsky (1987) argued involved using one's SOC to identify adequate resources. Thus, based on this theoretical framework, the third hypothesis predicted that the relationship among Level of Stressors and SOC to Alcohol consumption, OTC Cold/Pain medication use, and All Substance use would mediated by Perceived Stress. That is, Perceived Stress was expected to mediate the relationship between Level of Stressors and/or SOC and the outcome variables.

Hypothesis 4: Because SOC is shaped by life experiences (Antonovsky, 1987), a fourth hypothesis predicted a moderating effect from Stressor/SOC to the outcome variables through Perceived Stress. That is, SOC will moderate the relationship between Level of Stressors and Alcohol, OTC medication, and All Substance use via the Perceived Stress mediator variable.

Hypothesis 5: Research suggests that males and females differ on measures of SOC and in terms of their alcohol/OTC medication use (Badura et al., 2000; Koushede et al., 2011; Midanik & Zabkiewicz, 2009; Midanik et al., 1992). Therefore, the fifth hypothesis proposed that the significance of the direct and indirect (mediation and moderation) paths from SOC and Stressors/SOC to the outcome variables via Perceived Stress would differ by gender.

Methods

Power Analysis

While there is no consensus among researchers that specifies a "correct sample size" for path analyses, some guidelines have been proposed. For example, Bentler & Chou (1987)

indicate that the ratio of sample size to estimated parameters should be at least 5:1. That is, five participants are necessary for each free parameter in the model. Using Bentler and Chou's 5:1 ratio, the lowest (19) and highest (23) number of free parameters in the four path models presented above require sample sizes of 95 to 115 participants. Additionally, Kenny (2012) asserted that although a sample size of 200 are frequently collected in SEM research; smaller sample sizes are acceptable for simpler models, for example, in studies that do not contain any latent variables. Further, Norris (2005) suggested basing power calculations for path analyses on the regression equation that contains the most variables. A power analysis was conducted for this study using G*Power software (version 3.0.10) with specifications based on the multiple regression equation in the path model that contained the most variables. Results showed that 103 participants were needed to detect a moderate effect size ($f^2 = .15$) for seven predictor variables at the $p < .05$ significant level with a desired power of .80. Using these guidelines, the average number between the lowest (95) and the highest (200) sample size estimate is 148. Therefore, this study included 165 participants, which insured adequate power.

Participants

The participants in the study were 165 undergraduates enrolled in introductory psychology courses at Syracuse University. The eligibility criteria for this study required participants to be at least 18 years of age and proficient with the English language to ensure comprehension of the questionnaires and consent procedures. Additionally, in order to obtain an adequate sample of substance users, only participants who consumed at least one alcoholic beverage (beer, liquor, or wine) and/or one dose of OTC medications (analgesics, cold/cough) in the 30 days previous to the assessment date were eligible to participate in this study. Participants received course credit in exchange for their participation.

Recruitment

Eligibility for this study was determined using the most relevant research data available. Previous research (Simons et al., 2005) reported a prevalence rate of 96% (N = 317) for past 30-day alcohol consumption and 82% for OTC medication use (Advil most commonly used) among introductory psychology students at a northeastern university. Similarly, data collected at Syracuse University showed a high rate of alcohol use. Specifically, a study conducted on an unselected sample of PSY 205 psychology students showed a prevalence rate of 80% (N = 322) for alcohol consumption (K. Carey, personal communication, August 7, 2010). Using the most conservative prevalence rate of 80%, the estimate of participant eligibility for the current study was approximately 640 students.

The eligibility criteria as well as the study description were posted on the study recruitment website, The Psychology Research Participation System (SONA), at Syracuse University. Participants were recruited from a pool of approximately 800 students who were enrolled in the PSY 205 subject pool during the Fall 2011 semester.

Procedure

The researcher and a research assistant were present for each data collection session. The research assistant greeted participants at the door and reiterated the eligibility criteria. Those participants who met the above stated criteria were asked to enter the room and find a seat. Participants completed self-report assessments in small groups of ten to fifteen people. Each group session began with the research assistant distributing individual packets, which included the consent form (Appendix G) in addition to a packet of questionnaires. During each session, the researcher informed individuals that their participation was voluntary. They were also acquainted with the general aims, risks, and benefits of participating in the study. Next, the

participants were asked to sign a consent form that listed relevant information including contact details for the investigator and faculty advisor. During this time, the researcher assured participants that any information collected would remain confidential and anonymous. Following consent, participants were asked to attend to the projected images on the screen as the researcher read aloud the instructions for the various questionnaires. The researcher emphasized the importance of understanding the instructions prior to the completion of each questionnaire and encouraged participants ask any pertinent questions. The researcher then provided verbal and visual instructions for completing the substance abuse and symptom measures (TLFB, OTC medications, and physical and/or psychological symptoms).

Measures

Demographics Questionnaire. Participants completed a demographics questionnaire (Appendix A), which collected information regarding gender, age, race/ethnicity, and academic year. These demographic variables were used simply to document the characteristics of the sample. Only the gender variable was included in the hypothesis tests described below.

The Inventory of College Students' Recent Life Experiences (ICSRLE; Kohn, Lafreriere, & Gurevich, 1990). The ICSRLE was used to measure the level of reported stressful events (Appendix B). This measure was chosen because it was designed specifically for the college student population. In addition, the ICSRLE is described as "decontaminated" because, unlike the Hassles Scale (Kanner, Coyne, Schaefer, & Lazarus, 1981), it measures the influence of everyday stressors on physical and/or mental health rather than assessing direct outcomes of physical or psychological health, such as alcohol use, smoking, or medication side effects (Kohn et al., 1990; Kohn & Gurevich, 1993; Osman, Barrios, Longnecker, & Osman, 1994). Using a 4-point Likert scale ranging from "not at all part of my life" to "very much part of my life",

respondents rate 49 items that index the occurrence of experiences within the previous month across seven areas: (1) developmental challenge, (2) time pressure, (3) academic alienation, (4) romantic problems, (5) assorted annoyances, (6) general social mistreatment, and (7) friendship problems. The total score ranges from 0 to 147 with higher scores indicating a greater presence of stressors. Scale development testing using 208 Canadian college undergraduates reported an alpha reliability coefficient for the total scale of .88 in male and .89 in female undergraduates (Kohn et al., 1990). This study also conducted item-selection and cross-replication evaluations which showed that the ICSRLE was correlated with the Perceived Stress Scale (r = .67, r = .59, respectively). Another study (Osman et al., 1994) examining the reliability of the ICSRLE in 216 American college students also found a comparable total score alpha coefficient of .92. Nunnaly (1978) suggests that the coefficient alpha for a reliable scale typically exceeds .70. In this study, the Cronbach's alpha for the total scale of the ICSRLE was .91.

Sense of Coherence (SOC; Antonovsky, 1987). The Orientation to Life Questionnaire (Appendix C) was used in this study to measure the Sense of Coherence construct. Responses to the 29-item scale are scored on a 7-point Likert scale format across the three subscales of comprehensibility (11 items), manageability (10 items), and meaningfulness (8 items). The total score range is from 29 to 203 where a higher score corresponds with a stronger sense of coherence. Antonovsky (1987) found Cronbach alpha reliability coefficients ranging from .84 to .93 and, more recently, Erikkson and Lindstrom (2005) found ranges from .82 to .95, which represent sufficient values of internal consistency and reliability. In this study, the Cronbach's alpha for the full measure of SOC was .89.

The State-Trait Personality Inventory (STPI; Spielberger, 1979). The STPI is an 80-item self-report measure that consists of eight 10-item scales for measuring state and trait

anxiety, anger, depression, and curiosity (Appendix D). For the purposes of this study, only the STPI trait anxiety items were used. Using 4-point Likert scales (1=Not at all, 2=Somewhat, 3=Moderately so, 4=Very much so), the state anxiety items assess the intensity of emotional reactions that are experienced at a particular time, whereas the trait anxiety items (1=Almost Never, 2=Sometimes, 3=Often, 4=Almost Always) assess the frequency of experiencing these emotional states over time. A reported alpha coefficient of .84 in college students for the trait anxiety scales and .91 for the state scales indicated strong internal consistency (Spielberger, 1979). In this study, the Cronbach's alpha for the Trait Anxiety subscale of the STPI was .81.

The Perceived Stress Scale (PSS-10; Cohen, Kamarck, & Mermelstein, 1983). The PSS-10 was used in this study to measure the extent to which a person's appraisal or subjective evaluation of stressfulness, results from his or her interaction with the environment and perception of available coping resources. The questionnaire assumes that it is one's perception of stress rather than the stressors themselves that increases the risk of pathology and/or illness (Spacapan & Oskamp, 1989). The shortened 10-item scale (Appendix E) that was used in this study has been found to have similar psychometric properties to the original 14-item index (Cohen et al., 1983). The 10-item PSS items are scaled from 0-4, with a continuum ranging from "0" to "4", and measures whether a person has 'never' or 'very often' felt or thought a certain way. The total score range is from 0 to 40. Higher scores suggest increased levels of perceived stress and lower scores indicate lower levels of perceived stress. The PSS-10 has been validated across gender, racial, and educational groups (Cole, 1999) and is associated with a variety of health behaviors (Cohen & Williamson, 1988; Pbert, Doerfler, & DeCosimo, 1992). More recently, an evaluation of the psychometric properties of the PSS-10 in the college student population revealed an alpha coefficient value of .89 and strong convergent validity with the

factors of anxiety and depression in Spielberger's State-Trait Anxiety Inventory-Trait version (STAI-T) (Roberti, Harrington, & Storch, 2006). The Cronbach's alpha computed on the PSS-10 measure in the present study was .83.

The Timeline Follow-Back (TLFB; Sobell & Sobell, 2003). The TLFB was used to assess 30-day use of alcohol in college students (Appendix F). Although this information usually is aggregated via one-on-one personal interviews, Maisto and colleagues (2008) found no differences in individual reports of substance use when comparing the interviewing versus self-administration collection methods. Furthermore, Pedersen & LaBrie (2006) evaluated the administration styles of individual or group assessment of the TLFB and found no differences between these collection techniques. Therefore, in this study, the TLFB was given to groups of participants as a self-report instrument to assess daily alcohol use.

Participants were provided with instructions to begin with the day prior to the assessment and recall retrospectively the number of "standard" alcoholic drinks (e.g., 1 beer, one shot of liquor, 1 glass of wine etc.) they consumed each day. To facilitate recall of alcohol use, the calendar included events that may be significant to the college population (e.g., school holidays, exams, etc) and participants were encouraged to write in events that are personally relevant to them (e.g., birthdays, travel, etc.). The Timeline Follow-Back has exhibited adequate reliability with college students (Sobell et al., 1986) as well as different populations including homeless and psychiatric patients (Sacks, Drake, Williams, Banks, & Herrell, 2003). In addition, test-retest reliability is high for the college student population ranging from .87 to .97 for 30-day time periods (Sobell, Sobell, Leo, & Cancilla, 1988).

Alcohol and OTC Use. The data collected on the TLFB can be used to compute a variety of estimates that assess the quantity and frequency of alcohol use including days (percent) of

heavy drinking, number of drinking days, and number of drinks per week. However, this study investigated both alcohol and OTC medication use, both of which differ their dosages and the metric of their use (e.g., tablets per use, milligrams per dose, drinks per day, drinks per use etc.). Because there are a number of ways to ingest OTC medications (e.g., liquid, pill, etc.) there is no meaningful way quantifying dosage across substances. Therefore, this study focused on the frequency of use rather than the quantity of use. Thus, for alcohol, the average frequency of drinks per drinking day was estimated from participants' report of use. That is, the total number of drinks the participant reported during the previous month was divided by the number of days the participant reported consuming alcohol.

For OTC medication use, participants were asked to write the letters OTCP (over the counter pain medication), OTCC (over the counter cough medication), and/or OTCB (over the counter both which includes cold and pain medication) on the calendar day that correlated with their use of the above mentioned medications. Then, the number of days participants reported using these medications was divided by 30 (the number of assessed days) and multiplied by 100 to produce a percentage value.

All Substance Use. Published research suggests that the use of OTC medications is especially harmful when used with alcohol. Thus, the combined use of alcohol and OTC medications was assessed by counting the number of days each participant reported using a combination of these substances (alcohol and one or both of the OTC medications). Because the delivery systems (e.g., liquid, tablet, capsule) and dosage amounts of OTC medications are not standard or comparable to those used to measure alcohol consumption, the amount of consumption was not calculated. Instead, the percentage of days participants reported using both alcohol and OTC medications was computed by dividing the number of days the participants

reported using these substances by 30 and then multiplying by 100 to produce a percentage value.

Psychological and Physical Symptoms. As discussed earlier in this document, research has shown that OTC medications are taken for indicated and nonindicated purposes. Thus, in addition to OTC medication use, participants were instructed to denote whether they used OTC cold or pain medication for psychological or physical symptoms on the TLFB calendar by writing either the letter "F" for feelings or "P" for physical (Appendix F). The percentage of days for psychological or physical symptoms was computed by dividing the number of days participants reported experiencing either or both of these symptoms by 30 (the number of assessed days) and then multiplying the total by 100 to produce a percentage value. In addition, participants were instructed to list their experience of psychological and/or physical symptoms associated with using either or both of these medications. Symptoms such as headache, back pain, cold/cough symptoms, anxiety, sleeplessness, and sadness were common examples for using OTC medications.

Data Preparation

All variables were examined for missing data and outliers. Outliers were identified as those cases that exceeded a three standard deviation range (Tabachnick & Fidell, 2007). A visual inspection of boxplots indicated that the distributions of the Alcohol, OTC Cold Medication, OTC Pain Medication, and All Substance variables were negatively skewed. Square root transformations effectively normalized the distribution for the Alcohol and All Substances variables but not the OTC Cold/Pain use distribution. To address the issue of non-normality, robust maximum likelihood (MLR) estimation methods were used to analyze the OTC Cold/Pain path models in Mplus, version 6.2 (Muthén & Muthén, 2010). The MLR estimator computes

standard errors via the Huber-White "sandwich" estimator and yields a chi-square test statistic that is asymptotically equivalent to the Yuan-Bentler scaled T2 statistic for nonnormal continuous outcome measures (Muthén & Muthén, 2010). The MLR estimation method is therefore maximally robust to non-normality. The results for path analyses of OTC Cold/Pain medication data using the MLR estimation are presented below.

Further, all of the continuous predictor variables were centered by subtracting their mean values from each datum and the gender variable was dummy coded (e.g., 0 = male, 1 = female). Additionally, separate descriptive and correlational analyses were conducted for males and females to examine the relationship between the relevant variables (see Tables 1, 2, 3).

Path Analysis

Mplus (version 6.2) was to test the hypothesized direct as well as the indirect paths included in the model (Muthén & Muthén, 2010). The purpose of these analyses was to estimate the relative associations between the predictor variables of Level of Stressors (ICSRLE), Perceived Stress (PSS), and SOC and the outcome variables of Alcohol, OTC Cold, OTC Pain, and All Substance use. In addition, these analyses were used to test whether Perceived Stress had a mediating effect, SOC had a moderating effect, and Stressors/SOC (ICSRLE*SOC) had a mediated moderating effect on the outcome measures and across genders.

These study hypotheses were tested using MacKinnon's approach (MacKinnon, Fairchild, & Fritz, 2007) to evaluate direct and indirect effects in a path analysis framework. The simultaneous test for the moderating effect of gender on the indirect effects was evaluated through the multi-group portion of the analysis. This procedure allows for certain paths in the model to differ while other paths are constrained to be equal depending on theoretical prediction. In the various models discussed below, the paths from SOC and Stressor/SOC to Alcohol, OTC

Cold/Pain medication, and All Substance use were set to vary. In addition, the same paths were set to vary through the mediator variable of Perceived Stress. The remaining paths were constrained. This procedure increased power by estimating group differences selectively. Finally, the multi-group path analyses were bootstrapped, that is, multiple resamples of the dataset were created, to stabilize the estimates in the model. Specifically, 1,000 bootstrap samples were drawn by default with replacement from the full data set, and the 95% confidence intervals (CIs) were generated for these estimates. If the CIs for the estimates did not include zero, then the association between the variables was statistically significant (Shrout & Bolger, 2002).

An advantage of path analysis performed with Mplus over ordinary least squares regression analysis is that this method can test whether a model holds for multiple groups (e.g., for gender). Furthermore, path analyses are more powerful than traditional stepwise procedures because all direct and indirect paths between the variables can be tested for significance simultaneously (e.g., MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Finally, path analysis also tests for the fit of the overall model, including all the modeled paths between the variables.

The primary goal of a path analysis is to assess overall model fit of a hypothesized model and to evaluate the significance of the various hypothesized paths within the model. The two most popular ways of evaluating model fit are the chi-square statistic and goodness of fit indexes (Hu & Bentler, 1999). A nonsignificant chi-square indicates that the model fits the data well whereas a significant chi-square indicates that the model does not fit the data well (Munro, 2005). According to Kenny (2012), the chi square test is a reasonable measure of fit for models with a sample size of 75 to 200 participants. However, because the chi-square test is sensitive to

violations of multivariate normality, the MLR estimator was used to correct non-normality of the data for the OTC Cold and Pain medication variables.

Many researchers support using multiple indices to assess model fit. However, there is disagreement concerning what constitutes a specific or strict cutoff value for significance of model fit and there is no clear consensus concerning which fit indices to report (Hayduk et al., 2007; Kenny, 2012). Hu & Bentler, (1999) suggest reporting the chi-square statistic in addition to at least one absolute and one incremental fit index. Hooper, Coughlan, & Mullen, (2008) suggest reporting the chi-square statistic, RMSEA, SRMR, and the CFI because these indices are the least sensitive to sample size, model misspecification, and parameter estimates. Given these suggestions, it is reasonable to assume that the following combination of fit measures along with the chi-square provide an adequate estimate of model fit: The Root Mean Square Error of Approximation (RMSEA), Root Mean Square Residual (SRMR), Bentler's Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI). The absolute fit indices, RMSEA and SRMR, indicate how well an a priori model reproduces the sample data. The incremental fit indices, CFI and TLI, indicate how much a model fit improved compared to a target (usually the null) model. Current recommendations suggest that values of $\leq$.06 (Hu & Bentler, 1999) indicate a good fit whereas >.07 (Steiger, 2007) indicate a poor fit for RMSEA. Also, values ranging from $\leq$ .05 to .08 are considered to be good-fitting for SRMR (Hu & Bentler, 1999). Finally, values of $\geq$ .95 represent a good fit for CFI and TLI (Hu & Bentler, 1999).

Results

Participants

All 165 participants met the eligibility requirements and were included in the data analyses. The mean age of participants was 18.9 (SD = 2.8) and 99% of the sample were between the ages of 18 and 22. A majority of the sample were female (64%), freshman (58%) or

sophomores (33%), Caucasian (70%), and Asian (15%). There was no missing data in the assessment measures.

Descriptives

Table 1 provides the descriptive statistics for the total sample and for each gender separately. Tables 2 and 3 provide the means, standard deviations, and intercorrelations for the variables in the path models for males and females separately.

A review of the correlation matrix showed a strong inverse correlation (r = -.84, p < .01) between SOC and Trait Anxiety. High multicollinearity among variables in a path analysis may cause the beta weights for the path coefficients to be unstable, less accurate, imprecise, and more sensitive to small errors in measurement (Petraitis, Dunham, & Niewiarowski, 1996). To assess the effect of multicollinearity on model stability, path analyses were conducted which included and excluded the Trait Anxiety variable. Analyses including both SOC and Trait Anxiety yielded poorly fitting models; however model fit improved for each of the outcome measures when Trait Anxiety was removed from the analyses. As previously discussed, researchers have debated that negative affect (i.e., Trait Anxiety) is a proxy for the SOC measure (Hittner, 1994; Korotkov, 1993). In a recent study, Henje Blom, Serlachius, Larsson, Theorell, & Ingvar (2010) conducted a series of analyses investigating the relationship between SOC, anxiety, and depression. Results showed significant inverse correlations among these measures. In addition, multiple regression models from the study showed that anxiety and depression explained a major part of the SOC variance and multivariate analyses failed to isolate SOC as a distinct and separate construct from anxiety and depression. Because the hypotheses tested in this study concerned SOC and not Trait Anxiety, and because Trait Anxiety and SOC may be measuring similar constructs, the Trait Anxiety variable was removed from further analyses.

Hypothesis Testing with Path Analyses

Study hypotheses were tested using four multi-group path analyses (see Figure 1) for the dependent variables of Alcohol, OTC Cold, OTC Pain, and All Substance use. Tables 4, 5, 6, and 7 present beta weights, standard errors, *p*-values and confidence intervals for the direct and indirect paths. The models are discussed below in relation to goodness of fit and hypothesized paths. The effects discussed below include the terms of mediation, moderation, and mediated moderation. According to Baron and Kenny (1986), mediation occurs when one variable determines the relationship between a predictor variable and an outcome variable. For example, in this study, Perceived Stress is hypothesized to play an important role in clarifying the nature (i.e., why this effect occurred) of the relationship between SOC and substance use. Moderation occurs when the strength of the relationship between the independent variable and an outcome variable is dependent on a third variable (i.e., when this effect will occur). This third variable is characterized statistically as an interaction term. In this study, SOC is hypothesized to influence the strength of the relationship between Level of Stressors and substance use. Mediated moderation is a variant of both moderation and mediation. This effect occurs when the interaction between two variables affects a mediator, which, in turn, influences an outcome measure. In this study, SOC is hypothesized to influence the strength of the relationship between Level of Stressors and the substance use outcome variables and Perceived Stress is hypothesized to explain the relationship between these variables.

Alcohol Model

The fit of the hypothesized multi-group model for Alcohol was excellent. The chi-square and goodness-of-fit indices for this model are χ^2 (3) = 2.05, p = .56; TLI = 1.03, CFI = 1.00, RMSEA = .00 (95% CI = .00, .16), and SRMR = .02, indicating that the model fits the data well

(Hu & Bentler, 1999). The first hypothesis predicting direct paths from Perceived Stress (c1), Level of Stressors (c2), and SOC (c3) was not significant. The second hypothesis predicting a moderating effect of Stressor/SOC (c4) on Alcohol use was also not significant. The third hypothesis predicted that Perceived Stress would mediate the relationship between Level of Stressors (b1) and/or SOC (b2) to Alcohol use. Further, the fourth hypothesis predicted that SOC (b3) would moderate the relationship between Level of Stressors and Alcohol use via the Perceived Stress mediating variable. However, none of these mediation or moderation effects were significant. These results suggest that stress-coping sequence is influenced by factors beyond one's stress appraisal or one's SOC. Finally, the fifth hypothesis predicting that the direct path from SOC to Alcohol (c3), the moderating path from Stressors/SOC to Alcohol (c4), the mediation path from SOC to Alcohol via Perceived Stress (b2) and the mediated moderation path from Stressor/SOC to Alcohol via Perceived Stress (b3) would differ by gender was not supported by these data (see Table 4).

Although the mediation and moderation effects were not supported, several unexpected findings emerged from this data. Specifically, the path from Level of Stressors to Perceived Stress (a1) was significant for males ($\beta = .26$, $p < .05$) and the paths from SOC to Perceived Stress (a2) were significant for both males ($\beta = -.34$, $p < .05$) and females ($\beta = -.36$, $p < .05$). These significant paths suggest that stress appraisal did occur although it did not affect the decision to use alcohol. Further, the path from Stressor/SOC to Perceived Stress (a3) was significant for both males ($\beta = .35$, $p < .05$) and females ($\beta = .20$, $p < .05$) which suggests that the relationship between Level of Stressors and Perceived Stress is moderated by SOC. A plot of these variables showed that students with high stressors and low SOC experienced increased perceived stress (see Figures 2 and 3).

Over the Counter Cold Medication Model

The hypothesized multi-group model for OTC Cold medication showed poor fitting values for RMSEA and TLI and good-fitting values for CFI and SRMR. The MLR adjusted chi-square and the goodness-of-fit indices for this model are χ^2 (9) = 16.31, p = .85; TLI = .91, CFI = .96, RMSEA = .09 (95% CI = .00, .18), and SRMR = .05. Hu and Bentler (1999) recommend choosing a combination of an incremental fit and an absolute fit index to evaluate model fit. Although the incremental fit value of CFI and the absolute fit value of SRMR indicated a good-fitting model, the TLI and RMSEA statistics indicated a poor-fitting model. Unfortunately, there is no standard rule for choosing one incremental or absolute fit index over another to determine model fit. Because poorly fitting indices suggest inflated Type I and/or Type II error rates, these results should be interpreted with caution (Hu & Bentler, 1999).

In an effort to improve overall fit, model re-estimation procedures were attempted using the modification indices option in Mplus (Byrne, 1998). This option identifies any unspecified paths that might have improved model fit. That is, the greater the value of the index, the more the overall fit of the model would improve by adding that parameter. However, these re-estimation procedures did not provide any additional paths that would improve model fit and, thus, the results from the original model are discussed below.

The first hypothesis for this model predicted direct paths from Perceived Stress (c1), Level of Stressors (c2), SOC (c3), and Psychological/Physical (c5, c6) symptoms to OTC Cold medication use. Although most of the paths were nonsignificant, the direct path from Level of Stressors to OTC Cold Medication was significant for both males (β = .36, p < .05) and females (β = .54, p < .05). The second hypothesis predicted a significant moderating effect from Stressor/SOC (c4) on OTC Cold Medication use. The third hypothesis predicted that Perceived

Stress would mediate the relationship between the Level of Stressors (b1) and/or the Stressor/SOC (b2) variables to OTC Cold medication use. Further, the fourth hypothesis predicted that SOC would moderate the relationship between Level of Stressors and OTC Cold medication via the mediator, Perceived Stress (b3). None of these mediation or moderation effects were significant. Finally, the fifth hypothesis predicting that the direct path from SOC to OTC Cold medication (c3), the moderating path from Stressors/SOC to OTC Cold medication (c4), the mediation path from SOC to OTC Cold medication via Perceived Stress (b2) and the mediated moderation path from Stressor/SOC to OTC Cold medication via Perceived Stress (b3) would differ by gender was not supported by these data (see Table 5).

Although the mediation and moderation paths were not significant, other unexpected findings were apparent in these analyses. The paths from Level of Stressors (a1) and SOC (a2) to Perceived Stress were significant for males ($\beta = .26$, $p = .00$; $\beta = -.34$, $p < .05$) and females ($\beta = .29$, $p < .05$; $\beta = -.36$, $p < .05$). Consistent with the Alcohol model presented above, this result indicates that stress appraisal did occur although it did not affect the decision to use OTC Cold medication. Additionally, the path from Stressor/SOC to Perceived Stress (a3) was significant for the males only which suggests that, for males, the relationship between Level of Stressors and Perceived Stress was moderated by SOC. A plot of these variables showed that males with high stressors and low SOC experienced increased perceived stress (see Figure 2).

Over the Counter Pain Medication Model

The hypothesized multi-group model for OTC Pain medication provided an excellent fit. The MLR adjusted chi-square and the goodness-of-fit indices for this model are χ^2 (7) = 6.61, $p = .85$; TLI = 1.00, CFI = 1.00, RMSEA = .00 (95% CI = .00, .13), and SRMR = .02 (Hu & Bentler, 1999). The first hypothesis predicted that Perceived Stress (c1), Level of Stressors (c2), SOC

(c3), and Psychological/Physical (c5, c6) symptoms would form a significant direct path to OTC Pain medication. Although a majority of the paths were nonsignificant, the direct path from Psychological symptoms to OTC Pain medication use (c5) was significant for both males (β = .94, $p < .05$) and females (β = .80, $p < .05$). This finding suggests that males and females misuse OTC Pain medications to cope with psychological symptoms. Additionally, the direct path of Physical symptoms (c6) showed a significant inverse relationship with OTC Pain medication for males (β = -.46, $p < .05$) but not for females. This suggests that as the males' experience of pain increases they rely less on OTC pain medications to alleviate their symptoms. The second hypothesis predicting a significant moderating effect from Stressors/SOC to OTC Cold medication (c4) was not significant. The third hypothesis predicting that Perceived Stress would mediate the relationship between Level of Stressors (b1) and/or SOC (b2) to OTC Pain medication was also not significant. Additionally, the fourth hypothesis predicted that SOC would moderate the relationship between Level of Stressors and OTC Pain medication via the mediator, Perceived Stress (b3) was not significant. Finally, the fifth hypothesis predicting that the direct path from SOC to OTC Pain medication (c3), the moderating path from Stressors/SOC to OTC Pain medication (c4), the mediation path from SOC to OTC Pain medication via Perceived Stress (b2) and the mediated moderation path from Stressor/SOC to OTC Pain medication via Perceived Stress (b3) would differ by gender was not supported by these data (see Table 6).

Although the mediation and moderation effects were not significant, other unexpected findings emerged from these analyses. As was the case with the above dependent measures, the paths from Level of Stressors (a1) and SOC (a2) to Perceived Stress were significant for males (β = .26, $p = .00$; β = -.34, $p < .05$) and females (β = .29, $p < .05$; β = -.36, $p < .05$). This

indicates that stress appraisal did occur although it did not affect the decision to use OTC Pain medication. Further, the path from Stressor/SOC to Perceived Stress (a3) was significant for males only ($\beta = .35$, $p < .05$) which suggests that, for males, the relationship between Level of Stressors and Perceived Stress was moderated by SOC. A plot of these variables showed that males with high stressors and low SOC experienced increased perceived stress (see Figure 2).

All Substance Use Model

The hypothesized multi-group model for the All Substance model showed an excellent fit. The chi-square and goodness-of-fit indices for this model are χ^2 (3) = 1.96, $p = .58$; TLI = 1.03, CFI = 1.00, RMSEA = .00 (95% CI = .00, .16), and SRMR = .02 (Hu & Bentler, 1999). The first hypothesis predicted a significant direct path from the Perceived Stress (c1), Level of Stressors (c2), and SOC (c3) variables to the All Substance outcome variable. Although two of the paths were nonsignificant, the path from Perceived Stress to the All Substance variable was significant for males but not for females. This suggests that when males feel stressed, they consume more alcohol and OTC medications. The second hypothesis predicting a moderating path from Stressor/SOC to All Substance use (c4) was nonsignificant. The third hypothesis predicting that Perceived Stress would mediate the relationship between the Level of Stressors (b1) and the Stressor/SOC (b2) variables was also not significant. Further, the fourth hypothesis predicting that SOC would moderate the relationship between the Level of Stressors and the All Substance variables via the Perceived Stress mediator (b3) was not significant. Finally, the fifth hypothesis predicting that the direct path from SOC to All Substance (c3), the moderating path from Stressors/SOC to All Substance (c4), the mediation path from SOC to All Substance via Perceived Stress (b2) and the mediated moderation path from Stressor/SOC to All Substance via Perceived Stress (b3) would differ by gender was not supported by these data (see Table 7).

Consistent with the previous models, significant paths from Level of Stressors (a1) and SOC (a2) to Perceived Stress were significant for both males (β = .26, *p* = .00; β = -.34, *p* = < .05) and females (β = .29, *p* = .00; β = -.36, *p* < .05) suggesting that although stress appraisal did occur it did not affect the decision to use alcohol and OTC medications. Additionally, a significant path from Stressor/SOC to Perceived Stress (a3) was present for males which indicates that, for males, SOC moderates the relationship between Level of Stressors and Perceived Stress (β = .35, *p* < .05). A plot of these variables showed that students with high stressors and low SOC experienced increased perceived stress (see Figures 2 and 3).

Post Hoc Analyses

In the above analyses, the contribution of the Psychological and Physical symptom variables were analyzed contemporaneously making it impossible to isolate specific contributions from each variable and, thus, draw conclusions about use or misuse. It is important to partial out the variance due to Physical symptoms from each dependent variable so that the relationship between Psychological symptoms and the various dependent measures can be observed without any influence from the Physical symptoms variable. Therefore, additional analyses were conducted in which the contribution of Physical symptoms were removed statistically from the models before the Psychological symptoms variable was evaluated.

To investigate the relationship between Psychological symptoms and OTC Cold medication, a linear regression analysis was conducted wherein OTC Cold medication was first predicted from Physical symptoms. The OTC Cold residual values were then used as a new outcome variable in the path analysis. This preliminary analysis removed the contribution of Physical symptoms from the OTC Cold variable and, thus, any effects that occurred in the following analysis could not have been due to the Physical symptoms variable. Results from this

analysis showed that the model fit indices were good-fitting, MLR adjusted χ^2 (6) = 7.40, p = .29; CFI = 1.00, TLI = .99, RMSEA = .05 (95% CI = .00, .16), and SRMR = .03) and the previously nonsignificant path from Psychological symptoms to OTC Cold medication became significant for both males (β = .59, p < .05) and females (β = .59, p < .05). The psychological symptoms that participants in this study reported as reasons for using OTC medications in general were stress, anxiety, irritability, sadness, depression, and hurt. These symptoms suggest that the students' use of OTC cold medications was related more so to psychological symptoms than physical symptoms. Thus, the experience of increased psychological distress appears to increase the likelihood of misuse of OTC cold medications.

As noted, in the original path analysis, the path from Psychological symptoms to OTC Pain medication (c5) was significant for males and females. Additionally, the path from Physical symptoms to OTC Pain medication (c6) was significant for males only; however, the beta weight for this path was negative (β = -.46, p < .05) and the correlation was positive but small (r = .20, r^2 = .04). To explore this discrepancy in signs, another linear regression analysis was conducted in which the contribution of the Physical symptom variable was partialed out from the OTC Pain outcome measure and a path analysis was conducted on the residuals. Results showed that the model fit remained excellent, MLR adjusted χ^2 (5) = 4.25, p = .59; CFI = 1.00, TLI = 1.01, RMSEA = .00 (95% CI = .00, 14), and SRMR = .01); however the significant direct path from Psychological symptoms to OTC Pain medication was no longer significant for males or females once Physical symptoms was removed from the analysis. This finding may have emerged because the overall amount of shared variance between these variables was relatively small. Thus, removing Physical symptoms from the OTC Pain medication use variable reduced the amount of shared variance between Psychological symptoms and the residuals for the OTC Pain

medication variable to the point of nonsignificance. These results suggest that the relationship among physical and psychological symptoms and OTC medication use warrants further evaluation.

Discussion

This study assessed the contribution of salutogenic factors to the relationship between stressful life events, perceived stress, and substance use. Four separate path analytic models examined the direct and indirect relationships between these variables and students' use of alcohol, over the counter pain/cold medication, and the combination of these substances. Although the path analyses produced good-fitting indices for all dependent measures, the results provided support for only some of the hypotheses presented above. This discussion begins with a validation of these individual hypotheses and implications in relation to the results from previous research. Results from descriptive analyses wherein the stress-related, SOC, and alcohol consumption measures were dichotomized are also discussed. That is, the perceived stress, stressor, and SOC were divided into high (mean +1 SD) and low (mean – 1 SD) scores based on the normative data of the original scale and alcohol consumption was categorized into heavy and non-heavy drinkers ($\geq$ 4 drinks for females and $\geq$ 5 drinks for males per sitting). Next, consistencies and curiosities across the various models are discussed along with interpretation of the individual model results. Finally, the discussion addresses the limitations of these findings and the implications of the results for clinical and educational use.

Hypothesis One

The first hypothesis predicted significant paths from stressors, perceived stress, and SOC to the Alcohol, OTC Cold and Pain medication, and All Substance outcome variables. This hypothesis also predicted significant paths from Psychological and Physical symptoms to the

OTC Cold and Pain medication use variables. Results from this study showed no association between stressors, perceived stress, and alcohol. This finding is inconsistent with previous research (e.g., CASA, 2007; Weitzman, 2004) documenting that college students consume alcohol to reduce their experience of stress. However, it does support other research documenting that students consume alcohol for reasons unrelated to stress, for example, to increase socialization or to simply get drunk (Stewart et al., 1996). Descriptive analyses of the stress and alcohol measures in this study revealed that although a majority of males (70%) and females (82%) reported a high level of stressors, a minority of males (13%) and females (31%) reported a high perception of stress. Additionally, although nearly half of males and females engaged in heavy drinking patterns, only 3 males and 19 females with heavy drinking patterns reported experiencing higher levels of perceived stress. These descriptive findings suggest that although the students in this sample experienced increased stressors, their perception of stress was generally low and their consumption of alcohol was largely unrelated to stress.

Further, the relationship between SOC and alcohol use was nonsignificant. Descriptive statistics computed on the SOC and alcohol measures showed that the majority of male (97%) and female (96%) students reported higher SOC scores and roughly half of these students exhibited heavy drinking patterns. However, zero males and only one female with higher SOC scores actually engaged in heavy drinking patterns. This lack of relationship between SOC and alcohol use is consistent with previous research on college students showing that SOC and alcohol consumption are not significantly related (e.g., Frenz, Carey, & Jorgensen, 1993). However, this finding does not accord with research from the general population showing a significant relationship between these two variables (e.g., Badura, Gorczyca, Tomalczyk, & Matysiakiewicz, 2000; Midanik & Zabkiewicz, 2009; Midanik, Soghikian, Ransom, & Polen,

1992). The discrepancy between the results from this and other studies on college students and those from the general population is consistent with the emerging adulthood notion. That is, individuals between the ages of 18 to 25 are in a unique stage of development and, thus, may differ from other populations especially in relation to SOC and alcohol consumption patterns.

These combined results indicate that although students in this sample experienced increased stressors, their perception of stress was low. These low levels of perceived stress may result from the high levels of SOC suggesting that this group possessed adequate skills to manage life challenges. Further, high SOC scores may explain why the consumption of alcohol in this sample was largely unrelated to their experience of stress. That is, these students used alcohol for recreational use rather than to cope with mounting stress. Another explanation for the lack of relationship between stress and alcohol is that alcohol consumption in this sample was high; nearly 90% consumed alcohol and 50% were heavy drinkers. Therefore, creating a ceiling effect may have concealed an underlying relationship among the variables of stressors, perceived stress, SOC, and alcohol use.

The OTC models showed a positive relationship between stressors and OTC cold medication use and psychological symptoms and OTC pain medication use for both males and females. These findings are consistent with previous research showing that college students as well as those close in age to college students [e.g., high school seniors (Falck, Li, Carlson, & Wang, 2006; Johnston et al., 2006)] misuse these substances to reduce unwanted stress and psychological symptoms (Hansen et al., 2008; Hart & Hill, 1997; Stasio et al., 2008; Turunen et al., 2005). This issue is important because although moderate use of OTC medications may not be harmful, routine or excessive misuse may cause serious and potentially irreversible health problems. Although these findings add to the sparse literature on this topic, more research is

needed to investigate the frequency, quantity, and type of OTC medication misuse within this vulnerable population.

The All Substance model showed a significant relationship between perceived stress and all substance use for males but not for females. This suggests that when males are experiencing more stress, they increase their use of substances. This finding supports theories of self-medication (Conger, 1956; Khantzian, 1985, 1997; Leshner, 1997; Willis & Shiffman, 1985), which propose that individuals use substances to alleviate unwanted symptoms. It also supports the notion proposed by some researchers that the self-medication model operates differently for males and females and perhaps due to differences in coping responses and alcohol expectancies (Cooper, Russell, Skinner, Frone & Mudar, 1992). However, coping and expectancies were not specifically tested in this study and, thus, more research is needed in this area to elucidate the relationship among gender, stress, and substance use.

Hypothesis Two, Three, and Four: Moderation, Mediation, and Mediated Moderation

The second hypothesis which predicted that SOC would moderate the relationship between stressors and the Alcohol, OTC Cold/Pain medications, and All Substance outcome variables was not supported in any of the path models. Although previous studies have examined aspects of these variables, no study has examined the moderating role of SOC on stress, alcohol, and/or OTC medication in a college population. Therefore, this hypothesis was based on a single study conducted by Koushede et al. (2011) who reported that SOC moderated the relationship between perceived stress and OTC pain medication use in a sample of adults aged 25 to 44 from the general population. The discrepancy in findings between this and the Koushede et al. (2011) study suggests that college students may be a unique population in which the relationship between SOC and substance use, may differ substantially from other populations. This notion

also accords with Antonosky's (1987) theory which posits that one's SOC is shaped by life experiences until it stabilizes in early adulthood. Thus, individuals in the emerging adult years, such as the college students in this sample, may have a disproportionately high level of SOC compared to individuals who are in their late twenties or early thirties.

The third hypothesis which predicted that perceived stress would mediate the relationship between stressors and SOC and the outcome variables was also not supported in any of the path models. However, the Alcohol model showed a significant positive path from stressors to perceived stress for males while the OTCC, OTCP, and All Substance models showed significant and positive paths from stressors to perceived stress for both males and females. Additionally, each of these models showed significant but inverse paths from SOC to perceived stress across both genders. Further, the fourth hypothesis which predicted that SOC would moderate the relationship between stressors and the outcome variables through the perceived stress mediator was not supported in any of the path models. However, there was a significant relationship between the interaction term of stressor/SOC and perceived stress for both males and females for the Alcohol model and for males only in the other models.

These results suggest that as males and females experienced more stressors, their perception of stress also increased. However, when examining the role of SOC on stressors and perceived stress, students, and, in particular, males, who reported increased stressors and high SOC experienced a lower perception of stress. Additionally, no relationship emerged between stressors, perceived stress, SOC, and substance use. These findings highlight Antonovsky's theory (1987) which suggests that stressors influence the perception of stress which, in turn, informs the coping process. It is therefore reasonable to suggest that students with a high SOC,

such as in the majority of this sample, may have sufficient coping skills to reduce their perception of stress to the point where they do not resort to self-medicating with substances.

Hypothesis Five: Gender Differences

Finally, the fifth hypothesis which predicted gender differences in the paths from SOC to the outcome variables and for the moderation, mediation, and mediated moderation hypotheses referenced above was not supported by the data. Findings for the Alcohol model are consistent with some studies showing that gender has no association with SOC and alcohol use (Allison et al., 1999; Frenz et al., 1993; Kuuppelomäki & Utriainen, 2003); however, they are inconsistent with other studies that have shown a significant association (Badura et al., 2000; Midanik & Zabkiewicz, 2009; Midanik et al., 1992) between these variables. Only two of these studies (Frenz et al., 1993; Kuuppelomäki & Utriainen, 2003) were conducted on college student samples, however, making it impossible to discern a trend within this population.

Further, only two studies have investigated stress and/or SOC and OTC pain medication use; however, both of these studies were conducted on the general population rather than on a college student population. Koushede et al. (2010) examined the association between perceived stress and OTC pain medication use. Results from this study showed a significant and graded association between perceived stress and medicine use; however, no gender differences were found. A later study conducted by Koushede et al. (2011) investigated the moderating role of SOC on the relationship between perceived stress and OTC pain medication use. The authors found a graded association (stress and medicine use became increasingly stronger with decreasing SOC) among these variables for both males and females; however these results were not statistically significant for males. The studies discussed above highlight the paucity of research in this area as well as the lack of pattern for gender specific findings. Therefore, more

research is needed to investigate gender differences in the relationship between stress, SOC, and substance use in college students.

Consistencies and Curiosities

These results contribute to those previously reported on the relationship among stress, SOC and alcohol. Although there is variability in the results of published studies, findings from this study indicate no relationship between stress, SOC, and alcohol use. This lack in consistency may be due, in part, to the paucity of research on these variables within the emerging adult population. It may also suggest that factors other than stress, for example, socializing, the feeling of intoxication, or a psychologically disquieting event, trigger the use of alcohol (Hansen et al., 2008; Hart & Hill, 1997; Stasio et al., 2008; Stewart et al., 1996; Turunen et al., 2005).

The "emerging adult" model explains these results by assuming that a person of this age group is in a unique stage of development and, thus, may differ from other populations especially in relation to their SOC and alcohol consumption patterns. Most of the emerging adults in this study had a high level of SOC that may have reduced their levels of perceived stress to the point where they did not resort to alcohol use as a necessary vehicle for stress reduction. The descriptive statistics computed on these data showed that although most of the sample reported high levels of SOC it was unrelated to their consumption of alcohol. It is therefore reasonable to suggest that emerging adults' SOC is generally high and buffers their perception of stress to the point where they do not rely on alcohol to manage stress. However, they do rely on alcohol for recreation and as a social lubricant.

These data also suggest that emerging adults use OTC cold medications to reduce stress and OTC pain medications to reduce psychological symptoms. It is likely that this population views OTC medications as necessary to relieve stress and psychological symptoms in addition to

common everyday ailments, e.g., cold symptoms, acute pain, that limit their ability to function in the academic environment.

The published literature does not provide strong evidence for gender effects on the relationship between substance use, SOC, and stress. Likewise, these data suggest that the relationship is largely weak and inconsistent. Although there was limited evidence for gender differences in this study, there were a few other notable exceptions in which significant relationships were apparent for one gender but not for the other. For example, the path from stressors to perceived stress in the Alcohol model was significant for males but not for females. Additionally, the path from stressor/SOC to perceived stress was significant for males but not females in the OTC Cold, OTC Pain, and All Substance models. Further, the relationship between stressor, SOC, and perceived stress, specifically, that high stressors and low SOC increased the perception of stress, is apparent for both males and females in the Alcohol model but only for males in the other models. These findings suggest that the appraisal of stress appears to be a more ubiquitous process for males relative to females. Although these correlations are interesting, they will obviously require replication. At present, it is perhaps safe to conclude that there is no clear pattern of research findings indicative of gender differences among the SOC, stress, and substance use triad in the emerging adult populations.

Antonovsky's (1987) stress appraisal notion which posits a complex interaction of the person's perceived level of stress and their SOC is supported in these data. Consistent with this notion, in each of these path models, there were usually significant paths from stressors, SOC and stressors/SOC to perceived stress but a lack of mediation, moderation, or mediated moderation effects from perceived stress or SOC to any of the substance use outcomes. The

results suggest that the students' perception of stress was associated with the level of reported stressors and their SOC but generally unrelated to their use of alcohol or OTC medication use.

Limitations

One limitation of this study was that it used a sample of college students. Although the purpose of the study was to develop a model of substance use for this population, at the same time, the results are only relevant for this sample. Even within this sample, the results may not generalize to students of other races or ethnicities or those attending school in other geographic areas. Thus, it is important to collect data from heterogeneous samples within the college student population. A second limitation of this study is that the results apply only to non-prescription medications and alcohol. They may not generalize to other substances such as prescription medications, psychotropics, marijuana, or cocaine or opiate use. Although most of the models provided excellent fits to the data for this sample of college students, these models may not fit as well for individuals whose brain development has reached maturity, e.g., the middle-aged or the elderly. A third limitation concerns the possibility that different patterns will emerge for other demographics (e.g., business executives, professional athletes, or the homeless population). A fourth limitation is that the study used a cross-sectional design. This method of data collection provides only a snapshot view at a given time point. Because the data were collected at a single time, it is not possible to draw conclusions about cause and effect or changes in models as they unfold over time. A fifth limitation is that OTC data was collected using the TLFB measure. Because this measure was not designed to measure the consumption of OTC medications there may be issues with the validity or accuracy of the data collected. Additionally, the OTC cold and pain data were skewed; although adjustments were made in Mplus to normalize the data, this transformation may have affected the integrity of the results. A sixth limitation is that these

measurements assessed only the frequency of use rather than the quantity of use for these substances. As noted above, this approach was necessary because although there is a standardized method of measuring consumption patterns for alcohol, there is no such method for OTC medication consumption.

Clinical and Educational Implications

These findings are relevant to clinical practice and counseling in academia. For example, the results show that stressors and psychological symptoms increased OTC cold and pain medication use. Therefore, some college students may use these medications to cope with stressors rather than to relieve actual physical symptoms. It is therefore important for campus administrators to provide stress reduction training programs to assist students who are navigating through the college experience. Additionally, the literature shows that psychopathology is increasing in the college population (Gallagher, 2009) which highlights the need to familiarize students with the campus counseling centers so that they can seek professional help rather than rely on self-medicating coping strategies.

Results from this study show that increasing SOC could significantly reduce the overall stress experience, and potentially, substance use in college students. This finding suggests that college campuses provide salutogenic training programs designed to increase students' SOC. At least three studies have demonstrated the efficacy of salutogenic training programs with the general population (Langeland, Wahl, Kristoffersen, & Hanestad, 2007; Langeland et al., 2006) as well as first year college students (Davidson, Feldman, & Margalit, 2012). This type of training would emphasize: (1) comprehensibility – the perception that life is understandable, that things happen for a reason; and that there are explanations for what happens; (2) manageability – the confidence that things can be managed and that flexibility exists for choice of strategies; and

(3) meaningfulness - a sense that demands are actually challenges, worthy of investment and engagement. Making this type of training a focus of individual therapy for students who suffer extreme stress reactions in college may be especially helpful. It may also be helpful to provide discussion of SOC components as part of introductory psychology curriculum. Offering a short SOC-based workshop shortly after students enter college may significantly improve their overall experience and help them to adjust to their new roles and expectations.

Appendix A

Demographics Questionnaire

1. Age _____

2. Gender

- ❑ Male
- ❑ Female

3. Racial/Ethnical Background

- ❑ African-American/Black
- ❑ American Indian or Alaskan Native
- ❑ Arab American
- ❑ Asian American/Asian
- ❑ Caucasian/European American/White
- ❑ East Indian
- ❑ Hispanic/Latino/a
- ❑ Native Hawaiian/Pacific Islander
- ❑ Multi-racial
- ❑ Prefer not to answer
- ❑ Other (please specify): _____

4. Academic Year:

- ❑ Freshman
- ❑ Sophomore
- ❑ Junior
- ❑ Senior

Appendix B

Inventory of College Students Recent Life Experiences (ICSRLE)

Following is a list of experiences which many students have experienced at some time or other. Please indicate for each experience how much it has been a part of your life ***over the past month***.

Put a "1" in the space provided next to an experience if it was *not at all part of your life* over the past month (e.g., "trouble with mother in law-1"); "2" for an experience which was *only slightly part of your life* over that time, "3" for an experience with was *distinctly part of your life*; and "4" for an experience which was *very much part of your life* over the past month.

Intensity of Experience over Past Month
1- not at all part of my life
2- only slightly part of my life
3- distinctly part of my life
4- very much a part of my life

____ 1. Conflicts with boyfriend/girlfriend/spouse's family
____ 2. Being let down or disappointed by friends
____ 3. Conflict with professor(s)
____ 4. Social rejection
____ 5. Too many things all at once
____ 6. Being taken for granted
____ 7. Financial conflicts with family members
____ 8. Having your trust betrayed by a friend
____ 9. Separation from people you care about
____ 10. Having your contributions overlooked
____ 11. Struggling to meet your own academic standards
____ 12. Being taken advantage of
____ 13. Not enough leisure time
____ 14. Struggling to meet the academic standards of others
____ 15. A lot of responsibilities
____ 16. Dissatisfaction with school
____ 17. Decisions about intimate relationship(s)
____ 18. Not enough time to meet your obligations
____ 19. Dissatisfaction with your mathematics ability
____ 20. Important decisions about your future career
____ 21. Financial burdens
____ 22. Dissatisfaction with your reading ability
____ 23. Important decisions about your education
____ 24. Loneliness
____ 25. Lower grades than you hoped for
____ 26. Conflict with teaching assistant(s)
____ 27. Not enough sleep
____ 28. Conflicts with your family
____ 29. Heavy demands from extracurricular activities

____ 30. Finding courses too demanding
____ 31. Conflicts with friends
____ 32. Hard effort to get ahead
____ 33. Poor health of a friend
____ 34. Disliking your studies
____ 35. Getting "ripped off" or cheated in the purchase of services
____ 36. Social conflicts over smoking
____ 37. Difficulties with transportation
____ 38. Disliking fellow student(s)
____ 39. Conflicts with boyfriend/girlfriend/spouse
____ 40. Dissatisfaction with your ability at written expression
____ 41. Interruptions of your school work
____ 42. Social isolation
____ 43. Long waits to get service (e.g., at banks, stores, etc.)
____ 44. Being ignored
____ 45. Dissatisfaction with your physical appearance
____ 46. Finding course(s) uninteresting
____ 47. Gossip concerning someone you care about
____ 48. Failing to get expected job
____ 49. Dissatisfaction with your athletic skills

Source: Kohn, P. M., Lafreniere, K., & Gurevich, M. (1990). The inventory of college students' recent life experiences: A decontaminated hassles scale for a special population. *Journal of Behavioral Medicine, 13,* 619-630.

Appendix C

Sense of Coherence – Orientation to Life Questionnaire

Here is a series of questions relating to various aspects of our lives. Each question has seven possible answers. Please mark the number which expresses your answer, with numbers 1 and 7 being the extreme answers. If the words under 1 are right for you, circle 1; if the words under 7 are right for you, circle 7. If you feel differently, circle the number that best expresses your feeling. Please give only one answer to each question.

1. When you talk to people, do you have the feeling that they don't understand you?

1	2	3	4	5	6	7
Never						Always have this feeling

2. In the past, when you had to do something which depended upon cooperation with others, did you have the feeling that it:

1	2	3	4	5	6	7
Surely wouldn't get done						Surely would get done

3. Think of the people with whom you come into contact daily, aside from the ones to whom you feel closest. How well do you know most of them?

1	2	3	4	5	6	7
You feel that they're strangers						You know them very well

4. Do you have the feeling that you don't really care about what goes on around you?

1	2	3	4	5	6	7
Very seldom or never						Very often

5. Has it happened in the past that you were surprised by the behavior of people whom you thought you knew well?

1	2	3	4	5	6	7
Never happened						Always happened

6. Has it happened that people whom you counted on disappointed you?

1	2	3	4	5	6	7
Never happened						Always happened

7. Life is:

1	2	3	4	5	6	7
Full of interest						Completely routine

8. Until now your life has had:

1	2	3	4	5	6	7
No clear goals or purpose at all						Very clear goals and purpose

9. Do you have the feeling that you're being treated unfairly?

1	2	3	4	5	6	7
Very often						Very seldom or never

10. In the past ten years your life has been:

1	2	3	4	5	6	7
Full of changes without your knowing what will happen next						Completely consistent and clear

11. Most of the things you do in the future will probably be:

1	2	3	4	5	6	7
Completely fascinating						Deadly boring

12. Do you have the feeling that you are in an unfamiliar situation and don't know what to do?

1	2	3	4	5	6	7
Very often						Very seldom or never

13. What best describes how you see life:

1	2	3	4	5	6	7
One can always find a solution to things in life						There is no solution painful to things in life

14. When you think about your life, you very often:

1	2	3	4	5	6	7
Feel how good it is to be alive						Ask yourself why you exist at all

15. When you face a difficult problem, the choice of a solution is:

1	2	3	4	5	6	7
Always confusing and hard to find						Always completely clear

16. Doing the things you do every day is:

1	2	3	4	5	6	7
A source of deep pleasure and satisfaction						A source of pain and boredom

17. Your life in the future will probably be:

1	2	3	4	5	6	7
Full of changes without knowing what will happen next						Completely consistent and clear

18. When something unpleasant happened in the past your tendency was:

1	2	3	4	5	6	7
"To eat yourself up" about it						To say "ok that's that, I have to live with it and go on

19. Do you have very mixed-up feelings and ideas?

1	2	3	4	5	6	7
Very often						Very seldom or never

20. When you do something that gives you a good feeling:

1	2	3	4	5	6	7
It's certain that you'll go on feeling good						It's certain that something will happen to spoil the feeling

21. Does it happen that you have feelings inside you would rather not feel?

1	2	3	4	5	6	7

Very often Very seldom or never

22. You anticipate that your personal life in the future will be:

1 2 3 4 5 6 7
Totally without meaning or purpose Full of meaning and purpose

23. Do you think that there will always be people whom you'll be able to count on in the future?

1 2 3 4 5 6 7
You're certain there will be You doubt there will be

24. Does it happen that you have the feeling that you don't know exactly what's about to happen?

1 2 3 4 5 6 7
Very often Very seldom or never

25. Many people – even those with a strong character – sometimes feel like sad sacks (losers) in certain situations. How often have you felt this way in the past?

1 2 3 4 5 6 7
Never Very often

26. When something happened, have you generally found that:

1 2 3 4 5 6 7
You overestimated or underestimated its importance You saw things in the right proportion

27. When you think of the difficulties you are likely to face in important aspects of your life, do you have the feeling that:

1 2 3 4 5 6 7
You will always succeed in overcoming the difficulties You won't succeed in overcoming the difficulties

28. How often do you have the feeling that there's little meaning in the things you do in your daily life?

1 2 3 4 5 6 7
Very often Very seldom or never

29. How often do you have feelings that you're not sure you can keep under control?

1 2 3 4 5 6 7
Very often Very seldom or never

Source: Antonovsky, A. (1987). *Unraveling the mystery of health: How people manage stress and stay well.* San Francisco: Jossey-Bass.

Appendix D

State-Trait Personality Inventory (Form Y)

DIRECTIONS:
A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you *generally* feel.

1 Almost Never 2 Sometimes 3 Often 4 Almost Always

1. I feel calm **1 2 3 4**
2. I am in a questioning mood **1 2 3 4**
3. I am furious **1 2 3 4**
4. I feel strong **1 2 3 4**
5. I am tense **1 2 3 4**
6. I feel curious **1 2 3 4**
7. I feel like banging on the table **1 2 3 4**
8. I feel blue **1 2 3 4**
9. I feel at ease **1 2 3 4**
10. I feel interested **1 2 3 4**
11. I feel angry **1 2 3 4**
12. I feel miserable..... **1 2 3 4**
13. I am presently worrying over possible misfortunes **1 2 3 4**
14. I feel inquisitive **1 2 3 4**
15. I feel like kicking somebody **1 2 3 4**
16. I feel downhearted **1 2 3 4**
17. I feel nervous **1 2 3 4**
18. I feel like exploring my environment **1 2 3 4**
19. I feel like breaking things **1 2 3 4**
20. I feel alive..... **1 2 3 4**
21. I am jittery **1 2 3 4**
22. I feel stimulated..... **1 2 3 4**
23. I am mad..... **1 2 3 4**
24. I feel sad **1 2 3 4**
25. I am relaxed **1 2 3 4**
26. I feel mentally active..... **1 2 3 4**
27. I feel irritated **1 2 3 4**
28. I feel safe **1 2 3 4**
29. I am worried **1 2 3 4**
30. I feel bored..... **1 2 3 4**
31. I feel like hitting someone..... **1 2 3 4**
32. I feel gloomy **1 2 3 4**
33. I feel steady **1 2 3 4**
34. I feel eager..... **1 2 3 4**
35. I feel annoyed **1 2 3 4**
36. I feel healthy..... **1 2 3 4**
37. I feel frightened **1 2 3 4**

38. I feel disinterested..... **1 2 3 4**
39. I feel like swearing **1 2 3 4**
40. I feel hopeful about the future **1 2 3 4**
41. I am a steady person..... **1 2 3 4**
42. I feel like exploring my environment **1 2 3 4**
43. I am quick tempered **1 2 3 4**
44. I feel gloomy **1 2 3 4**
45. I feel satisfied with myself **1 2 3 4**
46. I am curious **1 2 3 4**
47. I have a fiery temper **1 2 3 4**
48. I feel happy **1 2 3 4**
49. I get in a state of tension or turmoil as I think over my recent concerns & interests..... **1 2 3 4**
50. I feel interested **1 2 3 4**
51. I am a hot-headed person **1 2 3 4**
52. I feel depressed **1 2 3 4**
53. I wish I could be as happy as others seem to be..... **1 2 3 4**
54. I feel inquisitive **1 2 3 4**
55. I get angry when I'm slowed down by others mistakes **1 2 3 4**
56. I feel sad **1 2 3 4**
57. I feel like a failure..... **1 2 3 4**
58. I feel eager..... **1 2 3 4**
59. I feel annoyed when I am not given recognition for doing good work **1 2 3 4**
60. I feel hopeless..... **1 2 3 4**
61. I feel nervous and restless **1 2 3 4**
62. I am in a questioning mood **1 2 3 4**
63. I fly off the handle..... **1 2 3 4**
64. I feel low..... **1 2 3 4**
65. I feel secure **1 2 3 4**
66. I feel stimulated..... **1 2 3 4**
67. When I get mad I say nasty things **1 2 3 4**
68. I feel whole..... **1 2 3 4**
69. I lack self-confidence **1 2 3 4**
70. I feel disinterested..... **1 2 3 4**
71. It makes me furious when I am criticized in front of others..... **1 2 3 4**
72. I feel safe **1 2 3 4**
73. I feel inadequate **1 2 3 4**
74. I feel mentally active..... **1 2 3 4**
75. When I get frustrated, I feel like hitting someone **1 2 3 4**
76. I feel peaceful **1 2 3 4**
77. I worry too much over something that really does not matter **1 2 3 4**
78. I feel bored..... **1 2 3 4**
79. I feel infuriated when I do a good job and get a poor evaluation **1 2 3 4**
80. I enjoy life..... **1 2 3 4**

Appendix E

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?.....**0 1 2 3 4**

2. In the last month, how often have you felt that you were unable to control the important things in your life?.....**0 1 2 3 4**

3. In the last month, how often have you felt nervous and "stressed"?.....**0 1 2 3 4**

4. In the last month, how often have you felt confident about your ability to handle your personal problems?.....**0 1 2 3 4**

5. In the last month, how often have you felt that things were going your way? **0 1 2 3 4**

6. In the last month, how often have you found that you could not cope with all the things that you had to do? **0 1 2 3 4**

7. In the last month, how often have you been able to control irritations in your life?.....**0 1 2 3 4**

8. In the last month, how often have you felt that you were on top of things?.....**0 1 2 3 4**

9. In the last month, how often have you been angered because of things that were outside of your control? **0 1 2 3 4**

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?.....**0 1 2 3 4**

Source: Cohen, S., Kamarck, T., and Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24,* 386-396.

Appendix F

Timeline Follow-Back Calendar

Please estimate in the spaces provided the number of drinks (refer to the standard drink chart below) you consumed for each of the days listed on the calendar. Begin with the date of _____ and continue backwards for the past 30 days. That means that for each of the days over the past month that you consumed alcohol, you will place the letter "A" and a number (e.g., A-4) in the block provided. Please also note the days on which you consumed over-the-counter pain or cough/cold/flu medications by writing OTC-P or OTC-C in the block provided. Note you do **NOT** need to list information about the **amount** of OTC medications you used.

1 Standard Drink is Equal to

One 12 oz can/bottle of beer

One 5 oz glass of regular (12%) wine

1 ½ oz of hard liquor (e.g. rum, vodka, whiskey)

1 mixed or straight drink with 1 ½ oz hard liquor

Complete the Following

Start Date (Day 1): _____ **End Date** (yesterday):___

2010	SUN	MON	TUES	WED	THURS	FRI	SAT
A	1	2	3	4	5	6	7
U	8	9	10	11	12	13	14
G	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30 Classes Began	31	1	2	3	4
S	5	6 Labor Day	7 Add Class DL	8	9	10 Eid Ul-Fitr	11
E	12	13	14	15	16	17	18 Yom Kippur
P	19	20	21	22	23	24	25
		27	28	29	30	1	2

	26						
O	**3**	**4**	**5**	**6**	**7**	**8**	**9**
C	**10**	**11** **Columbus Day**	**12**	**13**	**14**	**15**	**16**
T	**17**	**18**	**19** **Mid-terms**	**20**	**21**	**22**	**23**
	24	**25**	**26** **Drop Deadline**	**27**	**28**	**29**	**30**

Source: Sobell, L., C. & Sobell, M. B. (2003). Alcohol consumption measures. In J. P. Allen (Eds.), *Assessing alcohol problems: A guide for clinicians and researchers.* Treatment handbook (2nd ed, pp. 75-99). Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism.

***Please list the usual psychological and/or physical symptoms that you experienced when you used OTC pain or cold medications. For example, symptoms could include headache, back pain, cold/cough medications, anxiety, sleeplessness, sadness, etc.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Appendix G

INFORMED CONSENT TO PARTICIPATE IN THE
COPING WITH COLLEGE STRESS STUDY

My name is Rebecca Silver and I am a graduate student at Syracuse University in the department of psychology. I am inviting you to participate in a research study. Involvement in the study is voluntary, so you may choose to participate or not. This sheet will explain the study to you and please feel free to ask questions about the research if you have any. I will be happy to explain anything in detail if you wish.

I am interested in learning more about the methods that college students use to manage stress. You will be asked to provide information about your experience and perception of stress as well as your psychological/physical reactions to stress. You will also be asked to answer questions about the psychological and behavioral (alcohol and medication use) strategies you use to cope with stress. This will take approximately 1 hour of your time. All information will be kept anonymous, which means that identifying information, such as your name, will not be collected.

The benefit of this research is that you will be helping us to further our understanding of the stress-health-coping process in college students. Findings from this study may be used to develop stress-education programs that teach students effective strategies for coping with stress. In addition, this information should help researchers and health professionals to better understand the college students' experience of and reaction to stress which is becoming a topic of growing concern. If you choose to participate, you will be awarded 1 hour of research credit that counts toward the course requirement for a psychology course in which you are currently enrolled. The risk to you participating in this study is possible discomfort associated with answering questions about alcohol or medication consumption. If you experience uncomfortable emotions for a prolonged period of time as a result of your participation in this study, you may contact the Syracuse University Counseling Center at 443-4715 to address your concerns.

If you do not want to take part, you have the right to refuse to take part, without penalty. If you decide to take part and later no longer wish to continue, you have the right to withdraw from the study at any time, without penalty.

If you have any questions, concerns or complaints about the research, contact the principal investigator, Rebecca Silver at 717-424-0227 or Dr. Randall Jorgensen at 315-443-2753. If you have any questions about your rights as a research participant, you have questions, concerns, or complaints that you wish to address to someone other than the investigator, or if you cannot reach the investigator, contact the Syracuse University Institutional Review Board at 315-443-3013.

All of my questions have been answered, I am over the age of 18 and I wish to participate in this research study. I have received a copy of this consent form.

_____ _____

Signature of participant Date

_____

Printed name of participant

_____ _____

Signature of researcher (or witness) Date

_____

Printed name of researcher (or witness)

Table 1.

Descriptive Information for Whole Sample and by Gender

	Total (*n* = 165) *n* (%)	Males (*n* = 60) *n* (%)	Females (*n* = 105) *n* (%)
Age[†]	19 (2.8)	19 (4.4)	19 (1.2)
Gender (% male)	60 (36)		
Year in College			
Freshmen	96 (59)	35 (58)	61 (58)
Sophomores	54 (33)	18 (30)	36 (34)
Juniors	9 (6)	3 (5)	6 (6)
Seniors	6 (3)	4 (5)	2 (2)
Race			
Caucasian	115 (70)	42 (71)	73 (70)
Asian American	25 (15)	7 (12)	18 (17)
Hispanic/Latino/a	9 (6)	3 (5)	6 (6)
African American	6 (4)	3 (5)	3 (3)
Other	10 (5)	4 (7)	4 (4)

Note. Values for age are mean (SD)

Table 2.

Means, Standard Deviations, and Correlation Matrix of Study Variables for Male Participants, N = 60

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Level of Stressors	-.15	.35	1.00	--									
2. Physical Symptoms	6.1	8.6	.19	1.00	--								
3. Psychological Symptoms	.44	1.6	.04	-.37	1.00	--							
4. Perceived Stress	-.19	.61	.54**	-.20	.15	1.00	--						
5. Sense of Coherence	.16	.73	-.37**	.08	-.13	-.70**	1.00	--					
6. Stressor/SOC	-.12	.28	.21	.28*	.05	.27*	-.21	1.00	--				
7. Trait Anxiety	-.14	.56	.46**	.04	.08	.72**	-.77**	.13	1.00	--			
8. Alcohol	2.5	.54	.49**	-.06	-.01	.12	.01	.05	.03	1.00	--		
9. OTC Cold Medication	3.1	7.3	.12	.81**	-.11	-.08	.23	.36**	-.18	-.04	1.00	--	
10. OTC Pain Medication	2.7	4.2	.07	.28*	.41*	-.02	-.09	-.04	.17	-.06	-.23	1.00	--
11. All Substance Use	.35	.17	.22	.23	-.03	.09	.16	.19	-.15	.17	.29*	.04	1.00

Note. Level of Stressors=ICSRLE measure; Physical/Psychological Symptoms=Percentage days students reported experiencing physical/psychological symptoms in relation to taking OTCC or OTCP medications on the TLFB; Stressor/SOC=Interaction term of ICSRLE x SOC; Alcohol=Drinking days reported from the TLFB; OTC Cold/Pain Medication=Percentage days students reported consuming OTCC or OTCP medications on the TLFB measure. * $p < .05$, ** $p < .01$.

Table 3.

Means, Standard Deviations, and Correlation Matrix of Study Variables for Female Participants, N = 105

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11
1. Level of Stressors	.08	.40	1.00	--									
2. Physical Symptoms	8.7	13.	-.10	1.00	--								
3. Psychological Symptoms	1.8	4.6	.27**	-.01	1.00	--							
4. Perceived Stress	.11	.63	.66**	.09	.29**	1.00	--						
5. Sense of Coherence	-.09	.72	-.66**	-.03	-.31**	-.72**	1.00	--					
6. Stressor/SOC	-.19	.29	-.29**	.01	-.24*	-.23*	-.36**	1.00	--				
7. Trait Anxiety	.09	.67	.65**	.02	.41**	.69**	-.87**	-.39**	1.00	--			
8. Alcohol	2.0	.42	.33**	-.15	.06	.05	-.10	-.08	.13	1.00	--		
9. OTC Cold Medication	4.9	9.3	.05	.76**	.34**	.23*	-.19*	-.08	.18	-.10	1.00	--	
10. OTC Pain Medication	5.5	11.3	-.05	.18	.10	.01	-.02	.03	.11	-.07	-.07	1.00	--
11. All Substance Use	.33	.19	.37**	.33**	.28**	.20*	-.22*	-.24	.21*	.32**	.41**	.48**	1.00

Note. Level of Stressors=ICSRLE measure; Physical/Psychological Symptoms=Percentage days students reported experiencing physical/psychological symptoms in relation to taking OTCC or OTCP medications on the TLFB; Stressor/SOC=Interaction term of ICSRLE x SOC; Alcohol=Drinking days reported from the TLFB; OTC Cold/Pain Medication=Percentage days students reported consuming OTCC or OTCP medications on the TLFB measure. * $p < .05$, ** $p < .01$.

Table 4.

Multigroup Path Analysis Assessing Relationship Among Level of Stressors, Perceived Stress, Sense of Coherence, and Alcohol Use

	Males				Females			
Path	β	SE	p	CI	β	SE	p	CI
a1	.26	.11	.00*	.13, .39*	.29	.12	.11	.15, .42*
a2	-.34	.09	.00*	-.52, -.15*	-.36	.10	.00*	-.58, -.13
a3	.35	.12	.00*	.13, .57*	.20	.19	.00*	-.05, .44
b1	.05	.04	.10	-.02, .12	.05	.04	.17	-.05, .11
b2	-.06	.05	.23	-.16, .04	-.06	.05	.18	-.08, .00
b3	.06	.05	.21	-.04, .16.	.04	.04	.31	-.00, .06
c1	.19	.08	.14	-.07, .44.	.18	.08	.14	-.05, .41
c2	-.00	-.00	.97	-.25, .24	-.00	-.00	.98	-.26, .25
c3	-.21	-.08	.45	-.75, .33	.17	.07	.43	-.26, .61
c4	-.16	-.08	.43	-.56, .24	-.36	-.16	.07	-.74, .02

Note: paths a2, a3, b2, b3, c3, and c4 were constrained. * $p < .05$

Table 5.

Multigroup Path Analysis Assessing Relationship Among Level of Stressors, Perceived Stress, Sense of Coherence, Physical/Psychological Symptoms and Over the Counter Cold Medication

	Males				Females			
Path	β	SE	p	CI	β	SE	p	CI
a1	.26	.11	.00*	.13, .39*	.29	.11	.00*	.15, 42*
a2	-.34	.09	.00*	-.52, -.15*	-.36	.10	.00*	-.58, -.13*
a3	.35	.12	.00*	.13, .57*	.20	.12	.11	-.05, .44
b1	-.02	.03	.46	-.07, .03	-.03	.04	.46	-.11, .05
b2	.03	.03	.45	-.04, .09	.04	.05	.46	-.06, .13
b3	-.03	.04	.50	-.10, .05	-.02	.04	.58	-.09, .07
c1	-.07	.40	.44	-.26, .11.	-.10	.40	.44	-.36, .16
c2	.36	.57	.00*	.18, .54*	.54	.57	.00*	.32, .77*
c3	.06	.62	.72	-.29, .42	.33	.52	.09	-.03, .69
c4	-.04	.92	.85	-.44, .36	.14	.50	.44	-.20, .47
c5	-.05	.02	.34	-.15, .05	-.01	.02	.34	-.05, .01
c6	-.00	.02	.92	-.06, .05	-.01	.02	.92	-.20, .18

Note: paths a2, a3, b2, b3, c3, and c4 were constrained. * $p < .05$

Table 6.

Multigroup Path Analysis Assessing Relationship Among Level of Stressors, Perceived Stress, Sense of Coherence, Physical/Psychological Symptoms and Over the Counter Pain Medication

	Males				Females			
Path	β	SE	p	CI	β	SE	p	CI
a1	.26	.11	.00*	.13, .39*	.29	.11	.00*	.15, .42*
a2	-.34	.09	.00*	-.52, -.15*	-.36	.10	.00*	-.58, -.13*
a3	.35	.12	.00*	.13, .57*	.20	.12	.11	-.05, .44
b1	.02	.02	.26	-.02, .06	.02	.02	.21	-.01, .05
b2	-.03	.03	.32	-.08, .03	-.02	.02	.22	-.06, .01
b3	.03	.02	.26	-.02, .07	.01	.01	.36	-.01, .04
c1	.08	.74	.21	-.05, .21	.06	.74	.21	-.03, .16
c2	.00	.90	.96	-.09, .09	.00	.90	.96	-.07, .07
c3	.04	.77	.62	-.12, .20	-.05	1.1	.58	-.22, .11
c4	-.17	1.3	.09	-.38, .04	.10	1.4	.32	-.07, .27
c5	.94	.79	.00*	.83, 1.1*	.80	.10	.00*	.70, .89*
c6	-.46	-.78	.00*	-.55, -.36*	-.22	.27	.50	-.67, .23

Note: paths a2, a3, b2, b3, c3, and c4 were constrained. * $p < .05$

Table 7.

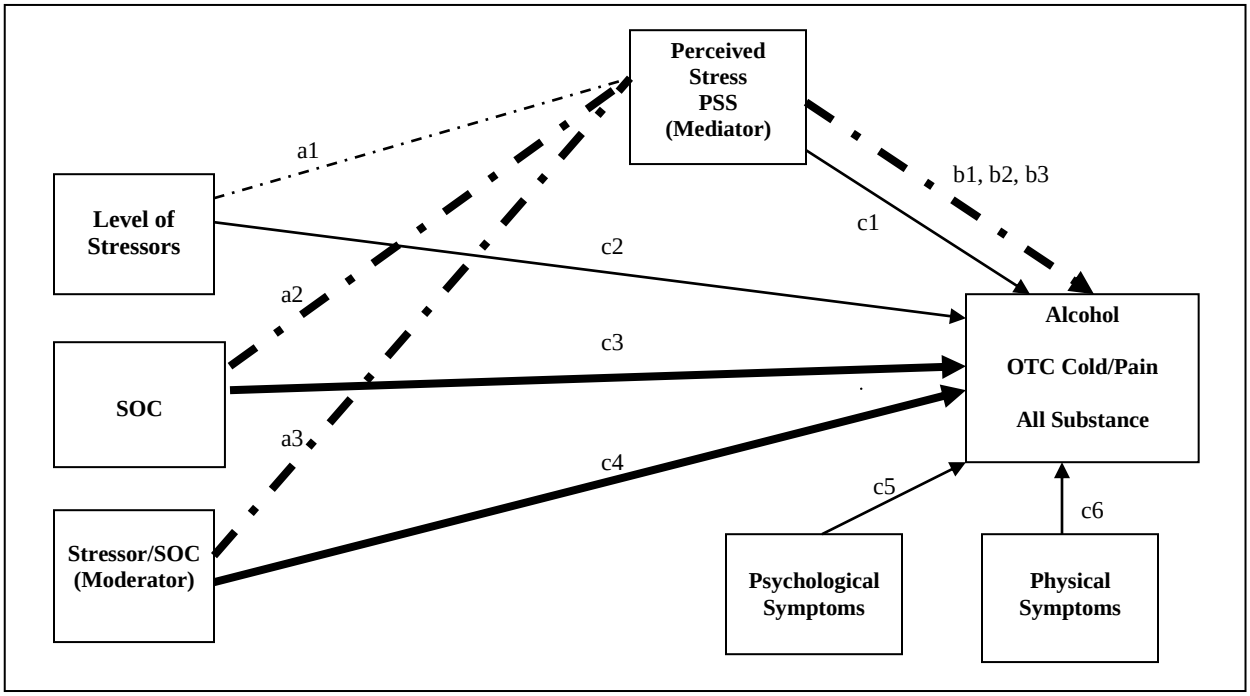
Multigroup Path Analysis Assessing Relationship Among Level of Stressors, Perceived Stress, Sense of Coherence, and All Substance

	Males				Females			
Path	β	SE	p	CI	β	SE	p	CI
a1	.26	.07	.00*	.09, .37*	.29	.07	.00*	.11, .40*
a2	-.34	.09	.00*	-.57, -.18*	-.36	.12	.00*	-.65, -.13*
a3	.35	.11	.00*	.13, .57*	.20	.12	.11	-.12, .44
b1	.01	.06	.08	-.05, .19	.01	.01	.34	-.02, .04
b2	-.13	.07	.07	-.31, -.01	-.02	.02	.36	-.06, .02
b3	.13	.07	.08	-.06, .25	.01	.01	.44	-.02, .03
c1	.38	.18	.03*	-.08, .67*	.05	.04	.30	-.07, .12
c2	.26	.18	.15	-.21, .56	.03	.09	.69	-.18, .17
c3	.25	.19	.19	-.25, .57	.18	.16	.25	-.23, .44
c4	-.34	.18	.06	.06, .53	.19	.16	.25	-.24, .46

Note: paths a2, a3, b2, b3, c3, and c4 were constrained. * $p < .05$

Figure 1.

Path Analytic Model



*Note: Solid lines indicate direct paths; dashed lines indicate indirect paths; bold lines indicate gender-based hypotheses

Figure 2.

Plot of Moderation of SOC on Stressors and PSS for Females

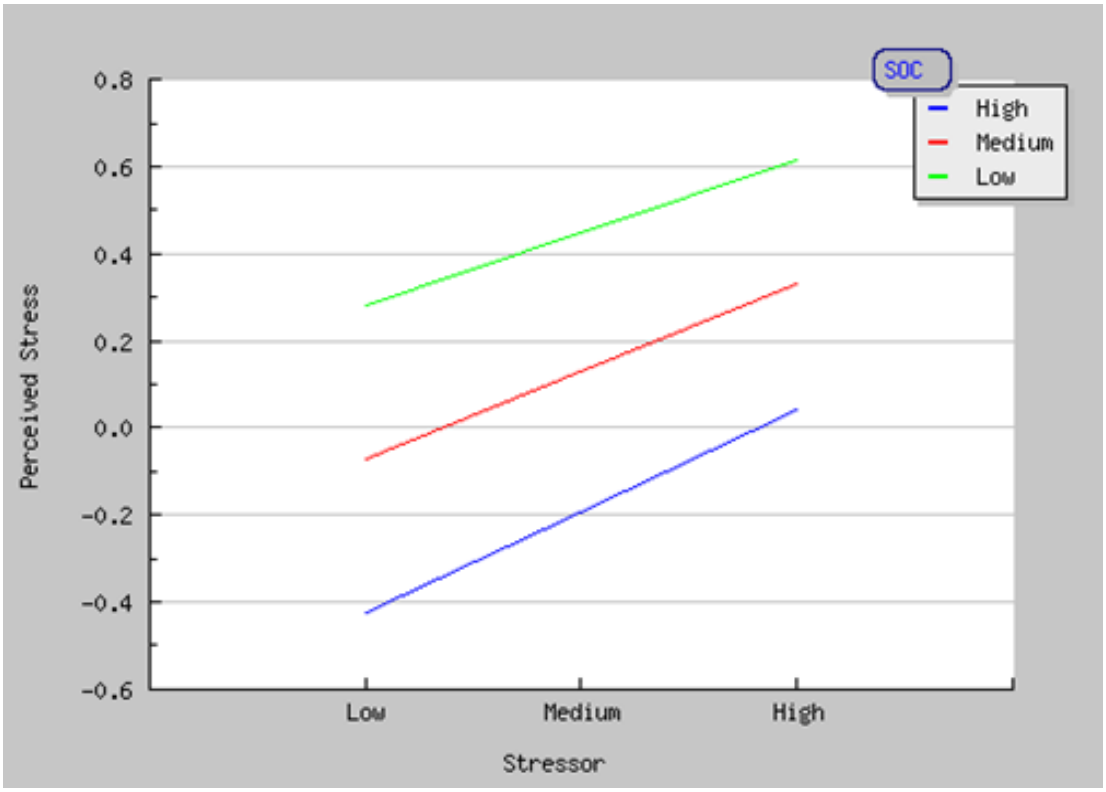
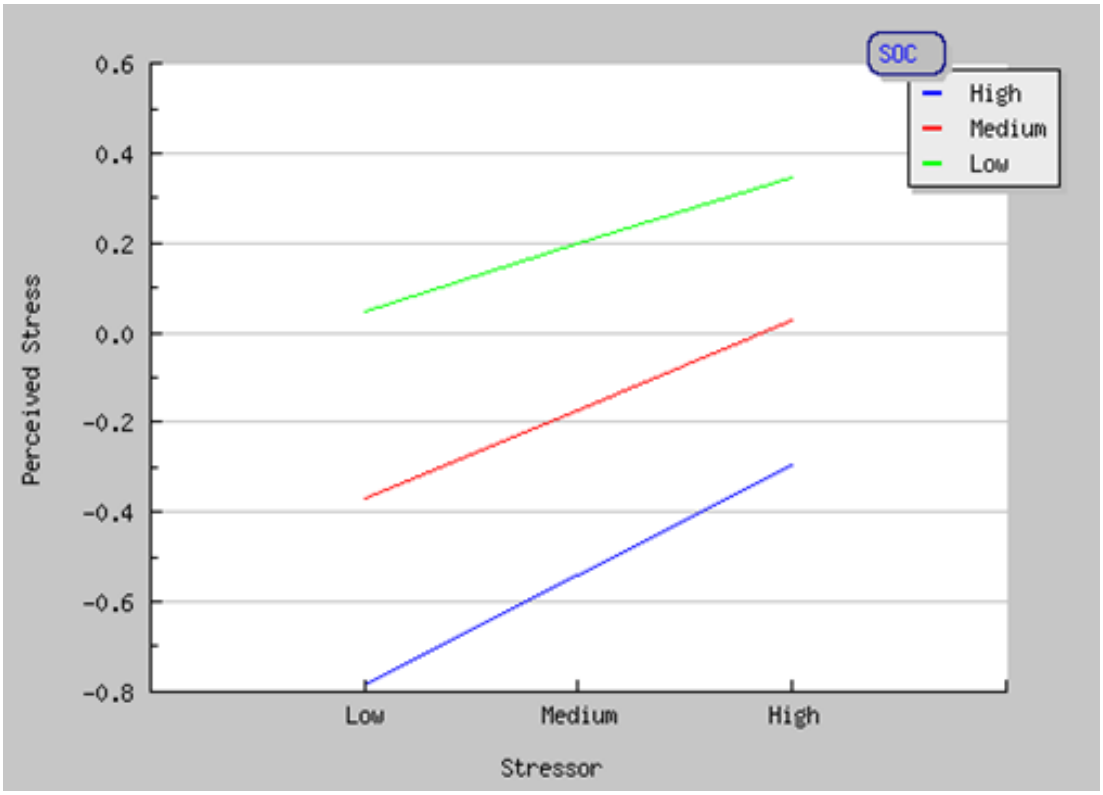


Figure 3.

Plot of Moderation of SOC on Stressors and PSS for Males



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