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Feeling the pressure: Differences in blood pressure among working undergraduate students

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By

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Feeling the pressure: Assessing perceived stress and blood pressure among working undergraduate students

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ABSTRACT

Studies have shown that being employed while pursuing post-secondary education may lead to higher levels of perceived stress and unhealthy behaviours. The current study involved a hierarchical regression model to analyze both perceived stress and blood pressure (BP) as a function of the number of hours worked per week (HW). Seventy-four undergraduate students from the from the University of Windsor completed measures of perceived stress, coping, physical activity, and daily hassles, and had their BP recorded after ten minutes of rest. There was a correlation between HW and systolic BP ($r = .23$, $p < .05$). Problem-focused coping was negatively associated with levels of perceived stress ($r = -.23$, $p < .05$), whereas emotion-focused coping was positively associated ($r = .57$, $p < .001$). Energy drink users had higher HW than non-users ($t = 2.14$, $p < .05$). There was no change in BP from before and after questionnaire administration.

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LIST OF ABBREVIATIONS/SYMBOLS

SBP – Systolic Blood Pressure

DBP – Diastolic Blood Pressure

PSS – Perceived Stress Scale

MSSS-A – McArthur Subjective Socioeconomic Status – Adolescent Version

ICSRLE – Inventory of College Student Recent Life Experiences

CISS-SF – Coping Inventory for Stressful Situations – Short Form

IPAQ – International Physical Activity Questionnaire

WCTH – Waist Circumference to Height

HW – Hours Worked per Week

Q – Cardiac Output

TPR – Total Peripheral Resistance

Feeling the pressure: Differences in blood pressure among working undergraduate students

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Feeling the Pressure: Assessing Blood Pressure among Working Undergraduate Students

The twenty-first century has seen many changes to the working environment in the industrialized world, including but not limited to increased globalization, the continuing shift from manual to mental labour, and a higher demand for worker qualifications (Dunning, 2002). In addition, the financial resources needed to pursue higher education in certain parts of the world have reached unprecedented levels. Tuition rates are rising at a dramatic pace, as well as the demand for seeking post-secondary education. There has been a three-fold increase in tuition rates in the last 20 years in Canada. Elsewhere, Great Britain, New Zealand, and China have all begun to place the burden of tuition fees on undergraduate students and their families since the 1990s (Huang, Fan & Xie, 2007; Manthei & Gilmore, 2005). As a result of rising education costs, many students are currently engaging in part-time employment to pay for their expenses. Other factors that have influenced this trend include an increase in mature students attending university, an increase in low-paying service sector jobs for which undergraduates are preferred, and classes with more flexible learning schedules. Overall, the percentage of working students has increased worldwide in the last ten years, with the exception of North America, where the percentage has remained relatively steady due to the recent economic downturn (Lansdown, 2009; Marshall, 2010).

Nonetheless, a large number of students are working to cover either part or all of their education and living expenses. Statistics Canada (Marshall, 2010) reports that roughly half of all Canadian undergraduates are engaged in paid employment during the school year, working an average of 15.6 hours per week. There is a growing body of

literature on how being a full-time university student can have negative effects on one's health and well-being (see Robotham & Julian, 2006, for a review). A major component of these effects is due to the increased stress associated with the demands of pursuing a university degree. There is also some research available on the effects of combining paid employment with post-secondary education. What research has been done, though informative, has not directly assessed the physiological effects of being a working student. Other gaps in the research include a lack of qualitative data, making it difficult to analyze the context of current quantitative findings, a lack of Canadian-based research on working students, and a failure to apply sound psychological theory on this subject. Finally, research has shown that working students are more likely to engage in negative health behaviours (Miller, Danner, & Staten, 2008).

The overall aim of the current study is to add to the current knowledge on working students in Canada. Below is a review of the current literature on the experience of working students, in particular its relation to stress, health, and well-being. This study wishes to also extrapolate on these findings by looking at the possible associations between student employment and a negative behaviour yet to be studied: consumption of energy drinks. Energy drink use has been associated with several negative health consequences compared to other substances that contain caffeine (Curry & Stasio, 2009; Iyadurai & Chung, 2007). Since energy drink users make up a significant component of undergraduate students in Canada, and specifically students who work in the evening (Ianni & Lafreniere, 2014), this subject is an important part of the working undergraduate experience. It is important to know how energy drinks affect students physiologically, but also to understand the kinds of paid employment in which users are engaged.

The Effects of Stress on Undergraduate Students

Before analyzing the effects of student employment on stress, it is necessary to understand how the stress of being a student alone can affect one's health. It is important to understand that the stress of pursuing any degree is not always negative, nor does it necessarily lead to negative health outcomes. Grounded in Selye's (1946) General Adaptation Syndrome, *eustress* is a term used to define positive outcomes due to moderate, manageable levels of stress. An example of eustress is that social service employees who have higher levels of work engagement (i.e., a positive approach to their work) have been found to have lower levels of job burnout (Kuzosnik, Rodriguez, & Piero, 2012). These findings can be extrapolated to the academic environment as well. A study involving nursing students found a positive correlation between course hassles and course satisfaction when levels of social support and self-efficacy were high (Gibbons, Dempster, & Moutray, 2011). Other studies have reported higher self-esteem, better time management skills, and more social support among students who had higher levels of stress (Monk, 2004). It should also be understood that over the course of one's life, acquisition of a university degree is associated with healthier behaviours. For example, people with a higher level of education are more likely to be employed, have more subjectively fulfilling jobs, and have higher levels of social support (Ross & Wu, 1995).

Nonetheless, the negative stress (*distress*) that many students experience has been shown to have detrimental effects on both health-related outcomes and academic performance. Studies that have looked at how stress affects one's academic sphere of life have found that it can lead to lower grades, increased attrition rates, and a delay in the time it takes to finish one's undergraduate education (Tannok & Flocks, 2003). From a

health perspective, other studies have shown that lower academic performance without proper stress management has a direct impact on the health of the students (Rabow, Choi, & Purdy, 1998). An American study (Misra & McKean, 2000) found that students may display this distress in various emotional (e.g., fear, anxiety, worry, anger), cognitive (e.g., unhealthy appraisals of stress levels), and physiological (e.g., sweating, stuttering, headaches, weight gain) manifestations. Negative reactions to stress can also result in reduced immune system functioning among undergraduates (Sarid, Anson, Yaari, & Margalith, 2004). Specific groups among the student population can also be affected by stress in specific ways. For example, students with mental health problems find that their symptoms are significantly exacerbated as stress from work and course load increase (Stanley & Manthorpe, 2001). From a behavioural perspective, students under higher levels of stress are more likely to engage in a wide variety of unhealthy behaviours, including poor diet, alcohol abuse and smoking (Hirsch & Ellis, 1996). In addition, students who have high stress levels are less satisfied with their fitness level, weight and overall health. Other studies have shown that students who have heavy study loads not only have increased stress levels but a decreased ability to cope with that stress (Abouserie, 1994). The long term implications of these negative effects have not been studied in detail, but some studies have shown that middle-aged workers who reported higher levels of adversity during their adolescence had more adverse physical reactions to psychological stressors in adulthood (Westerlund, Gustaffson, Theorell, Janlert, & Hammarstrom, 2011).

Health Effects of Being an Employed Student

The experience of being in university in and of itself can be quite stressful. Combining employment with studying during the semester can exacerbate this stress in several ways. It should be noted that research has shown positive outcomes of being a working student, including better time management skills and better chances of being employed upon degree completion (Manthei & Gilmore, 2005; Tam & Morrison, 2005). However, other studies have found several disadvantages of being a working student compared to their non-working counterparts. Working students have been found to have higher levels of stress, lower grades, less sleep, higher levels of binge drinking behaviours, and more negative appraisals of their studying experiences than non-working students (D'Alessandro & Volet, 2012; Miller et al., 2008; Weller et al., 2004). Longitudinal studies have found correlations between the number of hours students spent in paid employment and lower grades as they progress through school. For example, in a recent study, Australian nursing students were surveyed with regard to the number of hours worked throughout their education. Results showed that after accounting for demographic variables, there was a negative correlation between hours in paid employment in their first year and their GPA a year later (Salamonson, Everett, Koch, Andrew, & Davidson, 2012). These findings are supported by other studies that found lower Grade Point Averages (GPAs) among working students (Hawkins, Smith, Hawkins, & Grant, 2005; McKenzie & Schweitzer, 2010). Students from these studies cited that their lower GPAs were due to reduced time for studying, stress, fatigue, and exhaustion. Finally, some studies have shown that being employed takes time away from the full experience of university life, as working students are less likely to engage in

volunteer work, sporting activities, and everyday interaction with classmates (Nevill & Rhodes, 2004).

Qualitative Research on Working Students

Current qualitative research on working students supports this combination of negative and positive aspects from quantitative research. Most of the qualitative research in this area comes from mixed-methods studies. However, a few researchers in the area have conducted entirely qualitative studies. Both Robotham (2013) and Hall (2010) found that the biggest reason why most students were working was because of financial necessity. However, some students cited that gaining work experience, even if their work had nothing to do with their major, was their main reason for working (Robotham 2013). Both studies found a mixture of negative and positive comments in regards to being a working student. Many students found that it was difficult to find the motivation to do homework after completing a work shift, resulting in staying up longer to complete assignments and finish readings (Hall, 2010). Some students reported being dissatisfied with the quality of their written assignments. Students also reported less socializing due to their busy schedules (Robotham, 2013). There were also positive comments as well, including increased communication skills and decision-making abilities. Some students found that work allowed them to get away from thinking about school so they could come back to their schoolwork later with a refreshed mind (Hall, 2010). Other qualitative studies found that students were able to integrate the skills gained from both their education and work experience, even though there was a general feeling of reduced commitment to school work (Lansdown, 2009). In terms of what universities could do to ameliorate the situation of working students (besides increased financial support),

suggestions included better online facilities for communication and submitting assignments (Hall, 2010).

Using a demographic survey of working students, Robotham (2012) also found a mixture of both negative and positive comments. Negative outcomes included a reduced ability to concentrate due to tiredness and decreased physical activity. The study also found that 54% of those surveyed reported higher levels of stress due to their employment. Twenty-eight percent said that they had a reduced ability to cope with that stress, but the same percentage reported an increased ability to cope with stress because of their employment. It is unclear why this dichotomy exists, but certain personality characteristics and/or type of coping strategies may play a role. Overall the literature suggests positive outcomes related to time management, and negative outcomes that are academic, physiological, social, and behavioural.

One of the goals of the current study is to see if a Canadian sample produces similar qualitative data to previous research by Robotham (2013) and Hall (2010) by asking questions about similar topics. These include students' reasons for working, the consequences of being a working student, both negative and positive, managing priorities, and how their year of study affects their work schedule. The expectations of the current study are to find similar, but slightly more negative, results in the current study, given that Canadian undergraduates are working more hours and more jobs in the service sector compared to the British and Australian samples from previous research. Two limitations of the study by Robotham (2013) are that it did not address what specific coping mechanisms they used, nor did it inquire about possible changes they would make to improve the situation of working students on campus. Hall (2010) provided some

information on the latter, but there has yet to be a study to qualitatively assess working students' experience in Canada. The current study addressed these issues by allowing participants to comment on what kind of changes they would like to see on campus. In addition, they have given information about possible activities they may engage in or people that they talk to who buffer the stress that they may experience. Using a well-known theoretical model described below, the current study provides a more in-depth understanding of working students' appraisal of their situation.

The Transactional Model of Stress and Coping

Lazarus and Folkman's (1984) Transactional Model of Stress and Coping has been used as a theoretical model for myriad issues involving the appraisal of and reaction to environmental stressors. They defined appraisal as "the process of categorizing an encounter, and its various facets, with respect to its significance for well-being." (Lazarus & Folkman, 1984, p. 31) In their day-to-day lives, people use this categorization process in a two-fold process in response to a potential environmental stressor. The first is *primary appraisal*, in which the person decides if and how an environmental stimulus would affect their lives. The event must be perceived as stressful in order for the stressor to have an impact. For example, if a class learns of an upcoming exam, each student has to think about if studying and taking this exam will be manageable, and how it will affect their schedule for the coming week. Some students may appraise the situation as "stressful" and will think about how to best cope with the situation. Others may appraise the situation as "irrelevant" and believe they can pass without studying, while others appraise the situation as "benign-positive" viewing it as an opportunity to succeed. The study will account for this by using a well-known measure of perceived stress. In

secondary appraisal, the person decides what resources are available to deal with the stressor. While objective resources such as time, energy and money factor into secondary appraisal, people also use various *coping strategies* that they feel are most effective to deal with the situation (Folkman and Lazarus, 1985).

Coping strategies. Lazarus and Folkman (1984) defined coping as "efforts we take to manage situations we have appraised as being potentially harmful or stressful." They further state that there are three key aspects to coping. It involves a certain amount of planning, it assumes that the outcome may be positive or negative, and it is a process that occurs over time. Stress researchers usually divide coping strategies into three different categories. *Problem-focused coping* refers to specific actions that a person does in order to improve the external demands faced by the individual (Lazarus & Folkman, 1980). This may include studying for the exam, getting together and forming a study group, or bringing one's books to work. In also includes inwardly focused attempts to better the situation, such as deciding on a studying schedule. *Emotion-focused coping* refers to actions taken by the individual to either lower distressing emotions or improve positive emotions associated with the stressor (Lazarus & Folkman, 1986). In this case, students may vent their distress away by talking to fellow classmates, or by focusing on the emotionally positive aspects of the course. Lastly, *avoidance coping* involves ignoring or avoiding conflict associated with the stressor (Holohan, Moos, Holohan, Brennan, & Schutte, 2005). For example, students may completely ignore studying for the exam by playing video games, or by reading non-academic material.

Studies have shown that people in many different contexts are reported to use all of these strategies in different amounts; no coping strategy is used in the complete

absence of others. Folkman and Lazarus (1985) found that students studying for an exam used both problem and emotion-focused coping; Sometimes students during stressful situations benefit from emotion-focused coping strategies or avoidant coping strategies in small, brief amounts. In general however, problem-focused coping is regarded as most appropriate in situations that are high in changeability such as coursework, and emotion-focused and avoidance coping strategies are the most effective in situations that are not changeable, such as waiting for marks (Zeidner, 1995). Folkman and Lazarus (1985) comment further that the timing of the stressor plays a role in which coping strategies are most effective. These are generally divided into the anticipatory stage, the waiting stage, and the outcome stage. The anticipatory stage would be the stage that undergraduate students are faced with in the current study, as they are engaged studying for their courses. Problem-focused coping strategies would benefit students the most in this stage, whereas emotion-focused and avoidance coping strategies are best in the stages following the anticipatory stage (i.e., the waiting and outcome stages). In addition, students who use problem-focused coping are more likely to view the work as a challenge, whereas those who use emotion-focused coping are more likely to view it as a threat (McCrae, 1984). Therefore, high levels of problem-focused coping would be the most beneficial during the school semester.

Process-based approaches. Research has shown that different coping strategies are preferred based on both individual traits, and/or the type of stressor. Research that looks at personality or other differences is said to take a *trait-based* approach. Stress research that looks at differences due to the situation uses a *process-based* approach. Different individual traits have been known to correlate with physiological variables such

as blood pressure (BP) and heart rate. For example, Schalling and Svennson (1983) found that factors such as lower assertiveness, higher levels of anxiety, and higher hostility were associated with higher BP. These are now known as personality traits common to the "Type A" personality. However, specific traits have been known to be poor predictors of the type of coping strategies that are used in specific situations (Folkman & Lazarus, 1980). The current study will be taking a process-based approach in that the situation of working students will have an effect on what type of coping strategies they use, irrespective of differences in personality traits. In order to take a process-based approach in studying coping, Lazarus and Folkman (1985) comment that there are three criteria that must be satisfied. First, coping must examined within the context of a specific stressful encounter. For the current study, participants are all engaged in the same activities, namely school and work activities. Second, it must examine what people actually do as opposed to a hypothetical situation. The current study will be asking several open-ended questions about how they cope as a working student. Third, it must examine changes in coping strategies over time. It is beyond the scope of the current study to look at how working students deal with the waiting or outcome stage, but subsequent studies can expand on this by observing changes in coping strategies from year to year.

Physiological outcomes of coping strategies. Since the current study is looking at physiological differences among undergraduate students, a review of literature on the association between appraisal and health outcomes will be necessary. Recent research has shown that people who are more likely to use avoidance-coping strategies have higher rates of BP and heart rate, specifically in response to self-appraised stressful

situations (Kohlman, Weidner, & Messina, 1994). Endler and Parker (1990a) found that problem-focused coping was negatively related to test anxiety among undergraduates, and both emotion and avoidance coping was positively related to test anxiety. This may be because problem-focused coping is better suited in situations that are highly changeable, such as in preparing for an exam. Problem-solving skills or ability can be defined as the ability to search for information, analyze situations, generating alternative courses of action, and implement appropriate plans of action (Janis & Mann, 1977). People who are more likely to use problem-solving skills score higher on measures of problem-focused coping, lower on emotion-focused and avoidance coping strategies than ineffective problem solvers (MacNair & Elliot, 1992). Effective problem-solvers have been shown to have more positive health behaviours than ineffective self-appraised problem solvers. For example, Heppner, Kampa, and Brunning (1987) found that among undergraduate students, ineffective problem –solvers reported more health problems related to their cardiovascular system than effective problem-solvers. Elliot and Marmarosh (1994) noted that effective problem-solvers had fewer physical symptoms and health problems both before and on the day of an exam. There may be indirect effects that may explain this relationship, especially in regards to students. Ineffective problem-solvers measure higher on levels of psychological distress, and are more likely to suffer in terms of their academic performance. Finally, research has shown that people who are more likely to use avoidance-coping strategies in response to daily stressors are more likely to have higher levels of BP reactivity (Vitaliano, Russo, Bailey, Young, & McCann, 1993).

The current study will be using a well-known coping measure that contains items from these three categories of coping strategies. In regards to emotion-focused coping, the items that are on this subscale deal mainly with coping strategies that are considered maladaptive for participants' current stage of their school semester (e.g., self-blame). It is true that these types of strategies are still appropriate in measured amounts in the anticipatory stage. However, on the whole, they are better served for situations that are low in changeability, such as when waiting for the results of an exam. Furthermore, more appropriate emotion-focused coping strategies during the anticipatory stage, such as cognitive reappraisal, are absent from the measure that are used in the current study. Thus, we theorized that there would be a positive correlation between the emotion-focused coping and blood pressure. Similary, avoidant coping strategies are generally considered adaptive in only measured amounts during this stage (Zeidner, 1995). We expected a positive correlation between avoidant strategies and blood pressure, and a negative correlation between problem-focused coping strategies and blood pressure.

In summary, working students must appraise the level of subjective stress they experience from their daily life. At the same time, they have to decide how to cope with the situation, which is both highly changeable, and from an educational standpoint is the anticipatory stage of the semester. Previous research has shown that problem-focused coping would lower physical and mental distress. In contrast, emotion and avoidance coping strategies would, as a whole, have an opposite effect. We hypothesize that there will be a negative relationship between problem-focused coping strategies and blood pressure, and a positive relationship between emotion and avoidance coping strategies and blood pressure. In addition, the additive objective stress of increased working hours

may drain working undergraduates of available coping resources such as time and energy, over and above their coping strategy preferences. Therefore, the current study hypothesized a positive relationship between the number of hours in paid employment and blood pressure.

Blood Pressure

Blood pressure (BP) can be defined as the pressure exerted on the arterials walls due to the flow of blood through the circulatory system (American Heart Association, 1988). Approximately every second, BP oscillates due the contraction and relaxation of the heart. During full heart contraction, the pressure exerted on the arterial walls is at its highest pressure; this is known as the systole or systolic BP (SBP; Doohan, 1999). During the relaxation of the heart, BP is at its lowest point, which is called the diastole or diastolic BP (DBP). These two dichotomous variables are the most common measures of cardiovascular health. SBP and DBP are most commonly measured in millimeters of mercury (mm/Hg). The normal or desired BP in humans ranges from 90 to 120 mm/Hg for SBP and 60 to 80 mm/Hg for DBP (American Heart Association, 1993). Abnormally high BP or hypertension occurs through diagnosis of consistently high BP. Hypertension is divided into different stages, including pre-Hypertension (120 to 139 mm/Hg systolic and 80 to 89 mm/Hg diastolic), Stage 1 Hypertension (140 to 159 mm/Hg systolic and 90 to 99 mm/Hg diastolic), and Stage 2 Hypertension (160 to 179 mm/Hg systolic and 100 to 109 mm/Hg diastolic). Any reading higher than 180 mm/Hg for SBP and/or 110 mm/Hg for DBP is referred to as a Hypertensive Emergency (Doohan, 1999). Hypertension is considered one of the greatest risk factors for cardiovascular disease (CVD; Wilson et al., 1998). CVD covers a wide range of disorders related to

cardiovascular health, including but not limited to heart attacks, congenital heart disease, and heart failure. Currently, CVD is the leading cause of death in the world, causing 17 million fatalities per year (World Health Organization, 2013).

BP is calculated by finding the product of total cardiac output (or Q) and the total peripheral resistance (TPR) on the arterial walls (Doohan, 1999). Q can be defined as the total volume of blood pumped out by the heart in a span of one minute. It is usually calculated by multiplying the volume of blood pumped by the heart in each stroke (called stroke volume) and heart rate (number of beats per minute), and is usually measured in milliliters per minute (ml/min). Thus, any increase in heart rate subsequently raises BP, and any decrease in HR subsequently decreases BP (Doohan, 1999). Another factor that accounts for BP is TPR, which is the sum of forces that blood flow must work against to move blood through the circulatory system. TPR is calculated by subtracting the mean arterial pressure (usually calculated by adding 2/3 diastolic and 1/3 systolic pressure) by the mean venous pressure (which is usually very low at around 4 mm/Hg), and then dividing that number by Q (Doohan, 1999). TPR increases when hormones bind to different receptors located in the blood vessels, which will be discussed next.

Regulation of BP and Central Command. A complex higher order system within the body strictly regulates BP. When arousal of the body is necessary, the Sympathetic Nervous System (SNS) increases heart rate (HR) and Q, thereby increasing BP. The Parasympathetic Nervous System (PNS) subsequently lowers those functions once the stressor has subsided, thereby lowering BP to its homeostatic level (Dampney et al., 2002). Overseeing these two systems are the Central Command (CC) and the Cardiovascular Control Center (CCC), which are both located in the higher regions of the

brain. The CC sends signals to increase BP when necessary to the CCC, which then sends signals to the rest of the vasculature. There are also several receptors that send afferent signals to the CCC if the environment of the blood vessels has changed. Baroreceptors, located mainly in the arteries, function like regulators in response to the changing of pressure in the arterial walls (Lafranchi & Somers, 2002). When pressure increases, they send afferent signals to the CCC, which in turn activates the PNS to bring BP to its normal rate. When BP becomes lower, baroreceptors send signals to the PNS to increase BP. The result is a tightly regulated system keeps BP at homeostasis after short duration increases or decreases.

Located in the arteries and in the aorta, chemoreceptors also help regulate BP (Somers, Mark, & Abboud, 1991). They work by detecting changes in chemical markers such as oxygen, carbon dioxide, and hydrogen ions. Particularly when one exercises, chemoreceptors send signals to the CCC, which in turn will send signals to constrict the arteries and raise HR. The result is an increased in TPR and subsequently BP (Somers et al., 1991). Metaboreceptors act in a similar way be detecting changes in the level of enzymes such as potassium, adenosine, and serotonin (Somers et al., 1991).

Chronic stress, acute stress, and BP. From a physiological perspective, stress is divided into two basic types: chronic stress and acute stress. Acute stress occurs in reaction to common fight-or-flight situations. This occurs frequently, and begins with an increase in stress functions via the PNS, with subsequent lowering of those functions via the SNS (Charmandari, Tsigos, & Chrousos, 2005). Chronic stress, which is the stress that occurs over a longer period of time, is more detrimental to the body than acute stress. It refers to the gradual inability of the PNS to lower stress responses after repeated

stressful events. Because of the tendency of the body to constantly remain in an aroused state, chronic stress can lead to increased and prolonged secretions of corticosteroids such as cortisol and adenosine (Charmandari et al., 2005). Other systems of the body are inhibited in performing needed functions, such as the thyroid and the production of growth hormone (GH). This in turn can lead to negative health outcomes such as hypertension, lack of sleep, anxiety, depression, and other maladies (Charmandari et al., 2005). There are several factors which contribute to hypertension throughout the life span. Most notably, stressful workplaces have shown to produce high levels of chronic stress, resulting in elevated hypertension rates (Schnall, Schwartz, Landsbergis, Warren, & Pickering, 1998).

However, the influence of chronic stress on BP is complex, and is mediated by health behaviours, both negative and positive. There is ample evidence that negative behaviours or diminished positive behaviours as a result of that stress can act as mediating variables in raising people's BP indirectly. For example, consumption of alcohol can affect one's BP, though the effects are complex and vary depending on frequency, volume, and type. Small, infrequent consumption of alcohol is associated with temporarily lower BP, particularly for red wine; frequent consumption of alcohol is associated with consistently higher SBP and DBP long term (Russell, Cooper, Frone, & Welte, 1991). Another commonly used drug that has an effect on BP is caffeine. First daily use of caffeine is associated with a temporary rise in BP (James, 2003). Caffeine creates an increase in BP within 30 minutes, with peak increases in 60 to 120 minutes. Cross-sectional studies report increases in BP anywhere from 5 to 15 mm/Hg systolic and 5 to 10 mm/Hg diastolic after first daily intake. Successive amounts of caffeine during

the day results in smaller increases in BP until the end of the day when it begins to drop. The association between long-term caffeine use and BP is inconclusive, although there is evidence it can affect the BP of some people who are prone to hypertension, include greater reactivity to caffeine (Lavallo et al., 2000).

There are also several behaviors, personality characteristics, and activities that factor into individual differences in BP. For example, reactivity refers to the level of increase in BP upon presentation of a stressor. People with abnormally high reactivity are more likely to have higher rates of hypertension than those with low reactivity, even among young people (Markovitz, Raczysnki, Wallace, Chettur, & Chesney, 1998). The amount of physical activity people engage in has an effect on BP. Acute physical activity is associated with necessary increases in systolic BP, sometimes as high as 220 mm/Hg, due to the increase in heart rate. DBP usually decreases or remains at normal levels during exercise (Pescatello, Fargo, Leach, & Scherzer, 1991). Within minutes of stopping exercise, both BP and HR returns to pre-exercise levels. On a long-term basis, frequent exercise can either reduce BP to healthier levels or buffer eventual increases, especially among people with hypertension (Whelton, Chin, Xin, & He, 2002). Since there is an association between high workloads and less frequent exercise, it is possible that exercise frequency may mediate the relationship between hours worked and physiological variables such as BP.

There are also diurnal and seasonal influences on individual BP. One such example is called circadian variability, which is the predictable fluctuation of BP within a 24-hour period. BP is usually highest during the day time and lowest during the night, a phenomenon known as the “nocturnal dip” (Verdecchia, Schillaci, & Porcellati, 1991).

In addition, BP tends to be higher during the winter months as opposed to the summer months, as vasodilation occurs more often in warm environments (Minami, Kawano, Ishinimitsu, Yoshimi, & Takishita, 1996). Variability in BP because of circadian and seasonal changes should be accounted when performing research that occurs over long time frames. Among women, the menstrual cycle causes fluctuations in BP throughout the course of the month. BP is higher at the onset of menstruation, and lower during the final days of the cycle (Dunne, Berry, Ferriss, Grealy, & Murphy, 1991).

The effect of students' stress on BP. Entrance into university at any age presents the individual with several stressors that can affect their BP both directly and indirectly. Studies have shown that the more negative stressors are present in an undergraduate's life, the higher their BP will be. Brady and Matthews (2006) found that after accounting for several mediating variables, the number of negative stressors in their lives significantly correlated with higher systolic BP. Research has also shown that events commonly seen as routine in university life can also raise BP during stressful times, such as preparing for an exam and subsequently waiting for marks (Conley & Lehman, 2012). When one looks at the effects of chronic stress from work among non-students, increased stress has been found to result in an increase in systolic BP both during work and leisure time (Vrijkotte et al., 2000).

Among the adolescent population, high levels of chronic stress have several implications for the rest of their lives. There is a growing body of evidence that childhood and adolescent BP can predict future hypertension in adulthood (El Kasabany, Urbina, Daniels, & Berenson, 1998). In other words, environmental factors that are present in an individual's earlier years may have an effect on their overall health as they

age. It is true that genetics, physical inactivity and diet all play a role in hypertension, but the reaction to constant stressful situations can also play a significant role (Conley & Lehman, 2012).

However, there is yet to be a study that assesses whether or not the combined stress of working and studying results in an increase in BP. In theory, an increase in the amount of work from both work and school should produce similar results compared to the study by Vrijkotte et al. (2000). As the number of working hours increases, it should make completing assignments and studying for exams increasingly difficult for working students as their spare time diminishes. In addition to the direct effect of added stress on their physiology, they may engage in unhealthy behaviours that would have an indirect effect on their physical health. The resulting increase in mentally stressful tasks should result in an increase in BP due to increased chronic stress, after accounting for the other variables that are correlated with BP.

Methods for measuring BP. There are several ways to measure BP. The most accurate method is by placing a catheter directly into the artery (Perloff et al., 1993). However, this method is rarely used in research because of its invasive nature. Non-invasive techniques include auscultatory sphygmomanometric method and the oscillometric method. Auscultatory sphygmomanometry measures arterial BP by placing an inflatable cuff around the forearm. The cuff is then inflated manually until it occludes the brachial artery (Pickering et al., 2005). As pressure is released slightly, auditory changes can be detected in the artery with a stethoscope. The blood flow elicits a pulse synchronic pounding, which at its highest pressure represents SBP. The cuff is further released until no audible sound can be heard; the resulting number represents DBP.

Although ausculaotory sphygmomanometry is an accurate technique for measuring BP, there are a few disadvantages, observer measurement error, the possibility of incorrect cuff placement, and external noise disturbance.

Oscillometry is a similar method in that a cuff is placed around the forearm. This method measures BP by detecting oscillations in the cuff as it gradually deflates. Systolic BP occurs during the oscillations, and diastolic BP occurs when the oscillations cease to be detected (Langewouters et al., 1998). Instead of relying on human observation, the oscillometric device detects the oscillations and calculates SBP and DBP on its own with an algorithm. The cuff is placed three centimetres above the elbow crease of the non-dominant arm. This method is less susceptible to observer biases. However, oscillometry does have the disadvantage of being influenced by outside factors that are not related to arterial BP such as arterial stiffness, which can sometimes result in underestimations (Pickering et al., 2005). In addition, it is more sensitive to movements of the arm than the other methods mentioned previously (Bonnafoux, 1996). The current study will be using the oscillometric method. It is the simplest method for measuring BP with lowest possible increase in anxiety, especially since many of the participants will be engaging in health psychology research for the first time.

Energy Drinks and Their Effects on Health

Originally gaining popularity in Austria with the drink “Red Bull” in 1987 and with their subsequent popularity in North America in 1997, energy drink usage among adolescents and young adults is increasing exponentially worldwide, particularly among males. In 2006, the energy drink industry reported over $5 billion in sales; nearly half of those sales came from adolescents and young adults. There are more than a thousand

brands of energy drinks in North America, which usually contain a mixture of caffeine, taurine, and B vitamins, among other ingredients (Clauson, Shields, McQueen, & Persad, 2008). Even the energy drinks with the lowest amount of caffeine (such as Red Bull, the most popular) contain more than double the amount of caffeine than traditional soft drinks such as Coca-Cola and Pepsi. The main reason students consume these drinks are for short-term increases in energy and alertness. However, it is also a commonly held belief that they can mitigate the negative effects of alcohol use, such as the migraines associated with hangovers (Rios et al., 2013). Although these purported benefits have been documented, studies have also shown several negative effects associated with energy drink usage, both with and without combined alcohol use. Energy drinks by themselves can cause an accelerated heart rate (tachycardia), dizziness, inability to concentrate, and even seizures and death in rare cases (Iyadurai & Chung, 2007). In addition, the purported positive effects of energy drinks are often exaggerated (Clauson et al., 2008). This may be due to the fact that natural ingredients found in these drinks (e.g., ginseng) often appear in small or negligible amounts.

Contrary to popular belief that their consumption can mitigate the negative cognitive effects of alcohol use, short term use of energy drinks combined with alcohol has been associated with decreases in scores on neuropsychological tests and language performance scores (Curry & Stasio, 2009). In addition, there are severely negative and synergistic consequences to drinking alcohol and energy drinks together. People who combine the two are four times as likely to drive while intoxicated compared to those who drink alcohol by itself (Thombs et al., 2010). Marczinsky and Fillmore (2006) comment that the caffeine and other stimulants may positively impact aspects of alcohol

use such as response times, but may have a negative effect on more serious detriments associated with alcohol abuse, such as inhibitory control. This combination may lead individuals under the influence of alcohol to believe that they are less intoxicated than they actually are.

From this research, one can infer that energy drink consumption can be seen as a negative health behaviour that is more detrimental than other unhealthy foods such as caffeine, as it may have negative effects on one's physiology. As seen in the previous research on working students, students who spend many hours in paid employment are more likely to engage in unhealthy behaviours (Miller et al., 2008). However, the research has not yet studied if this association can be extrapolated to energy drink usage. Since some of the negative outcomes of working and being in school for long hours include reduced sleep and reduced ability to concentrate, it is quite possible that students will be consuming energy drinks in order to feel more awake and alert while studying. In addition, the increased alcohol consumption (Miller et al., 2005) associated with working long hours may have even more dire consequences if similar associations with energy drink use are found. The Transactional Model of Stress and Coping can offer a theoretical explanation for this possible association. In primary appraisal, students would perceive the amount of stress from their job and from school. In secondary appraisal, the student ponders over what can be done to complete those tasks satisfactorily. This may take the form of staying up during the night to complete an assignment, or have enough energy to work through a long work shift. If one thinks of energy drinks as a form of problem-focused coping, the supposed "boost" from energy drinks could serve as an extra resource in the student's secondary appraisal of their work load. The current study

plans to add to the growing body of research on working students by looking at possible associations between energy drink usage and paid employment.

Cognitive Tasks and their Effect on BP

An important methodological implication of research involving BP is that tasks that require mental effort can produce an increase in physiological responses for a short period of time. This phenomenon has been seen in several studies involving different cognitive tasks. For example, studies have shown that more complex version of Raven's matrices result in elevated BP (Carroll, Smith, Sheffield, Shipley, & Marmot, 1995). Even simple tasks such as reading coloured text on a screen without the Stroop test or vocalizing words and numbers can result in an increase in heart rate and BP (Linden, & Estrin, 1988; Stein & Bouthcer, 1993). However, research has also found that when participants did not have to respond verbally to a monochrome Stroop task, there was no change in BP. Since there are no verbal demands placed upon the participants in the current study, one could infer that the same non-significant results would be found. However, other studies have shown that thinking or writing about emotionally charged situations can result in short-term increases in BP (Pennebaker & Beall, 1986). While the questions asked in the current study were not of a personal nature per se, answering questions about work, school, and daily life may have resulted in the short-term increases in BP found previously.

Summary

Working students make up a large demographic of undergraduate population both in Canada and abroad. Previous research on their experience has focused on how it affects their academic performance and their overall lifestyle. The current study

expanded on this research by analyzing how it affects their health and well-being. Using undergraduates from the University of Windsor, the current study used hierarchical regression analysis (HRA) to analyze resting BP as a function of hours worked per week, after factoring out extraneous variables that affect BP such as age, subjective socio-economic status (SSS), lifestyle behaviours, and physical activity. There is mounting evidence that hypertension in young adulthood is related to myriad future illnesses, from diabetes to cardiovascular disease (Muntner, He, Cutler, Wildman, & Welton, 2004). Perceived stress has been shown to relate to short-term secondary outcomes such as slower wound-healing (Ebrecht et al., 2004) to more long-term, tertiary outcomes such as cognitive deficits (Potter, Hartman, & Ward, 2009). We also analyzed what type of coping strategies working students used, how it related to health, and what the underlying reasons behind those coping strategies were. Another aim of the research was to analyze the possible correlation between hours worked and energy drink usage. There is evidence that energy drink usage may lead to negative health outcomes, both short-term and long-term. Results of this study has implications in regards to how future interventions aimed at working students can help them find more appropriate ways to stay healthy during school and work activities.

Hypotheses

There were five hypotheses for the current study. Hypothesis 1 stated that there would be a significant positive correlation between the number of hours students work per week (HW), and levels of SBP and/or DBP, after accounting for extraneous variables. Hypothesis 2 stated that emotion-focused and avoidance coping strategies would be positively correlated with BP, after accounting for extraneous variables. Hypothesis 3

stated that problem-focused coping strategies would be negatively correlated with BP, after accounting for extraneous variables. Hypothesis 4 stated that energy drink users would have higher levels of HW than non-energy drink users. Hypothesis 5 stated that there would be a significantly higher increases in terms SBP, DBP and/or HR from the first BP reading (Time 1) to the reading administered after the questionnaires (Time 2). Apart from these five hypotheses, questions modeled from British and Australian studies by Robotham (2013) and Hall (2010) provided qualitative information on the sample of the current study.

Method

Participants

Seventy-four undergraduate students from the University of Windsor participated in the study (75% women). Participants were drawn from the participant pool from the Psychology department, from the students in a Kinesiology class via a public announcement given by the researcher, and by flyers posted around the university campus. Data collection ran from February to July 2014. If participants registered for the study via the participant pool, they were compensated with participation .5 bonus marks per half-hour of participation, pro-rated to the nearest half-hour. All other participants were compensated with $5 per half hour of participation, pro-rated to the nearest half-hour. All regulations in dealing with participants were in accordance with the Standard Operating Protocol (SOP) of the Participant Pool of the Psychology department at the University of Windsor.

Exclusion criteria included people who were younger than 18 years or older than 25 years, women who were pregnant, people who have had surgery in the last six months,

people who were currently taking medication for BP, and people who were taking only one or no courses during the semester in which they participated. We also excluded people with a history of cardiovascular disease or other serious health problems (e.g., stroke, heart murmurs, arrhythmia), though we included those with hypertension or pre-hypertension. We included non-working students in the study so that we could assess differences between working and non-working students in Hypothesis 4.

Measures

Perceived Stress Scale (PSS; See Appendix A)**.** Created by Cohen, Karmack and Mermelstein (1983), and adapted from a 14 to a 10-item questionnaire by Cohen and Williamson (1988), the PSS is one of the most commonly known and widely used measures of perceived stress. It examines the extent to which how unpredictable, overwhelming, and uncontrollable one's life is. Respondents are asked to select a number between 0 and 4 for every question (0 = *Never*, 1 = *Almost Never*, 2 = *Sometimes*, 3 = *Fairly Often*, 4 = *Very Often*), yielding a total score range between 0 and 40. A recent factor analysis using a large undergraduate sample has shown that the 10-item version of the PSS has excellent internal reliability overall ($\alpha = .89$) and among its two subscales (Perceived Helplessness and Self-Efficacy, $\alpha = .85$ and .82, respectively; Roberti, Harrington, & Storch, 2006).

The Inventory of College Students Recent Life Experiences (ICSRLE; See Appendix B). Created by Kohn, Lafreniere, and Gurevich (1990), the ICSRLE measures various stressors associated with being an undergraduate student, and is specifically designed for this population. The measure contains 49 items which are marked on a scale of 1 to 4, yielding a total score range between 49 and 196. The

subscales on the ICSRLE measure stressors are related to academic life, family, relationships, and daily hassles. It is suitable for the nature of this study because it does not specifically mention hassles related to employment. The questions are actually series of statements to which the respondent answers the extent to which it is a part of their life (1 = "*not at all a part of my life*", 2 = "*only slightly part of my life*", 3 = "*distinctly part of my life*", 4 = "*very much part of my life*.") The other six remaining subscales include Relationship Problems (e.g., "being let down or disappointed by friends"), Social Alienation (e.g., "social rejection"), Academic Discord (e.g., "dissatisfaction with grades"), System Negotiation (e.g., "conflict with teaching assistant[s]"), Disappointments (e.g., "Having your trust betrayed by a friend"), and a catch-all subscale called Assorted Annoyances (e.g., "Separation from people you care about," "difficulties with transportation"). The ISCRLE has very high internal reliability among undergraduate students (α = .88 for men, .89 for women; Kohn et al., 1990).

Coping Inventory for Stressful Situations – Short Form (CISS-SF; See Appendix C). The Coping Inventory for Stressful Situations, created by Endler and Parker (1990a), was made available as a short-form version by Cohan, Jang, and Stein (2006). Originally, the CISS-SF measures three dimensions of coping: emotional, avoidance, and task-oriented (i.e., problem-focused coping). The measure has 21 items, with 7 items per subscale. It is graded on a five-point Likert scale (1 = "*not at all"* to 5 = "*very much"),* yielding a total score range between 21 and 105. Cohan et al. also found good internal consistency with the CISS-SF in their study, with alpha levels for the three subscales ranging from α = .72 to .87 among male and female undergraduates, respectively (2006).

International Physical Activity Questionnaire – Short Form (IPAQ-SF; See Appendix D). The IPAQ was created by a working group that included the World Health Organization, Sweden's Karolinska Institute, and the Center for Disease Control (CDC; Craig et al., 2003). The IPAQ measures the duration, frequency, and type of physical activity over a specified amount of time. For the current study, it measured activity within one week. It measures three different types of physical activity: vigorous, moderate, and walking. Internal consistency for these three measures is low to moderate ($\alpha = .34$; Meeus, Eupen, Willems, Kos, & Nijs, 2011). In addition, there is a question about how much time respondents spend sitting down.

McArthur Scale of Subjective Status – Adolescent Version (MSSS-A; See Appendix E). The MSSS-A (Goodman et al., 2001) has been used in several studies involving physical and mental health, and has been shown to predict health outcomes more effectively compared to objective measures of SES (Ghaed & Gallo, 2007). Because the current study specifically looked at both a perceived stress measure and a physiological marker as outcomes, it would be more advantageous to use this subjective measure of SES. Another reason why this is an appropriate measure is that it is commonly used for adolescents and young adults who are living at home, because it measures the subjective SES of the family as opposed to the individual. In this test, a picture of a ladder with 10 rungs is given to the respondent. Participants are asked to place an X on the rung that best represents where one stands in their society. The scale has high test-retest reliability using a nationally represented sample (Operario, Adler & Williams, 2004).

Demographic and open-ended questions. (See Appendix F)**.** Data from the participant pool currently have some information on whether students are unemployed, work part-time, work full-time, or have two part-time jobs. However, there are no data on the number of hours that students are currently working, nor are there data on the time of day that they are working. Thus, participants were asked how many hours they are working per week, and the most common time that they would be working (e.g., morning, afternoon, or night shifts).

There were two questions related to the level of demand and the level of control in their work. These two variables have their origins from the Job Content Questionnaire (JCQ) by Karasek et al. (1998). Their research has shown that these two variables are highly related to stress and job satisfaction in the workplace. Jobs and professions are often divided into four quadrants based on demand and control. Jobs that are high in demand and low in control are shown to result in the highest levels of negative stress. Most service sector and retail jobs fall within this quadrant. Low demand and low control jobs have also shown to be stressful, leading to "negative job learning or gradual loss of previous acquired skills." (Karasek et al., 1998, p. 323) The quintessential job in this quadrant can be thought of as the "night watchperson." Theoretically, participants to score within these two quadrants, as jobs with high control are usually found in professional careers that require a high level of educational attainment (e.g., journalist). It is beyond the scope of the current study to look at how demand and control relate to working students, but the data gathered on this subject may be useful for post hoc analyses and/or subsequent longitudinal designs. There was also a question about how many cigarettes participants smoked per day. Smoking behaviours can be related to BP

outcomes, and it has been used in other HRA models in other studies that have used BP as an outcome variable (Karmack et al., 1997).

In addition to the quantitative measures mentioned above, participants will also have the chance to answer a few qualitative questions in regards to their experience of being a working student. Questions will include those related to reasons for working "What are your main reasons for working while being in University?" positive consequences "What do find are some of the advantages of working and studying at the same time?", negative consequences "What are some of the disadvantages of working and studying at the same time?' setting priorities "Do you ever have to choose between work and school, and if so, how do you prioritize?" coping mechanisms "What are some of the different ways you handle the stress of being a working student?", and finally possible interventions "Is there anything you would like to see on campus that would benefit students who are also working?"

Apparatus

SBP, DBP, and heart rate was recorded by an Omron BP Monitor Series 10 – HEM741. The monitor has an adjustable cuff, digital display, and safety cancel option. It can record three consecutive readings one minute apart, displaying the average of the readings. The monitor has a self-calibration system check, and an indicator that confirms that the cuff has been wrapped correctly. The monitor was also calibrated before use in the study.

Procedures

Familiarization session. Before participating in any BP recordings or completion of questionnaires, participants came in for a brief familiarization session.

During this session, the researcher explained the nature of the study, informed participants of the necessary abstentions participants they would have to complete before participating in the testing session, and they asked participants if they met eligibility requirements to participate. This included asking them about any cardiovascular diseases they may suffer from, excluding hypertension or pre-hypertension. Informed consent to participate was offered after a full oral explanation of the procedures, which included a series of necessary abstentions before coming in for the testing session. Abstentions included refraining from consuming alcohol or exercising 24 hours prior to the testing session, consuming energy drinks or caffeine 12 hours prior to the testing session, and consuming a large meal 4 hours prior to the testing session. The familiarization session also allowed participants to become used to the room in which the testing session would take place, the researcher, and the monitor itself. All of these procedures were applied to reduce possible increases in BP due to anxiety of being in a medical setting, often referred to as white-coat hypertension (Pickering, 1996). After the consent form was signed, the researcher scheduled the testing session for the participant at a time that was most convenient for them, but also keeping in mind that the testing session should be booked as closely as possible to the familiarization session. Finally, participants were asked if they would consider participating in subsequent studies by providing basic contact information.

Testing session. Testing sessions occurred at least 24 hours after familiarization sessions. It consisted of a BP administration, completion of questionnaires, another BP administration, and finally height and weight measurements. All sessions were conducted in the same room as the familiarization session. Participants were first asked

if they participated in the necessary abstentions; two participants failed to observe the abstentions and were rescheduled. Standard procedures specific to BP administration were implemented to provide the most accurate reading possible (Lockwood, Conroy-Hiller & Page, 2004; O'Brien et al., 2003; Pickering et al., 2005). They were asked if they had to use the washroom before the administration, as a full bladder triggers activation of the SNS, thereby raising SBP anywhere from 10 to 15 mm/Hg (Mahony, Laferte, & Blais, 1977; Pickering et al., 2005). Participants were instructed to keep their feet on the ground during the BP administration, their dominant arm on the table or on their lap, and to remain as silent and still as possible during the readings (Pickering et al., 2005). Both a male and female researcher were involved in the study to allow for religious or other accommodations. The temperature of the room was held constant at 22 degrees Celsius, and lights in the room were turned off if the reading occurred during daylight hours (the room contained an outside window). The cuff was then placed around the participant's bare, non-dominant forearm (Pickering et al., 2005). For the first BP administration, participants first engaged in ten minutes of seated rest. During the BP reading, both the digital display of the device and the researcher were out of the participant's visual field. Each of the two BP administrations consisted of four separate readings, each recorded exactly two minutes apart from each other (time began when the device displayed BP information). The final measure used in all analyses consisted of the average of the final three readings for SBP, DBP, and HR.

After completing the BP administration, participants completed, in a fixed order, PSS, ISCRLE, CISS-SF, MSSS-A, open-ended questions, and finally demographic questions on a computerized program. The cuff was kept on during questionnaire

completion. The researcher remained outside the room until completion of the questionnaires. The questions in total took approximately 15 minutes to complete. One question required participants to record their own waist circumference. Participants were given a soft tape measure to record their own waist, and were given a picture displaying how to record their waist. This measure was used to calculate waist circumference to height ratio (WCTH). They did not have to remove any clothing for this procedure. Participants then had their BP recorded a second time by the same researcher using the same procedures as the first administration, excluding the ten minutes of seated rest. The researcher made sure that the cuff was in the same spot as the first administration. Finally, weight and height of the participant were recorded using a digital scale and a wall-mounted tape measure. Weight was recorded in order to calculate Body Mass Index (BMI) for any future studies that may use the data garnered from this study.

Upon completion of the testing session, participants were asked if they would like to see their reading. Participants were informed that this reading is not done by a medically trained professional; nonetheless, giving their reading may motivate participants to seek a professional reading if their BP reading is abnormally high or low. A chart of different BP readings was given, as well as pamphlets and resources in regards to stress and health. These pamphlets were provided to the researcher for free from the Heart and Stroke Foundation of Canada (Heart and Stroke Foundation). Resources was also given for information on worker's rights; these materials were also provided free of charge to the researcher from the Windsor Occupational Health Information Service (WOHIS).

Results

Demographics

Data collection ran from February to July 2014. Seventy-four students from the University of Windsor participated in the study, 56 of whom were women (75%). The mean age of the participants was 20.6 years (*SD* = 2.15). Participants were at various stages of their academic career, with 18 in their first year of study, 25 in their second year, 16 in their third year, and 15 in their fourth year or beyond. Thirty-two participants were of Caucasian descent, 16 were of Arab descent, 11 were of African descent, 6 were of South Asian descent, and the rest cited other or multiple origins. Twenty-five participants were not currently engaged in paid employment, 30 had one place of employment, and 19 had more than one place of employment. Among students with one place of employment, mean HW was 17.3 (*SD* = 13.5; range: 2-40) Among students with multiple placements, mean hours worked per week was 16.9 (*SD* = 11.1; range: 5-44). Twenty-four participants worked shifts at different times of the day throughout the workweek. *Table 1* shows the different times of day in which students worked. The most common shift was the afternoon shift (Approximately 3PM to 11PM), and the least common shift was the midnight shift (Approximately 10PM to 6AM). *Table 2* shows the different kinds of work in which students were engaged. The most common type of employment was in food services (e.g., waiter/waitress, bartender or fast food). For the first BP administration, the mean average for SBP was 103mm/Hg (*SD* = 9.03), DBP mean average was 67 mm/Hg (*SD* = 5.41), and HR mean average was 75.9 beats per minute (BPM; *SD* = 10.73). Among women, SBP was 100mm/Hg, DBP was 66 mm/Hg, and HR was 77.3 BPM. Among men, SBP was 110 mm/Hg, DBP was 71 mm/Hg, and HR was 72 BPM.

Among participants who consumed energy drinks (n = 13), two worked morning shifts, five worked day shifts, ten worked afternoon shifts, and two worked midnight shifts. In addition, two were not engaged in paid employment, six had one place of employment, and five had multiple placements. Although our original sample for the current study was predominately female, seven of the thirteen energy drink users were male. Mean SBP of energy drink users was 110 mm/Hg and 101 mm/Hg among non-users. Mean DBP of energy drink users was 69 mm/Hg and 67 mm/Hg among non-users. Mean HR of energy drink users was 79.5 BPM, and 75.1 BPM among non-users.

Initial Independent Variable Analysis

Simple Pearson product moment correlations of the predictor and outcome variables can be seen on *Table 3*. Gender was significantly correlated with both SBP ($r[70] = -.45$, $p < .001$) and DBP ($r[70] = -.42$, $p < .001$), with men having higher BP than women. The MSSS was significantly correlated with SBP ($r[70] = -.34$, $p < .01$), indicating that lower subjective socioeconomic status is correlated with BP. WCTH was positively correlated with SBP ($r[70] = .22$, $p = .04$), and DBP ($r[70] = .29$, $p < .01$). The IPAQ questionnaire, which measures physical activity levels, was correlated with HW ($r[70] = .42$, $p < .001$), indicating a positive correlation between exercise and involvement in paid employment. The ICSRLE was positively correlated with the PSS scale ($r[70] = .58$, $p < .01$), indicating that daily hassles are correlated with levels of perceived stress. The CISS Emotion Subscale (CISS-E) was positively correlated with the PSS scale ($r[70] = .57$, $p < .001$), indicating that emotion-focused coping strategies are positively related to perceived stress. Finally, HW was significantly correlated with SBP ($r[70] = .23$, $p = .04$).

Testing Assumptions

We ran separate hierarchical regression analyses (HRA), one for SBP and for DBP as the outcome variables. Two participants were eliminated from these particular analyses because of a malfunction with the BP monitor. No potential outliers were eliminated from the analyses, as none of the remaining participants had a Mahalanobis distance value greater than 3, or Cook's Distance value greater than 1 for either of the two analyses. Assumptions of multicollinearity were not violated as all predictor values had a Variance Inflation Factor (VIF) less than 2.5 for both analyses. Q-Q Plots of standardized residual and predicted value plots revealed no general pattern: assumptions of homoscedasticity were not violated. We ran correlations on the time of the day of each recording on both measure of BP. Finally, we investigated whether time of day statistically impacted on SBP and DBP, so as to assess diurnal influences on BP. Results showed that time of day was not statistically significantly correlated with SBP ($r[70] = .14$, $p > .05$) or DBP ($r[70] = .03$, $p > .05$). Study week (SW) was also not statistically significantly correlated with SBP ($r[70] = .05$, $p > .05$) or DBP ($r[70] = -.07$, $p > .05$). A *t*-test was conducted to see if women who were using oral contraceptives had significantly higher BP than women who were not using them; results showed that this was not significant for SBP ($t[55] = .43$, $p > .05$), DBP ($t[55] = 1.34$, $p > .05$) or HR ($t[55] = .70$, $p > .05$). Finally, a regression analysis was run to see if there was an association between date of last menstrual cycle and BP among women. In the demographic section of the questionnaire, women were asked to give the number of days since their last period began. We expected SBP, DBP and/or HR to be higher in the beginning stages of the cycle, therefore a negative association between days since last

period and BP. There was no significant correlation for SBP (r[52] = .27, p > .05), DBP (r[52] = .25, p > .05), or HR (r[52] = .18, p > .05).

Hypothesis 1

Hypothesis 1 stated that there would be a positive association between the number of hours worked (HW) and SBP and DBP after factoring out extraneous variables, which were entered into Step 1 of the model (i.e., age, WCTH, gender, ICSRLE, IPAQ, and MSSS). In analyzing SBP as the outcome variable Step 1 of the model showed an overall significant change, and two of the predictor variables were significant in predicting SBP (gender and the MSSS scale). In the DBP model, WCTH (t[68] = 2.01, p =.049) and Gender (t[68] = 3.30, p = .004) were statistically significant. In adding HW to the model in Step 2, this predictor was not significantly correlated with SBP (t[67] = 1.78, p = .08; See Table 4) or DBP (t[67] = .09, p = .50; See Table 6). Simple correlations revealed that there was a significant correlation between HW and SBP (r[70] = .23, p = .04), but this association became non-significant after factoring out the variables in Step 1 of the HRA. In addition, the effect size of HW on the SBP predictor was very small, accounting for less than 1% of the variance (F[1, 64] = 3.16, p > .05, r^2 change = .034).

Hypothesis 2

Hypothesis 2 stated that there would be a positive association between emotion-focused coping strategies and both measures of BP. In addition, there would be a positive association between avoidant coping strategies and both measures of BP. After entering in the extraneous variables (from Step 1) and HW (from Step 2), we entered levels of perceived stress from the PSS scale (Step 3). We then entered each subscale

from the CISS separately into Step 4. CISS-Emotion was not significantly correlated with SBP (t[68] = .63, p > .05) or DBP (t[68] = .19, p > .05). CISS-Avoidance was not significantly correlated with SBP (t[68] = .38, p > .05) or DBP (t[68] = .38, p > .05). Correspondingly, Step 4 of the model did not add any variance to the model for SBP (F[1, 64] = .32, p > .05, r^2 change = .01) or DBP (F[1, 64] = .10, p > .05, r^2 change = .00). Simple correlations showed that CISS-Emotion was positively related to PSS (r[70] = .57, p < .001), and CISS-Avoidance was positively related to PSS (r[70] = .19, p = .04).

Hypothesis 3

Hypothesis 3 stated that there would a negative association between the task subscale of the CISS and SBP/DBP. CISS-Task was not significantly correlated with SBP (t[64] = .77, p > .05) or DBP (t[64] = .38, p > .05). Simple correlations showed that CISS-task was negatively related to PSS (r[70] = -.23, p = .02).

Hypothesis 4

We conducted an independent samples t-test, dividing groups into energy drink users (one or more per month), and non-energy drink users (zero per month). The hypothesis that energy drink users and non-users would differ in hours worked per week was supported (t[72] = 2.14, p = .036). Levene's test of equality of variances supported the assumption that the differences in sample variances were random (F[1, 72] = 1.78, p > .05). Mean HW among non-energy drink users was 7.5 (SD = 11.6). Mean HW among energy drink users was 15.4 (SD = 14.4).

Hypothesis 5

Results of the dependent samples t-test can be seen in *Table 8*. The hypothesis that there would be a significant change in SBP from before (Time 1) and after (Time 2) taking the questionnaires was not supported ($t[70] = 1.37$, $p > .05$). There was no significant change in DBP from Time 1 to Time 2 ($t[70] = .63$, $p > .05$). There was a significant change in HR from Time 1 to Time 2 ($t[70] = 6.02$, $p < .001$), although the change was in the opposite direction than was predicted. Mean heart rate from time 1 (M = 76.14 BPM) to time 2 (M = 72.51 BPM) actually decreased.

Qualitative Data

Reasons for working and studying. The most common reason participants gave for working while studying was for monetary purposes. The expenses that they used the funds for included tuition, books, transportation, groceries, and spending money. In addition, participants also worked in order to advance their job prospects, looking toward the future, for example, "to establish relationships that I can later use for references…" Participants also cited several social reasons for working, such as "being able to blend in better in society," and "to get a feel for how to serve others in society and fully make sure that they are satisfied as well." In other words, there is a general desire to learn practical skills that will be valuable in the working world.

Advantages of working and studying. Most participants cited that extra money was a major advantage of being a working student. From a long-term perspective, many participants cited that their job allowed them to gain experience and contacts that would help their work situation once they were finished school, for example, "having a larger network of professionals to talk to." Some participants stated that being on a strict time

schedule forced them to become more focused when it came to studying: “It keeps you on a tight schedule… you have to make sure that while you aren’t at work you are studying, so that you are focusing on both.” In a similar vein, some participants stated that being a working student fostered a good work ethic. Another advantage that was stated by several participants was that their job allowed them to “stay active and become more social.” Not only were they able to meet new people at work but those people provided what they called a “social outlet.” Finally, some participants stated that their work provided a sense of personal growth, such as “knowing the value of money and the work a person puts in. Helps you appreciate what anyone will go through for a better life.”

Disadvantages of working and studying. Participants cited several disadvantages of being a working student. These included academic losses, loss of sleep, increased stress and lack of focus. Academic losses were stated by several participants, stating that their work schedule had affected their grades negatively by taking away their available time to study: “(It) takes your time and focus away from school. Grades can suffer.” Lack of sleep was also noted by several participants. Many stated that the lack of sleep affected their everyday functioning: “I’m always tired, and never have enough time to learn something or to exercise or relax.” Most of the jobs that participants were engaged in were generally inflexible to their situation. These included long shifts, unpredictable schedules, and not being compensated enough for the work they put in: “Stressful, minimum wage jobs which may mean you are not respected or taken advantage of.” Stress was also a common theme, sometimes to an unbearable degree: “sometimes the stress can be overwhelming when you have multiple exams or

assignments to complete." While some participants wrote that working helped them gain more of a social network, others wrote that being a working student makes a person more socially isolated. Finally, participants reported a lack of focus: "While being employed and going to school you can become burnt out and lose focus on your goals."

Coping strategies for working students. Many participants offered several problem-focused coping strategies, offering only a few avoidant and emotion-focused coping strategies. The most common problem-focused coping strategy given was to have an agenda or planner for organizing their weekly schedules: "I organize everything beforehand in a calendar and set up in my head. It has to be all organized perfectly or it falls apart." These comments are related to other comments that emphasize planning when to work on certain assignments: "If I have a big test coming up I try to take the day off so that I can study instead." In addition, some participants cited to stop procrastinating as much as possible: "(I) put what needs to be done into a list and aim to complete it all ASAP so I can have more time to myself." Some students found it useful to study as soon as work was complete: "…as soon as you're done working, start studying so that you can sleep earlier, and wake up and not be tired all day." Finding uncommon times to complete schoolwork was also seen as a problem-focused coping strategy, including while at work or after work if possible: "I do school work and study while I am at work." One avoidant coping strategy that was not found in previous literature is physical activity. Several students found the time to add exercise to their already busy schedule of work and school. Several of them found exercise to be a motivating factor, others saw it as an outlet to get their mind off school: "Usually I lift weights about three or four times during the week. This helps me cope and get my mind

off work and school." Participants also described some avoidant coping strategies not related to exercise, such as watching television and hanging out with friends: "I also cope by doing spontaneous activities with friends because if I live my schedule too much life can become boring and mundane." Participants cited very few emotion-focused coping strategies, but having a positive support system was seen as important.

Resources for working students. Participants offered several suggestions they feel ameliorate the situation of working students. The most common recommendation was for the university to provide workshops that would focus on stress management, organization, financial management, and proper coping strategies: "I would like to have a workshop about how to deal with stress and schedules." At least one of these programs already exists on campus "I know there are already a few stress management clinics as well as organization courses. I find those help." Several of them suggested that the university offer more chances for employment for university students: "that way students who are not living on campus can work and not have to worry about finding a job." Several of them suggested that a room be provided on campus that would be specifically used for relaxation purposes. Students recommended that there should be more flexible class schedules, which corresponds with the complaints about the inflexibility of their work schedules at work: "I would say more flexible class schedules, because some classes only have one time slot offered to take the course. (I would like to see this implemented) so that it will help work schedules and school schedules both be consistent."

Discussion

Hypothesis 1

The hypotheses that hours worked per week (HW) would be related to SBP and DBP after factoring out extraneous variables were not supported. However, Pearson product moment correlations showed a significant correlation between HW and SBP. There are several explanations for these particular findings. First, BP is a highly variable physiological marker that fluctuates in a variety of different ways. Since we only recorded participants' BP on one day, the data we collected may not have been as accurate compared to multiple recordings on different days. In addition, although oscillometry is an accurate and reliable measure of BP, other technologies such as Ambulatory Blood Pressure Monitoring (ABPM) would allow us to measure BP more precisely (Conway, Johnston, Coats, Somers, & Sleight, 1988). Changes to BP due to chronic stress are more noticeable in the long-term and may only be detectable over many months or years. It involves a series of physiological changes that may not be particularly noticeable in one reading. Another factor that may have contributed to our mostly null findings is that there was an association between HW and level of physical activity, as seen with the correlation between HW and scores on the IPAQ. Several students also commented that one of the advantages of being in paid employment is that it kept them active. This apparent association is supported by the fact that several working students in our sample worked in physically active jobs, such as food services, babysitting, lifeguard, and construction. Working while going to school, while potentially creating a more stressful situation, may also have contributed positively to student health by offering a chance for moderate physical activity while they work. In

other words, possible increases in BP due to working may have been suppressed by increased physical activity, which has the effect of lowering HR, thereby lowering BP (Holmes & Roth, 1988). Finally, compared to the general population, our sample was young (18 to 25 years) and healthy (e.g., no history of cardiovascular disease), rendering possible increases in BP due to stress less noticeable than in other populations.

Nonetheless, simple Pearson product moment correlations showed that HW was modestly positively related to SBP, though the effect size was small. This means that in spite of the factors mentioned above, the association between the work/study situation and changes in physiology are noticeable. The added stress of extra working hours while in school may have created a more stressful environment for students, resulting in a direct increase in BP. Both qualitative and quantitative data from the study both support the argument that the students in this study are working in stressful environments. For example, the average number of hours worked among working students was slightly higher than the mean average cited by national data. Qualitative data showed that many students were frustrated by the busy and inflexible schedules, the lack of sleep and focus, and losses in academic output. There may also be indirect influences they may have contributed to this correlation between BP and hours worked. An increase in working hours may have led to other negative health behaviours, acting as a mediating variable.

Looking at the bigger picture of the working student and the university, the current study provides evidence that the user-pays model of university tuition can have negative effects on students from a perspective of health. Since one of the main reasons students were working was monetary, and tuition rates continue to be steady or rising in many countries (Manthei & Gilmore, 2005), this trend of working long hours while

studying is likely to continue. Qualitative data from the current study also showed that even though students are working, their funds are not necessarily paying their tuition, but often for necessities such as food and insurance. This means that they may continue to work into later years of their undergraduate classes, and possibly even post-graduate education in order to meet the cost of their living expenses. Regardless, the fact that tuition must eventually be paid creates a constant demand for paid employment among students. The current study provides more evidence that the user-pays model of education creates even more of a disadvantage for students from a lower socio-economic background. In addition to lower grades, higher stress, and a higher likelihood to engage in negative health behaviours, students who are forced to work for economic reasons may even suffer more from a health perspective. This may be apparent not only during their years in university but also in the future as they eventually enter the workforce. The current study offers a glimpse into the possible correlation between working, studying, and stress among this population.

There are two avenues we can take on to expand this research. The first is that if we extrapolate these findings longitudinally, we may better understand how being a working student can affect one's health. As more students enter university and the work force simultaneously, BP may be one of many factors that can be affected in a negative manner in the long term. Second, physiological markers that are a more accurate determinant of short-term stress may be more appropriate in cross-sectional studies. It is also important to look at possible mediating variables in this regard. Certain behaviours in which working students are more likely to engage may increase BP. Furthermore, it is possible that people with certain personality traits may be more drawn to a busier

lifestyle. For example, people with a Type A personality, specifically those with high levels of hostility, are known to have higher levels of BP than their Type B counterparts (Durel et al., 1989). It is possible that people with Type A personalities might be more likely to engage in longer hours at work. It is beyond the scope of the current study to analyze this possible association, but future studies can analyze how personality characteristics may have an influence on this population.

Hypotheses 2 and 3

The current study failed to find changes in either SBP or DBP due to different coping strategies, after factoring out extraneous variables. There are several explanations for these findings. One is that there was a limited sample size for the Hierarchical Regression Analysis (HRA) we conducted. The recommended sample size should be at least n = 10 per predictor variable (Tabachnick & Fidell, 1996). In addition, as stated above, using a physiological marker such as BP is complex and changes are not often noticeable without an adequate sample size.

However, consistent with the Transactional Model, the CISS-task scale was negatively correlated with perceived stress. From a theoretical standpoint, when students are faced with a situation they interpret as stressful, they must decide which coping strategies would be the most appropriate. Indeed, when asked about what coping strategies they used, most of their responses were problem-focused coping strategies. They reported strategies such as making an agenda, finding uncommon times to study, and planning out study times ahead of schedule were all helpful tactics. Emotion-focused coping had the strongest positive correlation with levels of perceived stress. This may

mean that people who are more likely to use these kinds of coping strategies are less able to deal with the anticipatory stage of the school semester. There are certain emotion-focused coping strategies that are known to reduce stress and even lower blood pressure in the anticipatory stage, such as positive reappraisal (Fontana & McLaughlin, 1998). However, the CISS-Emotion subscale contains items that can be seen as maladaptive in these situations, such as "Blame myself for the situation" and "wish I could change things." While some emotion-focused coping in measured amounts can be helpful (Zeidner, 1995), they are better used for specific stages in the semester such as waiting for marks and dealing with course outcomes. Participants cited very few emotion-focused coping strategies in the context of working and studying. The strategies that were mentioned are the kind that are regarded as helpful in the anticipatory stage of the school semester. Most of those were related to having a strong support network, or by expressions of emotion at certain times.

Since working students comprise a growing number of undergraduate students, it is important to understand what kind of coping resources they are using, when they are using them, and how to help them deal with the stress associated with working while going to university. This study added to the body of literature on the current knowledge of working students' problem-focused coping strategies. Furthermore, the negative correlation between problem-focused coping and reduced perceived stress supports the findings by Zeidner (1995), this time extrapolating these findings to working students. One of the aims of the current line of research is to help working students apply the skills that they have learned so that they are ready to make the transition to the working world once they graduate. Future interventions should focus on providing tips and strategies for

different problem-focused coping skills, how to implement new strategies, or improve coping strategies that are already being utilized. Because of the high demand for worker qualifications among new graduates, it will be essential for post-secondary institutions to help working students focus on their strengths, even if it means being able to articulate them in a way that helps them with such projects such as resume building.

It is also important to note that both emotion-focused coping strategies and avoidant coping strategies are indeed important and essential when in the anticipatory stage. However, the current study looked at specifically maladaptive emotion and avoidant coping strategies for the anticipatory stage of an event. It was beyond the scope of the current study to look at more useful emotion-focused coping strategies such as cognitive reappraisal. However, interventions that assist working students should include strategies that help with the emotions of being involved in stressful situations. Though the current study found a positive correlation between perceived stress and avoidant coping strategies, avoidance is also necessary in lowering stress in measured amounts. All of these factors should be taken into account when designing interventions geared toward working students.

Hypothesis 4

The hypothesis that HW would be significantly related to energy drink usage was supported. Users of energy drinks worked on average twice as much as non-users. Previous studies on working students have shown associations between hours worked and negative health behaviours such as alcohol use, reduced sleep, and smoking (D'Alessandro & Volet, 2012; Miller et al., 2008; Weller et al., 2004). The current study

found that these negative health behaviours may be extrapolated to energy drink use. One possible explanation for these findings is that students who are working many hours per week have conflicting time schedules that may necessitate studying during the night. Increased caffeine use may allow them to stay awake and focused during this time period to study for exams or complete assignments. They may also consume energy drinks because the inverse situation, perhaps having a need consume to stay awake at work after spending a considerable amount of time and effort on academics. Another possible explanation is that certain personality or situational characteristics may act as a mediating variable between energy drink usage and the desire to work for long periods of time. For example, since research has shown that students from a lower socio-economic background are more likely to have an unhealthy diet (Jannsen, Boyce, Simpson, & Pickett, 2006), and having a lower SES is associated with working more hours per week (Robotham, 2010), students from a lower socio-economic background may be likely to both consume more energy drinks and work more hours per week. In other words, SES may act as a mediating variable between HW and energy drink use. Previous research has also shown that working students are less likely to engage in extra-curricular activities, form social networks, and participate in study groups. Since these can be considered important resources for maintaining good study habits, it is possible that more working students turn to energy drinks in lieu of other activities for which they may not have time in their schedule. The current study also showed that many students are working afternoon shifts and/or midnight shifts. This would theoretically truncate the available time to study during daylight hours, necessitating the need to stay up to study when one would normally be sleeping. Finally, since research has shown that working

students are more likely to have lower grades throughout their years in school (Salamonson et al., 2012), they may be under more pressure to earn grades that are high enough for either completion of their degree, or for their own personal standards.

The Transactional Model of Stress and Coping can provide a theoretical explanation for these findings. Problem-focused coping refers to specific actions that a person does to help alleviate external demands faced by the individual (Folkman & Lazarus, 1985). After interpreting an exam or other school assignments as stressful, the student must look for resources to deal with that stressor. It is speculated that consuming energy drinks would allow one to improve their ability to finish homework more alertly. Since studying at inappropriate times or when one is very tired may be the only option to complete an assignment, energy drinks or other stimulants may seem like an appropriate resource in working students' secondary appraisal of their situation. As seen from previous research, working while studying can result in increased tiredness and reduced sleep (Weller et al., 2004). This would theoretically fuel the need for resources that would alleviate this problem for short periods of time. Other problem-focused coping strategies such as participating in a study group may be less available to working students (as seen in our qualitative findings), whereas energy drinks are readily available and easily consumed.

Looking at the broader scope of these findings, there are several implications that are important to understand. The current situation with which working students find themselves may serve as a hotbed for the popularity of energy drinks, along with other products that contain high amounts of caffeine or other stimulants. Other negative health behaviours that are consequences of working while studying may have a synergistically

negative effect when combined with energy drinks, namely alcohol (Marczinsky & Fillmore, 2006). The implications from the current study and previous research are that HW may contribute to both of these behaviours that can be quite dangerous when combined. In addition, many students are working in environments where both of these products are readily available (bars, restaurants, convenience stores). Overall, future trends indicate that the user-pays model of university education makes this subject both important and timely. Given the gradual increase in tuition rates, the increasing number of students entering university, and a greater demand for student workers (Manthei & Gilmore, 2005), the demand for energy drinks along with other specific health behaviours is likely to continue among working students. The data from our sample revealed that working students were working a mean average of 17 hours per week, slightly higher than the 15.6 hours per week found from a national study five years ago. It is unclear whether this is due to regional differences, possible selection biases, or if the working student population is generalizable to the rest of Canada and the world. Nonetheless, our data indicates that students are working several hours in employment, necessitating the need for stimulating products.

There are several possible follow-up studies that would give us more information on these findings. Since the current study used energy drink use as a dichotomous variable, a future study could look at how hours worked results in an increase in energy drinks use *among* energy drink consumers as opposed to the general population of students. Another study could look at the consumption of energy drink use over time, to see if increased stress over time would have an influence on energy drink usage. Another option would be to look at differences between energy drink use and other health

behaviours associated with combining work and school. Behaviours such as alcohol consumption and other drugs are qualitatively different than energy drink use in the context of coping strategies. For example, alcohol differs from energy drinks in that more than one alcoholic beverage can be consumed in a short time frame. Energy drinks almost always consumed in single doses, and to have more than one in a 24 hour period can be extremely dangerous. Thus, there may be more of a short-term reward for drinking more alcoholic beverages than from drinking more energy drinks. In addition, alcohol has a significant social component. Working students may see drinking alcohol at gatherings as a method to take their mind off the stress of work and school, and to socialize with their friends (Schall, Kemeny, & Maltzman, 1992). In contrast, energy drinks are usually consumed to increase alertness, but it is unclear if there is a significant social component like there is with alcohol. We recommend more in-depth qualitative research on energy drinks and working students. Important questions could include their level of knowledge about these products, if there is a significant social component to their use, and if and how energy drink usage is encouraged or recommend at their place of employment. Finally, future studies could also look at consumption of unhealthy foods and/or drinks in the fast-food industry.

Hypothesis 5

The current study explored whether or not administration of these questionnaires would result in an increase in BP. Previous research had shown that thinking about how working and studying at the same time may result in increased physiological arousal (Carroll et al., 1995; Linden & Estrin, 1988; Stein & Boucher, 1993). Contrary to our hypothesis that SBP, DBP and/or HR would increase after completing the questionnaires,

SBP and DBP remained the same, and HR actually decreased from Time 1 to Time 2. There are several explanations for these findings. First, the questions that were asked were not sensitive or personal in nature, even though they were related to work, school, coping strategies, and stress. The questions did not take as much cognitive effort as such tasks as the Stroop task, where significant raises in BP were found in previous research (Stein & Boucher, 1993). Second, the researcher was not present during questionnaire completion, so as not to influence participants while they were completing the questionnaires. This meant that there was no potential pressure from other people while completing the questions. Third, completing the BP administration the first time may have alleviated any potential anxiety about completing a second administration. In other words, participants may have become more comfortable with their surroundings and the procedure as time progressed. This may explain the fact that there was an actual decrease in heart rate from Time 1 to Time 2.

Current literature supports the idea that potentially stressful or mentally perplexing tasks may influence BP (Carroll et al., 1995). The current study found that answering questions of a non-sensitive nature about work, school, and daily hassles, does not have an influence on one's BP. Researchers in future studies who use BP or other physiological measures as an outcome variable should be more confident that questionnaires similar to the ones used in the current study will not have a significant effect.

Limitations

There were a few limitations to the current study. Though we completed two measures of BP to analyze the effect of completing the questionnaires, we were only able

to record participants' BP on one day, as opposed to measuring their BP on different days. BP as a physiological marker is highly variable. The most accurate measures are recorded over several occasions, even in studies that are conducted within limited time frames. Thus, the physiological data we recorded would have been more accurate had we collected data on several occasions. Moreover, changes in BP due to chronic stress usually occur over several years. This is further confounded with the fact that BP and other physiological markers often change through aging, regardless of stress level. Thus, changes in BP due to this stressful environment would be better analyzed via a longitudinal design. In terms of the limitations of resources available to conduct the study, we did not possess the resources to use more accurate and frequent measures of BP such as Ambulatory Blood Pressure Monitoring (ABPM), in which participants wear a monitor that takes their BP at intervals throughout the day. Future studies may find more accurate representations of physiological markers with more sophisticated measurements. Another limitation of the study was that BP and heart rate were the only physiological measures used to look at stress. Other physiological markers such as salivary cortisol, which are more accurate in measuring short-term stress (Hellhammer, Wust, & Kudielka, 2009), would have provided more accurate information on how combining school with employment may have affected students physiologically. These limitations can be addressed in future studies, as several participants have provided their contact information, and have agreed to participate in the future.

The current study looked at the correlations between women's menstrual cycles and BP. Though the correlations were not statistically significant, the effect size was actually quite modest, and remains a limitation of the study. While this measure took

into account changes in BP due to their cycles, a more accurate method of BP measurement would be to record their BP during the same time of the menstrual cycle. However, given that some women would have been uncomfortable mentioning their cycles to a male researcher, we decided to instead see if there were any statistically significant differences. Similarly, we were not able to measure everyone's BP at the same time of day. We worked around this limitation by checking to see if there were statistically significant differences between BP and time of day. We also looked possible correlations between BP and the time of the season participants had their data recorded. This was because BP tends to be higher in the winter months as opposed to spring and summer.

Another limitation of the study was that the sample were predominately women, due to the fact that we used the Psychology Participant Pool. In addition, the participants in the sample were mainly of Caucasian descent. There are specific differences between men and women, and different ethnic groups, in regards to both BP and energy drink usage. Men have higher BP readings on average than women regardless of age, and peoples of African descent on average have higher BP than other ethnic groups. A sample that would be more representative of the current student population may have provided more accurate information.

Conclusion

We found a slight association between working hours and a measure of physiological health. These are interesting findings that should warrant further analyses. Unfortunately, we found no association between the different coping strategies and BP.

However, task-focused coping strategies were more useful in reducing levels of perceived stress, whereas emotion and avoidant coping strategies resulted in the opposite effect. Energy-drink users were found to work more hours per week than non-energy drink users, further demonstrating the correlation between the need for working and negative health behaviours. Future studies provide more information into the reasons behind these findings. Finally, completing the questionnaires did not have a significant effect on BP.

In terms of benefits offered to the participants on an individual level, the knowledge gained from their BP reading in the current study may spur them to seek professional advice if they found that their reading is abnormally high or low. Likewise, the pamphlets on BP could provide useful, take-home information on issues related to BP and hypertension. The qualitative data gave more in-depth understanding of the negative and positive aspects of combining work and studies. The qualitative data provided greater understanding for those results. One of the ultimate goals of using this data is not only to work on ameliorating the negative aspects but also to highlight the positive aspects of being a working student. Since previous research has shown that some students are learning, for example, better time management skills, future studies and interventions should take this into account. Future interventions could range anywhere from seminars conducted by former working students on coping strategies, to groups formed by current students to help increase social integration to the university.

This was the first study, to the author's knowledge, that specifically looked at the experience of working students in Canada. Many of the findings were similar to other studies and data from studies from other countries. Canadian students reported working a similar number of hours per week to countries such as Great Britain, United States, and

Australia. In addition, qualitative data was similar to the data from other countries. Differences however included physical activity as a positive avoidant coping strategy, and inflexible work schedules that made it more difficult for them to meet their obligations. Participants also recommended workshops and seminars on stress and time management and a room for relaxation purposes. Money was the greatest reason for being a working student, but students also were looking for career advancement after they graduate. Greatest advantages included increased organizational skills, greater motivation to succeed, and a needed break from studying. Consistent with previous literature, disadvantages included lack of sleep, loss of focus, and loss of academic output.

Working students make up a growing segment of post-secondary students. Further studies need to look at how their busy lifestyle affects their health in other ways. The study showed possible associations with systolic BP, albeit small, but more information on the subject is needed. Recommendations include a longitudinal design on the long-term effects of working and studying, studies using other physiological markers, and a study of how certain personality characteristics may moderate this relationship. Other studies should look at how working students' grades are affected in a Canadian context given the many comments about lower grades. Applied research should also focus on implementing the skills that working students have acquired in their workplace. For example, this could take the form of a work/study program involving their line of work. This way, post-secondary institutions can provide opportunities for students to advance their career, and to combine the skills they have learned in all of their current endeavours.

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TABLES

Table 1

Categories of Employment

Type of Employment	n	%
Sales/Retail	9	12.2
Food Services (Waiter, bartender, fast-food)	15	20.3
Tutoring/Teaching Assistant	8	10.8
Manual Labour (Construction, Janitor, etc.)	10	13.5
Self-Employed	6	8.1
Lifeguard	3	4.1
Other	11	14.9

Note. Other jobs included babysitter, media writer, day-care, and family respite.

Table 2

Type of Working Shift

Type of Shift	n	%
Morning Shift (Approx. 6AM – 12PM)	19	22.7
Day Shift (Approx. 10AM – 5PM)	22	26.2
Afternoon Shift (Approx. 3PM – 10PM)	33	39.3
Midnight Shift (Approx. 10PM – 6AM)	10	12.0
Single Shift (Only one shift)	26	51
Irregular Shifts (More than one shift)	25	49

Table 3

Simple Correlations for Hierarchical Regression Analysis

	DBP	Age	WCTH	Gender	IPAQ	ICSRLE	MSSS	HW	PSS	CISS-T	CISS-E	CISS-A
SBP	.65***	.02	.22*	-.45***	.14	.00	-.34**	.23*	-.01	-.09	.01	-.01
DBP		.10	.29**	-.42***	.04	-.04	-.21	-.03	-.02	-.02	-.05	-.07
Age			.00	-.18	.08	-.05	.10	-.09	-.02	.02	-.01	-.23*
WCTH				-.18	.02	-.11	-.01	.07	-.14	-.17	-.26*	-.11
Gender					-.07	.08	.15	-.14	.12	-.06	.05	.25*
IPAQ						-.04	-.16	.42***	-.20	-.06	-.23	.06
ICSRLE							.11	-.13	.58**	.01	.46**	.10
MSSS								.06	.09	-.07	.06	-.11
HW									-.01	-.25*	-.10	.03
PSS										-.23*	.57***	.19
CISS-T											.24*	.08
CISS-E												.01
CISS-A												

Note. SBP – Systolic Blood Pressure, DBP – Diastolic Blood Pressure, WCTH – Waist Circumference to Height, IPAQ – International Physical Activity Questionnaire, ICSRLE – Inventory of College Students Recent Life Experiences, MSSS – MacArthur Scale of Subjective Socio-economic Status, HW – Hours Worked, PSS – Perceived Stress Scale, CISS – Coping Inventory for Stressful Situations (T = Task Scale, E = Emotion-Focused Scale, A = Avoidance Scale).

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 4

Model Summary – HRA with Systolic Blood Pressure (SBP) as outcome

	r	r^2	Adjusted r^2	r^2 Change	*F* Change	*p*
Step 1	.558	.312	.245	.312	4.677	.001
Step 2	.588	.345	.270	.034	3.155	.08
Step 3	.588	.346	.259	.001	.077	.783
Step 4	.598	.357	.233	.011	.323	.809

Note. Step 1 – Age, Waist-circumference-to-Height (WCTH), Gender, International Physial Activity Questionnaire (IPAQ), Inventory of College Student Recent Life Experiences (ICSRLE), MacArthur Scale of Subjective Socio-Economic Status (MSSS). Step 2 – Hours Worked, Step 3 – Perceived Stress Scale, Step 4 – Coping Inventory for Stressful Situations (CISS), Task scale, emotion-focused sale, avoidance scale.

Table 5

Hierarchical Regression Analysis – Systolic Blood Pressure (SBP) as Outcome Variable

Predictor	B	Std. Error	β	*t*	*p*	Partial Correlation
Step 1						
Age	-.12	.45	-.020	.263	.793	-.03
WCTH	19.17	13.37	.155	1.434	.157	.18
Gender	-8.07	2.33	-.38	3.47	.001*	-.403
IPAQ	2.07	.000	.073	.681	.498	.086
ICSRLE	.045	.062	.076	.715	.477	.090
MSSS	-1.487	.583	-.279	2.552	.013*	-.308
Step 2						
HW	.161	.091	.213	1.776	.081	.222
Step 3						
PSS	.057	.207	.038	.277	.783	.036
Step 4						
CISS-T	-.219	.284	-.099	.769	.445	-.101
CISS-E	.133	.209	.099	.634	.529	.084
CISS-A	.095	.248	.047	.382	.704	-.005

Note. WCTH – Waist Circumference to Height, IPAQ – International Physical Activity Questionnaire, ICSRLE - Inventory of College Students' Recent Life Experiences, MSSS – MacArthur Scale of Subjective Socio-economic Status, HW – Hours Worked per Week, PSS – Perceived Stress Scale, CISS – Coping Inventory for Stressful Situations (T = Task Scale, E = Emotion-Focused Scale, A = Avoidance Scale).

Table 6

Model Summary – HRA with Diastolic Blood Pressure (DBP) as Outcome Variable

	r	r^2	Adjusted r^2	r^2 Change	F Change	*p*
Step 1	.502	.252	.179	.252	3.47	.005
Step 2	.507	.257	.172	.006	.454	.503
Step 3	.507	.258	.159	.000	.036	.849
Step 4	.511	.261	.119	.004	.103	.958

Note. Step 1 – Age, Waist-circumference-to-Height (WCTH), Gender, International Physial Activity Questionnaire (IPAQ), Inventory of College Student Recent Life Experiences (ICSRLE), MacArthur Scale of Subjective Socio-Economic Status (MSSS). Step 2 – Hours Worked, Step 3 – Perceived Stress Scale, Step 4 – Coping Inventory for Stressful Situations (CISS), (Task Scale, Emotion-focused Scale, Avoidance Scale).

Table 7

Hierarchical Regression Analysis – Diastolic Blood Pressure (DBP) as Outcome Variable

Variable	B	Std. Error	β	*T*	*P*	Partial correlation
Step 1						
Age	.156	.279	.063	.559	.578	.071
WCTH	16.555	8.26	.225	2.01	.049*	.247
Gender	-4.36	1.437	-.350	3.304	.004*	-.360
IPAQ	-3.855	.000	-.023	.206	.838	-.026
ICSRLE	.013	.039	.038	.339	.736	.043
MSSS	-.525	.360	-.167	1.461	.149	-.182
Step 2						
HW	-.039	.057	-.086	.673	.503	-.086
Step 3						
PSS	.025	.130	.028	.191	.849	.025
Step 4						
CISS-T	-.069	.180	-.052	.380	.706	-.050
CISS-E	.025	.133	.032	.189	.851	.025
CISS-A	.060	.157	.050	.383	.704	.051

Note. WCTH – Waist Circumference to Height, IPAQ – International Physical Activity Questionnaire, ICSRLE - Inventory of College Students' Recent Life Experiences, MSSS – MacArthur Scale of Subjective Socio-economic Status, HW – Hours Worked, PSS – Perceived Stress Scale, CISS – Coping Inventory for Stressful Situations (T = Task Scale, E = Emotion-Focused Scale, A = Avoidance Scale).

Table 8

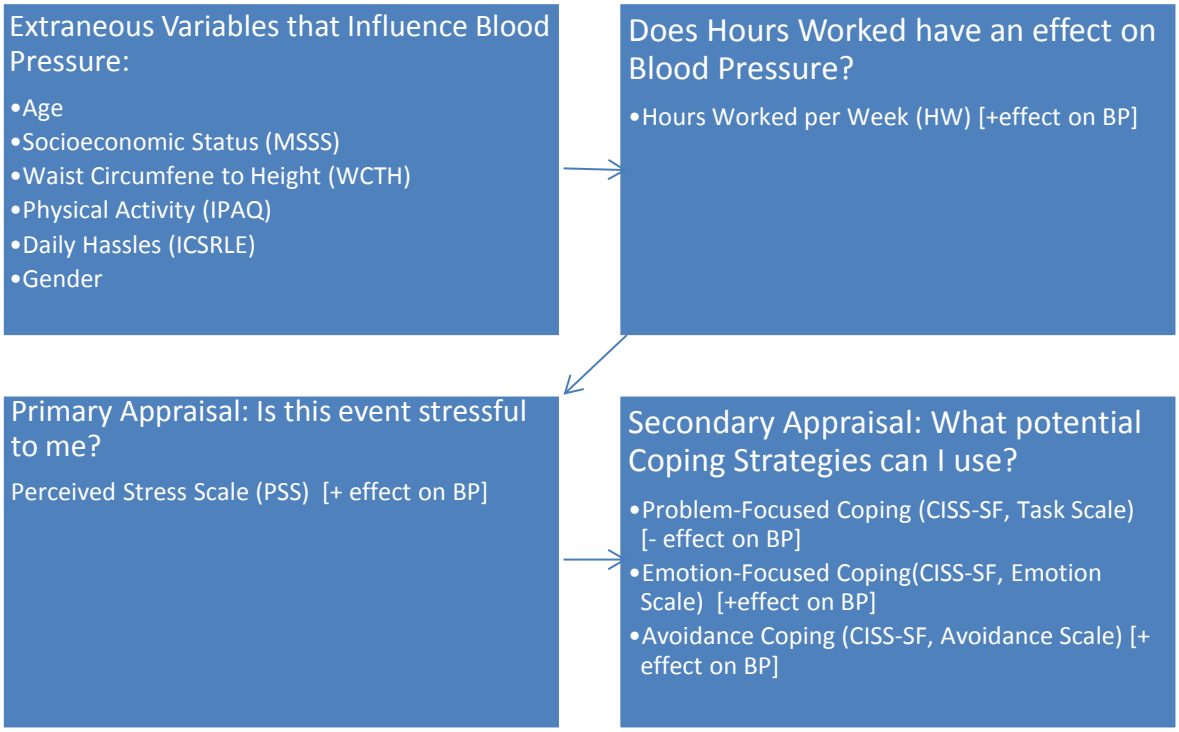
Paired Samples T-Test – Time 1 and Time 2

	M	SD	CI (Lower)	CI (Upper)	*t*	*p*
SBP 1 – SBP2	.76	4.70	-.34	1.86	1.37	.18
DBP 1 – DBP 2	-.30	4.01	-1.24	.65	.627	.53
HR 1 – HR 2	3.63	5.12	2.42	4.83	6.02*	< .001

FIGURE

Figure 1

Transactional Model of Stress and Coping and Working Students



Appendix A – Perceived Stress Scale

Perceived Stress Scale

The questions in this scale ask you about the 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

Appendix B – Inventory of College Students' Recent Life Experiences (ICSRLE)

Following is a list of experiences which many students have 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 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 that was only slightly part of your life over that time, "3" for an experience which was distinctly part of your life; and "4" for an experience that 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 part of my life

1.	Conflicts with boyfriend's/girlfriend's/spouse's family	_____
2.	Being let down or disappointed by friends	_____
3.	Conflict(s) with professors	_____
4.	Social rejection	_____
5.	Too many things to do 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 responsibilities	_____
16.	Dissatisfaction with school	_____
17.	Decisions about intimate relationships	_____
18.	Not enough time to meet your obligations	_____

19. Dissatisfaction with your mathematical 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 time for sleep _____
28. Conflicts with your family _____
29. Heavy demands from extracurricular activities _____
30. Finding courses too demanding _____
31. Conflicts from 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 an expected job _____
49. Dissatisfaction with your athletic skills _____

Appendix C – Coping Inventory for Stressful Situations – Short Form

Coping Inventory for Stressful Situations

Instructions: Indicate how much you engage in these types of activities when you encounter a difficult, stressful, or upsetting situation.

1 = Not at all

2 =

3 =

4 =

5 = Very Much

1. Take some time off and get away from the situation. _____
2. Focus on the problem _____
3. Blame myself for the situation _____
4. Treat myself to a snack _____
5. Worry about being unable to cope _____
6. Consider similar problems _____
7. Visit a friend _____
8. Determine course of action _____
9. Buy myself something _____
10. Blame myself for being too emotional _____
11. Work to understand the situation _____
12. Become very upset _____
13. Take corrective action immediately _____
14. Blame myself for not having solution _____
15. Spend time with a special person _____
16. Think about and learn from mistakes _____
17. Wish I could change things _____
18. Go out for a meal _____
19. Analyze the problem _____
20. Focus on my inadequacies _____
21. Phone a friend _____

Appendix D – International Physical Activity Questionnaire – Short Form (IPAQ)

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. This is part of a large study being conducted in many countries around the world. Your answers will help us to understand how active we are compared with people in other countries. The questions are about the time you spent being physically active in the last 7 days. They include questions about activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.
Your answers are important.

Please answer each question even if you do not consider yourself to be an active person.

THANK YOU FOR PARTICIPATING.

In answering the following questions,

- **vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal.
- **moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

1a. During the last 7 days, on how many days did you do **vigorous** physical activities like
heavy lifting, digging, aerobics, or fast bicycling,?
Think about *only* those physical activities that you did for at least 10 minutes at a time.

_____ **days per week** ⇨

1b. How much time in total did you usually spend on one of those days doing vigorous physical activities*?*

_____ **hours** _____ **minutes**

_____**or none**

2a. Again, think *only* about those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week** ⇨

2b. How much time in total did you usually spend on one of those days doing moderate physical activities*?*

_____ **hours** _____ **minutes**

_____**or none**

3a. During the last 7 days, on how many days did you **walk** for at least 10 minutes at a time? This includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise or leisure.

_____ **days per week** ⇨

3b. How much time in total did you usually spend walking on one of those days*?*

_____ **hours** _____ **minutes**

_____ **or none**

The last question is about the time you spent sitting on weekdays while at work, at home, while doing course work and during leisure time. This includes time spent sitting at a desk, visiting friends, reading traveling on a bus or sitting or lying down to watch television.

4. During the last 7 days, how much time in total did you usually spend *sitting* on a **week day?**

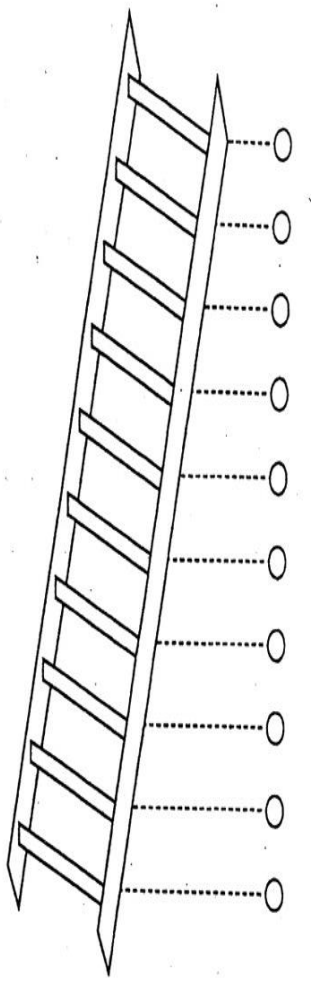
____ **hours** _____ **minutes**

This is the end of questionnaire, thank you for participating.

Appendix E – McArthur Scale of Subjective Socioeconomic Status

1. Imagine that this ladder pictures how North American society is set up.
   - At the top of the ladder are the people who are best off—they have the most money, the highest amount of schooling, and the jobs that bring the most respect.
   - At the bottom are the people who are the worst off – they have the least money, little or no education, no job or jobs that no one wants or respects.

   Please fill in the circle that best represents where you would be on this ladder.



F – Demographic and Open-Ended Questions

1. Age _____
2. Gender M ____ F____
3. (Question came up if #2 answer was female) How many days since your last menstrual cycle began? _____
4. How many hours of paid employment were you engaged in this week?

5. How many hours per week on average do you work during the semester?

6. How many cigarettes do you smoke per day?_____

7. How many caffeinated beverages do you consume in one day(coffee, iced cappuccinos, caffeinated soft drinks, caffeinated tea)? _____

8. How many energy drinks do you consume in one week? _____

9. Please check if you have any of the following medical conditions.
   a) Type I Diabetes
   b) Type II Diabetes
   c) Gout
   d) High Cholesterol
   e) Kidney Disease
   f) Hypertension
   g) Cardiovascular Disease
10. Do you currently take any of the following medications?
    a) Oral Contraceptives
    b) Blood Pressure medication
    c) Acetaminophen (Tylenol)

11. Approximately how many hours do you sleep per day?

12. Next to your computer, there is a soft measuring tape. Please measure your waist circumference in centimeters. Please follow the diagram which details how to take your waist circumference. _____ cm

(The following questions will be given if the answer to Question 1 was greater than 0).

13. Which of the following best describes your work schedule (circle more than one if necessary)

    a) Morning Shift (Approximately from 6AM to 12PM)
    b) Day Shift (Approximately from 10AM to 5PM)
    c) Afternoon Shift (Approximately from 5PM to 11PM)
    d) Night Shift (Approximately from 10PM to 6AM)

14. Which of the following best describes your job? (please specify work place)
    Waiter/Waitress/Bartender _____
    Fast Food Industry_____
    Sales/Retail_____
    Tutoring/Teaching Assistant_____
    Manual Labor (e.g., Factory, Custodial) _____
    Customer Service (e.g., Call Centre) _____
    Transportation (Truck Driver, Taxi Driver) _____
    Clerical_____
    Self-Employed_____
    Other _____
15. What are your current living arrangements?
    I live in residence at the university _____
    I live in an apartment apart from family _____
    I live at home with my family _____

16. What are your main reasons for being employed while going to school?

17. What do you find are the advantages of being employed and being a student at the same time?

18. What do you find are some of the disadvantages of being employed and being a student at the same time?

19. What are some of the ways that you cope with the schedule of working and studying?

20. Are there any activities or resources that you would like to see on campus that would help working students?

21. On a scale of 1 to 10, how demanding do you feel your job is?

22. On a scale of 1 to 10, how much personal control do you feel you have in your job?

23. How many energy drinks do you consume per month?

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