Running Head: EVOLUTIONARY TRIGGERS OF WORKPLACE MENTAL HEALTH

Mental Health and Illness in the Workplace:

An Evolutionary Perspective on Several Workplace Triggers of Mental Illness

Caitlin Demsky

Faculty Mentor: Stephen Colarelli, Ph.D.

Summer 2009

Abstract

The present study examines the hypothesis that the prevalence of mental illness in the workplace is partially due to a mismatch between qualities of the modern workplace and the anscestral environment in which humans evolved. The Workplace Characteristics Survey (see Appendix A) was developed to assess the levels of several evolutionarily relevant characteristics of the workplace, including: exposure to sunlight, exposure to greenery, noise levels, physical activity, quality of sleep and amount and quality of interaction with animals and humans. Dependent variables were depression, anxiety, and somatic symptoms, which were also assessed with questionnaires. The researcher hypothesized that lower levels of depression, anxiety, and somatic symptoms would be found in employees who reported higher levels of sunlight exposure, physical activity, interaction with humans and animals, greenery exposure and sleep quality as related to their workplace, and that higher levels of depression, anxiety, and somatic symptoms would be found in employees who reported higher noise levels in their workplace. Significant correlations were found between noise levels and quality of sleep and depression, anxiety, and somatic symptoms. Human interaction was also found to be correlated with anxiety in several subgroups. The remaining hypotheses were not fully supported by the results. Future research may seek to adjust several of the scales developed for the purpose of this study, as well as sample individuals within other areas, such as agriculture and manufacturing, as this sample focused mainly on various aspects of the service industry.

Human beings lived primarily as hunter-gatherers in sparse, independent groups for hundreds of thousands of years. It was only 10,000 years ago that the advent of agriculture created a major shift in our society, and just 6,000 years ago that modern society arose, which included sprawling cities and the preference for numerous specialized professions over the former livelihood of farming (Nicholson, 1997). As Desmond Morris points out in his 1996 book, *The Human Zoo*, it was the change in lifestyle from that which humans had evolved in for so long, to something we are more familiar with today—the bustling, impersonal, fast-paced lifestyle of the modern city-dweller—that serves as a cause of the violent and disturbing behavior modern society has become all too familiar with.

In viewing modern organizations, Nicholson (1997) argues that we are an ancient people living in a modern world. He suggests that as a result of our hunter-gatherer upbringing, we tend to gravitate towards creating in-groups and out-groups, as well as a family and community organization. Psychologically, there is evidence to show that modern human beings are somewhat similar to their hunter gatherer ancestors; indeed, there has been little time and inconsistent environmental pressure to force humans to biologically evolve beyond this state. Nicholson's theories of evolutionary psychology focus primarily on the social conditions within the workplace that have developed as a result of human evolution. This view is in line with much of the current research done on workplace environment. Many of the factors within the workplace that are currently being researched focus on psychological and social factors of the workplace. Goals, social interaction, relationships, autonomy and work stress are all common lines of research within the field (Muchinsky, 2006).

The present study seeks to provide some preliminary evidence that the mismatch between the environment human beings evolved in as hunter gatherers and the environment of the modern workplace contributes to depression, anxiety, and somatic symptoms amongst employees. Several physical characteristics of the workplace referred to within this paper as the 'primary health environment' of the organization will be examined. These variables have either been previously linked to mental illness, or would have been a key characteristic of the environment humans lived in during their lengthy evolutionary period through the hunter-gatherer stage.

Exposure to Sunlight

While human beings primarily lived outdoors and spent a great deal of time in direct sunlight during the days of the hunter-gatherer tribes, this is no longer the case in modern society. Human beings receive much less sunlight, and modern office buildings and factories are commonly designed with little interior exposure to natural light. As many individuals are confined to work in cubicles, offices, or factories, they tend to receive much less light on a daily basis than their ancestors would. A great deal of research has been done on exposure to natural sunlight and its effects on depression levels. Vitamin D has been shown to improve mood, lead to lower levels of depression, and prevent numerous physical ailments such as rickets, osteoporosis, autoimmune diseases and cardiovascular disease (Holick, 2008). Exposure to sunlight is a major source of vitamin D for humans, and we therefore evolved a natural adaptation to producing vitamin D as a result of sun exposure. As one previous study suggested, exposure to natural sunlight has been considered an important factor in depression (McGrath, J., Feron, F., Eyles, D., & Mackey-Sim, A, 2001). Compelling research findings have also shown that exposure to vitamin D plays a significant role in seasonal affective disorder (SAD)

(Lansdowne & Provost, 1998; Stumpf & Privette, 1989). Light therapy tends to be a well-known method of treatment for those affected by SAD as well.

Hypothesis 1: Exposure to sunlight will be negatively correlated with depression, anxiety, and somatic symptoms.

Noise

Another mismatch between the modern workplace and the hunter-gatherer environment is found when discussing noise levels. Before the creation of modern society, life would have been viewed as much simpler and much quieter. Without the existence of heavy machinery, cars, airplanes, etc., modern society would be a much quieter place. The majority of employees will experience some type of noise in their work environment, be it from telephones, air conditioning, fax machines, or large machinery—none of which would have existed 10, 000 years ago. Noise has also been studied in relation to mental health. Rafaello & Maass (2007) showed that increased levels of noise were directly related to lower levels of psychological well-being in the workplace. Employees whose organization had moved to a quieter location were found to have reported significantly fewer stress symptoms, such as headaches and sleep disturbances. Somatic symptoms have also been shown to increase with noise levels, particularly when individuals are constrained in a noisy environment (McDonald & Ronayne, 1989).

Hypothesis 2: Noise levels with be positively correlated with depression, anxiety, and somatic symptoms.

Physical Activity

Physical activity was a part of every day life for those living thousands of years ago. Men would spend much of the day away from the tribe hunting, while the women and children collected other food to eat. Even when agrarian societies were established, individuals would

have spent much of their days being physically active. Today, however, the majority of adults are employed in positions that do not allow them the freedom to be very physically active on the job. People are commonly confined to offices and cubicles where they sit for much of the day or behind sales counters where they are not allowed to take a seat. Physical activity has been shown to change the activity levels of neurotransmitters in the brain such as monoamines (norepinephrine and serotonin) that are related to depression (van Praag, 2006). Exercise therapy has been shown to be effective in treating depression in both younger and older adults, and has, in some cases, been demonstrated to be just as effective in alleviating depressive symptoms as antidepressant medication (Spirduso, Poon, & Chodzko-Zajko, 2008). Increased physical activity among an adult workplace population has been positively associated with increased health status (Bize & Plotnikoff, 2009), and a systematic review of the literature on physical activity and health shows overwhelming support for a relationship between the two variables (Bize, Johnson, & Plotnikoff, 2007).

Hypothesis 3: Physical activity will be negatively correlated with depression, anxiety, and somatic symptoms.

Interaction with Humans and Animals

During the evolutionary period prior to modern society, humans lived in tight-knit social groups, in which relationships could be formed with every member of the tribe. However, in modern society, personal connections are far less frequent. Workplaces vary in levels of social interaction, both with humans and with animals. While many individuals experience some sort of interaction with other humans throughout the day, interaction with animals on the job is far less frequent, unless animals are a primary function of the job environment. This is much different from the interaction levels our ancestors would have had with other members of the tribe, as well

as with domesticated animals. Interaction with humans and animals has long been associated

with positive health benefits. A meta-analysis of the literature on animal assisted therapy (AAT)

demonstrated moderate effect sizes in improving four main areas: autism spectrum symptoms,

medical difficulties, behavioral problems, and emotional well-being (Nimer & Lundahl, 2007).

Some major companies, like Google, even let employees bring animals in to work. Isolation

from human interaction and is often used in prisons and torture as a form of punishment, and

social exclusion in the form of bullying and in-group/out-group behavior has been viewed as

having negative affects on those who fall victim to this behavior.

> *Hypothesis 4a:* Interaction with humans will be negatively correlated with depression,
> anxiety, and somatic symptoms.

> *Hypothesis 4b:* Interaction with animals will be negatively correlated with depression,
> anxiety, and somatic symptoms

Exposure to Greenery

Prior to the creation of modern urban cities, rural environments were much more typical.

There was no shortage of living plants within close reach. However, as urban sprawl and

development continues, plants become less and less a part of every day life. Many office spaces

may have a potted plant or tree sitting in a corner, but that level of exposure to greenery is far

less than a human being would have been exposed to thousands of years earlier. Exposure to

greenery in the form of living plants or a rural environment lacking much traffic from cars and

other humans has been linked to restoring attention and occasionally linked to reducing

depression and anxiety. Activities as simple as a walk through a park have been shown to

improve cognitive functioning in the form of directed attention, as shown on backwards digit-

span tasks (Berman, Jonides, & Kaplan, 2008). The peaceful and calming effects of nature are

thought to offer the attention span an opportunity to recover and restore. In a similar task, directed attention was shown to improve simply through viewing pictures of nature. Another study demonstrated an interaction between both tranquility and depression/anxiety and exposure to greenery (Bodin, Hartig, 2003).

Hypothesis 5: Exposure to greenery will be negatively correlated with depression, anxiety, and somatic symptoms.

Amount of Sleep

In modern society, individuals have the choice of working several different types of shifts, and often have the opportunity to work over-time. Once an employee leaves work, they have a home to return to and more tasks to complete. Sleep is often set aside so that individuals can complete various extra responsibilities. However, our hunter-gatherer ancestors only had a primary job to concern themselves with: gathering food. Their sleep patterns were a function of the rising and setting of the sun and not of the demands of a strict work schedule. Sleeping much longer or much less than seven to eight hours a night has long been known as a symptom of depression. Studies of sleep problems in children have demonstrated relationships between later depressions (Gregory, et. al, 2009). In yet another study, individuals who slept more or less than seven to eight hours a night were found to have higher depressed mood states than those who typically slept for the intermediate seven to eight hours per night (Buela-Casal, et. al, 2007). Interestingly enough, sleep deprivation has recently been developed as a treatment for clinically depressed individuals (Benedetti et. al, 2007) as a method of resetting biological rhythms.

Hypothesis 6: Quality of sleep will be negatively correlated to depression, anxiety, and somatic symptoms.

As certain environmental factors have already been linked to psychological well being and physical symptoms, this study will work towards placing these factors within the framework of an evolutionary perspective. It will also serve as a basis for future research on the topic, and as means for preventative measures businesses can take against employee mental illness.

Method

Participants

Invitations to participate in a web-based survey were sent out to 2,117 alumni of a large mid-western university. Of the 2,117 invitations that were sent out, 201 completed the online survey, for a response rate of 9.49%. All 201 surveys were included in data analysis. 122 participants were female, 60 were male, and 19 did not report sex. All participants were 22 years of age or older, M=33.41, SD=9.86.

Procedure

All invitation e-mails to potential participants were sent by the alumni relations department of a large Midwestern university. E-mails included a short explanation of the research, as well as an Internet link to the cover letter, consent form and survey. Participants were allowed to consent anonymously to taking the survey by agreeing that the return of their survey implied their consent. Completion of the survey took approximately 30 minutes. At the completion of the survey, respondents were invited to provide their name and contact information to be entered into a drawing for a gift certificate as compensation for participating. All identifying data were stored separately from survey data, and no attempt to connect the two data sets was made.

Measures

     Exposure to Sunlight. Both direct and indirect exposure to sunlight was measured with four questions, all of which were developed for this survey. Samples of these questions include: "While working, how often are you exposed to sunlight directly? (i.e., working directly outdoors)" and "How often are you exposed to natural sunlight through windows in your workplace?" Participants responded to the items on a 5-point Likert scale ranging from 1 (*never*) to 5 (*40+hrs per week*). Lastly, participants were asked to self-report the strength of the lighting in their workplace on a 5-point scale ranging from 1 (*very weak*) to 5 (*very strong*). Cronbach's alpha for this measure in the present study is .398.

     Noise. Noise levels were measured with six questions. Five of the questions used for this scale were developed by Leather, Beale and Sullivan (2003). The initial question states, "How often do each of the following disturb you?" A 5-point scale ranging from 1 (*never disturbs*) to 5 (*constantly disturbs*) is provided for each of the following: air conditioning; telephones; office machines; people talking; noise from the street. This question was adapted from the original Likert scale utilizing 1 to 7 numbering to use only the numbers 1 through 5. This was done to ensure uniformity with all other questions on the survey. Leather, Beale and Sullivan did not report a coefficient alpha for their scale. The last question was taken from a 2002 study by Raffaello and Maass, and states "How much are you disturbed by noise in your workplace?" The question is answered with a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*very much*), and the previous wording of "work unit" was adapted to read "workplace" to conform to the current study. Cronbach's alpha for this measure in the current study is .636.

Greenery. Greenery was measured by three questions that were developed for the purpose of this study. Questions include: "How much are you exposed to natural greenery (plants, grass, trees) during your work day?", "Are you exposed to living plants in your workplace?" and "Are you exposed to pictures of landscapes or outdoor settings in your workplace?" Respondents rated each questions on a 5-point scale that ranged from 1 (*Never in my line of vision*) to 5 (*Continuously in my line of vision*). Cronbach's alpha for this measure in the current study is .679.

Amount of Sleep. The 4-Item Jenkins Scale (Grano, 2007) was used to measure quality of sleep. Questions ask the participants to rate four different sleep problems on a Likert scale ranging from 1 (*never*) to 6 (*every night*) based on their experiences within the previous four weeks. The Likert scale in this instance has been adapted to a 5 point scale to match the rest of the questions on the Workplace Characteristics Survey (see Appendix A). The four symptoms are: having trouble falling asleep; waking up several times per night; having trouble staying asleep; and waking up after the usual amount of sleep feeling tired and worn out. In a previous discussion of this scale (Jenkins, Stanton, Niemcryk, & Rose, 1988), a different rating system was used, and a coefficient alpha was not reported. Cronbach's alpha for this measure in the current study is .771.

Physical Activity. Three questions assessing physical activity within the workplace have been developed for this survey. These questions were developed to assess participants' ability to get exercise at work, whether or not they actually take the time to exercise at work and a self-report measure of the amount of physical activity they would say their job consists of. Questions read: "How often do you have the opportunity (i.e., time) to exercise at work?", "How often do you take time to exercise while at work?", and "How much physical activity (involving increased

heart rate; ex: brisk walking or lifting—not including repetitive physical tasks) would you say your job consists of?" Cronbach's alpha for this measure in the current study is .671.

   Interaction with Humans and Animals. Six questions assessing employee interaction with both humans and animals were developed specifically for this survey. Examples of questions assessing human interaction include "How enjoyable would you say your typical interactions with other individuals (customers, clients, other employees, etc.) in your workplace are?", "How well do you know the typical individual you interact with during the workday?", "What type of interaction do you experience with other individuals in your workplace?", and "What percentage of your day is spent interacting with the following groups? (infants, children, teenagers, adults, elderly, animals)?" In order to assess interaction with animals, two short questions were developed for this study and include, "To what extent do you interact with animals as a part of your daily job?" and "What type of animals do you interact with?" Cronbach's alpha for interaction with humans in the current study is .528; Cronbach's alpha for interaction with animals was not calculated.

   Depression. The Center for Epidemiological Studies Depression (CES-D) Scale (Radloff, 1977) was used to assess depression in participants. The scale is used to measure depression levels in the general population. The CES-D is a self-report scale that consists of 20 questions that ask participants to rate their feelings over the past week. Examples of items include "I felt depressed," "I felt everything I did was an effort," and "I enjoyed life (reverse scored)." Radloff reported a coefficient alpha of .85 in the development sample. Cronbach's alpha for this measure in the current study is .654.

Anxiety. Anxiety symptoms were measured with the Beck Anxiety Inventory (Beck, Epstein, Brown and Steer, 1988). This 21 question self-report scale asks participants to rate how often within the past month they have been bothered by common symptoms of anxiety. Symptoms include: numbness or tingling, an inability to relax, nervousness, and feelings of choking. Participants will rate each symptom by choosing one of the following: "not at all," "mildly, but it didn't bother me much," "moderately—it wasn't pleasant at times" or "severely—it bothered me a lot." Beck et. al. reported a coefficient alpha of .92 in their original development of the scale. Cronbach's alpha for this measure in the current study was .843.

Somatic Symptoms. Somatic symptoms were measured with the Physical Symptom Inventory (PSI) (Spector & Jex, 1998), an 18 item scale asking participants to indicate if they have had various somatic symptoms over the previous 30 days, and if they have, whether or not they have seen a doctor for the symptom. Symptoms listed include: an upset stomach or nausea, a backache, trouble sleeping, a skin rash, shortness of breath, etc. Participants answer each question by selecting "No," "Yes, but I did not see a doctor," or "Yes, and I saw a doctor." In the original development of this scale, Spector and Jex did not report a coefficient alpha, but instead looked at the PSI as three separate measures: no somatic symptoms, somatic symptoms and no doctor, and somatic symptoms with doctor. In order to stay true to the original development of this scale, the present study will look at the PSI in the same way.

Demographics. Demographic measures included age, gender, job salary, and job title. Participants were also asked whether or not they had their own office, how secure they felt in their current position, and how likely they thought they would be to be laid off within the next six months. In addition, participants were asked how many hours per week they typically work,

as well as what shifts they typically worked. Finally, two questions were also asked to determine whether or not participants had previously been diagnosed with and treated for mental disorders.

Results

A correlation matrix of all variables in the study is shown in Table 1. Of the sample group, 10.4% (N=19) had been diagnosed with a mental disorder, and 9.6% (N=17) were currently taking medication for a mental disorder. For all data analyses, the cases in which participants had either been diagnosed with a mental disorder or were receiving treatment for one were taken out of consideration.

Hypothesis 1

The first hypothesis stated that exposure to sunlight would be negatively correlated with depression, anxiety, and somatic symptoms. In data analysis, sunlight was not found to be significantly correlated with depression, anxiety, or somatic symptoms. Exposure to sunlight was found to be significantly correlated with greenery ($r = .416$, *p.* $< .01$), and was also significantly related to human interaction ($r = .219$, *p.* $< .01$). Lastly, sunlight was negatively correlated with having an office ($r = -.302$, *p.* $< .01$), meaning that those with an office of their own are more likely to report increased levels of sunlight in the workplace.

Hypothesis 2

The second hypothesis, that noise levels would be positively correlated with depression, anxiety, and somatic symptoms, was supported by the current data. Noise was significantly correlated with depression ($r = .228$, *p.* $< .01$) and anxiety ($r = .232$, *p.* $< .01$), as well as no somatic complaints ($r = -.194$, *p.* $< .05$), and somatic complaints with a doctor's visit ($r = .141$,

p. < .05). These results support the current research findings of a relationship between noise levels in the workplace and psychological well-being.

Hypothesis 3

The third hypothesis, that physical activity would be negatively correlated with depression, anxiety, and somatic symptoms, was not supported by the current data. No significant correlations between physical activity and any other scale were found amongst the entire survey population. However, a significant correlation was found between physical activity and somatic complaints with a doctor's visit ($r = .459$, *p.* < .01) amongst those surveyed who also reported feeling between "somewhat likely" and "very likely" to be laid off within the next six months.

Hypothesis 4

The next hypothesis, that interaction with humans and animals would be negatively correlated with depression, anxiety, and somatic symptoms, was also not supported by the current data. Interestingly, human interaction was significantly correlated to sunlight ($r = .219$, *p.* < .01), as well as to animal interaction ($r = -.380$, *p.* < .01). The latter negative correlation may be due to a number of respondents who worked from home. In home work environments, individuals may be more likely to interact with pets than with other employees. While no correlation was found between human and animal interaction and measures of mental health in the general population, evidence was found among several subsets of the population to support a link between human interaction and anxiety. These findings are discussed further in the *Exploratory Findings* section.

Hypothesis 5

The current data do not support the fifth hypothesis, that exposure to greenery would be negatively correlated with depression, anxiety, and somatic symptoms. No significant correlations between these variables were found, though exposure to greenery was found to be significantly correlated with exposure to sunlight ($r = .416$, $p. < .01$). Interestingly, greenery was found to be negatively correlated with no somatic complaints ($r = -.193$, $p. < .05$), meaning that those who reported more exposure to greenery reported higher numbers of somatic complaints, either with or without doctor's visits. Lastly, greenery was positively correlated with age ($r = .232$, $p. < .01$), sex ($r = .168$, $p. < .05$) and having an office ($r =-.314$, $p. < .01$). This means that those who are older, those who are female, and those with their own office are more likely to report high levels of greenery.

Hypothesis 6

The current data do support the final hypothesis that quality of sleep would be significantly correlated with depression, anxiety, and somatic symptoms. Quality of sleep was found to be significantly correlated with depression ($r = .357$, $p. < .01$), anxiety ($r = .358$, $p . < .01$), as well as no somatic complaints ($r = -.444$, $p. < .01$), somatic complaints with no doctor's visit ($r = .364$, $p. < .01$), and somatic complaints with a doctor's visit ($r = .226$, $p. < .01$). Quality of sleep was also found to be positively correlated to age ($r =.233$, $p. < .01$).

Exploratory Analyses

Exploratory analyses were conducted on several subsets of the general survey population, namely: males; females; those under 40 years of age; those 40 years of age and older; those with a reported job security between "very insecure" and "neither insecure nor secure"; and those who reported their likelihood of being laid off within the next six months to be between "somewhat likely" and "very likely."

Among the males (N=60) who were surveyed, quality of sleep was more strongly correlated with anxiety ($r = .419$, $p. < .01$) than in the general population ($r = .358$, $p. < .01$). A slightly larger correlation was found between quality of sleep and somatic complaints with no doctor's visit ($r = .370$, $p. < .05$) amongst males than in the general population ($r = .364$, $p. < .01$). Noise was only found to be correlated with depression ($r = .336$, $p. < .01$) and anxiety ($r = .327$) in the male subset, which differs slightly from the analysis of the general population. Also, the male subset supported hypothesis four, that human interaction would correlate with measures of mental health. Human interaction was found to be negatively correlated with depression ($r = -.198$, $p. < .01$) and anxiety ($r = -.505$, $p. < .01$) amongst males. While human interaction was correlated with anxiety in the general population ($r = -.286$, $p. < .01$), it was not found to be significantly correlated with depression.

Within the female (N=122) subset of the surveyed population, only noise and sleep were significantly correlated to measures of mental health, which reflect the findings among the general population. Correlations between sleep and noise and measures of mental health do not vary greatly from those found among the general population.

For those surveyed under the age of 40 (N=140), noise and sleep were also significantly correlated to measures of mental health. Noise was significantly correlated to anxiety ($r = .206$, $p. < .01$) and somatic complaints with a doctor's visit ($r = .141$, $p. < .05$). The correlation to anxiety was somewhat lower than amongst the general population ($r = .232$, $p. < .01$). Correlations between sleep and mental health measures did not vary greatly from those of the general population, other than that there was no significant correlation between quality of sleep and somatic complaints with a doctor's visit amongst the under 40 population. Interestingly, as seen in the male population, a significant negative correlation between human interaction and depression ($r = -.196$, $p. < .05$), as well as anxiety ($r = -.301$, $p. < .05$) was seen.

Among survey participants age 40 and over (N=42), noise was only significantly correlated to depression ($r = .389$, $p. < .05$), anxiety ($r = .366$, $p. < .05$), and no somatic complaints ($r = -.170$, $p. < .05$). The correlations to depression and anxiety are stronger than those seen in the general population ($r = .228$, $r = .232$, respectively, $p. < .01$). Sleep was also much more strongly correlated to all measures of mental health among the 40 and over age group. These correlations can be seen in Table 2. Also, an interesting positive correlation was found between sunlight and depression among this age group ($r = .310$, $p. < .01$).

Among those who reported their job security to be between "very insecure" and "neither insecure nor secure" (N=54), quality of sleep was also found to be negatively correlated with depression ($r = .373$, $p. < .01$), anxiety ($r = .417$, $p. < .01$), no somatic complaints ($r = -.274$, $p. < .01$), and somatic complaints with a doctor's visit ($r = .279$, $p. < .01$). No correlation was found between noise and mental health measures among this group. This group also showed evidence of a link between human interaction and depression ($r = -.207$, $p. < .01$), and anxiety ($r = -.470$, $p. < .01$).

Several significant correlations were found among the subset of the population who reported their likelihood of being laid off within the next six months to be between "somewhat likely" and "very likely" (N=31). A strong correlation between physical activity and anxiety ($r = .419$, $p. < .01$), no somatic complaints ($r = -.459$, $p. < .01$), and somatic complaints with a doctor's visit ($r = .660$, $p. < .01$) was found, which was not seen in any other subsets of the sample population. Greenery was found to be significantly correlated with anxiety ($r = .251$, $p. < .01$) and no somatic symptoms ($r = -.317$, $p. < .01$). Sleep was found to be strongly correlated with several mental health measures, including depression ($r = .389$, $p. < .01$), anxiety ($r = .439$, $p. < .01$), no somatic complaints ($r = -.262$, $p. < .01$), and somatic complaints with a doctor's visit ($r = .326$, $p. < .01$). Further exploratory analyses were conducted on the general population controlling for job security and potential to be laid off in addition to being diagnosed with or treated for a mental disorder. This resulted in several slight variations in correlations between the general population, and the general population while in addition controlling for job security and potential to be laid off. The differences in these correlations can be explained further by Table 1. Interestingly, when controlling for job security and potential to be laid off, a positive correlation was observed between sunlight and depression ($r = .170$, $p. < .05$).

Discussion

The present study sought to support the ideas of Morris (1996) and Nicholson (1997) by placing the primary health environment of the workplace within an evolutionary context. The researcher proposed that higher levels of exposure to sunlight, physical activity, interaction with humans and animals, exposure to greenery, and quality of sleep would be related to lower levels of depression, anxiety, and somatic symptoms, and that higher noise levels would be related to higher levels of depression, anxiety, and somatic symptoms. While past research has supported each individual variable's link to measures of mental health, the success of the current study's attempt to replicate those findings was limited.

The current study supported the hypotheses that quality of sleep and noise levels would be related to depression, anxiety, and somatic symptoms. Overall, the general population saw strong significant relationships between these variables, while several different groups within the overall survey sample were affected differently by both quality of sleep and noise. Males appeared to be less affected by quality of sleep, and unaffected by noise levels when compared to the general population.

While two hypotheses were supported according to the findings of this study, the remaining four hypotheses were not supported, excluding two special cases. No evidence was found to link exposure to greenery or exposure to sunlight to depression, anxiety, or somatic symptoms, excluding one counterintuitive case in which sunlight was positively related to depression. It is possible that the hypothesis regarding exposure to sunlight was not supported due to scaling issues. The reliability of the sunlight exposure scale was a great deal lower in the general sample than in the previously tested pilot group. It is quite possible that the four questions assembled to measure exposure to sunlight were not successful in determining the

variable in question. In addition, only three questions were used to determine the level of greenery exposure, and all were developed specifically for this study. No other self-report measures of greenery exposure levels currently exist, and more development of this and other scales are needed.

Also, while there was no evidence to link physical activity to measures of mental health among the general population and several subset groups, there was a correlation between physical activity and somatic complaints with a doctor's visit among subjects who perceived an increased likelihood of being laid off within the next six months. Lastly, while the general population did not demonstrate a relationship between human or animal interaction and measures of mental health, several subset groups showed a relationship between human interaction and anxiety levels. For males, those under 40, and those reporting their job security to be between "very insecure" and "neither insecure nor secure," lower amounts of human interaction were shown to be related to higher anxiety levels. This may show that human interaction has greater effects on lessening symptoms of anxiety among these groups.

There are several possible limitations of this study, which include validity issues that may occur within several of the new measures. The majority of scales were created for the purpose of this study due to the lack of previously existing measures for many of the variables in question. The validity of all of the measures would need to be taken into account, as well as the variability of the scales. It may also be the case that many participants would rate aspects of the environment, particularly sunlight, as being nearly the same as the majority of respondents were located in the same geographic area. It may be possible that more data is needed for a sufficient conclusion on the matter.

Future research into this area may take several courses of action. One possibility may be to divide the current study into several smaller studies for a more focused data analysis of each variable in question. Also, the majority of individuals surveyed were employed in various service industries. Future studies may seek to draw from more randomized samples that include various industries (such as manufacturing and agriculture), and a more balanced sample of females and males, as this sample consisted of approximately two females for every one male. Furthermore, it may also be helpful to conduct further studies of the effect of noise levels and quality of sleep on depression, anxiety, and somatic symptoms to draw more specific conclusions. While this research was purely correlational, it may be interesting to conduct experiments on several of the variables discussed in this study.

References

Beck, A. T., Epstein, N., Brown, G., & Steer, R. (1988). An inventory for measuring anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology, 56*, 893–897.

Benedetti, F., Barbini, B., Colombo, C., & Smeraldi, E. (2007). Chronotherapeutics in a psychiatric ward. *Sleep Medicine Reviews, 11(6),* 509-522.

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science, volume 10 (12),*1207-1212.

Berndt, E. R., Bailit, H.L., Keller, M. B., Verner, J. C., Findelstein, S. N. (2000). Health care use and at- work productivity among employees with mental disorders. *Health Affairs, 19*, 244-256.

Bize, R., Johnson, J., & Plotnikoff, R. (2007). Physical activity level and health-related quality of life in the general adult population: A systematic review. *Preventive Medicine: An International Journal Devoted to Practice and Theory, 45(6),* 401-415.

Bize, R., Plotnikoff, R. (2009). The relationship between a short measure of health status and physical activity in a workplace population. *Psychology, Health, & Medicine, 14(1),* 53-61.

Bodin, M., Hartig, T. (2003). Does the outdoor environment matter for psychological restoration gained through running? *Psychology of Sport and Exercise*, *4(2),* 141-153.

Buela-Casal, G., Miró, E., Iañez, M. Á., & Catena, A. (2007). Relation between habitual sleep duration and depressed mood state: Somatic versus cognitive symptoms. *International Journal of Clinical and Health Psychology, 7(3),* 615-631.

Generalized Anxiety Disorder Self Test. Retrieved April 9, 2009, from Anxiety Disorders

  Association of America Web site: http://www.adaa.org/GettingHelp/

  SelfHelpTests/selftest_GAD.asp.

Grano, N., et al. (2007). Association of impulsivity with sleep duration and insomnia in an

  employee population. *Personality and Individual Differences, 43(2),* 307-318.

Gregory, A. M., Rijsdijk, F., Lau, J. Y., Dahl, R. E., & Eley, T. (2009). The direction of

  longitudinal associations between sleep problems and depression symptoms: A study of

  twins aged 8 and 10 years. *Sleep: Journal of Sleep and Sleep Disorders Research, 32(2),*

  189-199.

Holick, M. F. (2008). Sunlight, UV-radiation, vitamin D and skin cancer: How much sunlight do

  we need? In J. Reichrath (Ed.), *Sunlight, vitamin D, and skin cancer* (1-15). New York:

  Landes Bioscience and Springer Science+Business Media, LLC

Jenkins, D.C., Stantion, B-A., Niemcryk, S.J., & Rose, R. M. (1988). A scale for the estimation

  of sleep problems in clinical research. *Journal of Clinical Epidemiology, 41,* 313-321.

Lansdowne, A. G., Provost, S. C. (1998). Vitamin D-sub-3 enhances mood in healthy subjects

  during winter. *Psychopharmacology, 135(4),* 319-323.

Leather, P., Beale, D., & Sullivan, L. (2003). Noise, psychosocial stress and their interaction in

  the workplace. *Journal of Environmental Psychology, 23*, 213-222.

McDonald, N. J., & Ronayne, T. (1989). Jobs and their environment: The psychological impact

  of work in noise. *Irish Journal of Psychology, 10(1),* 39-55.

McGrath, J., Feron, F., Eyles, D., & Mackey-Sim, A. (2001). Vitamin D: The neglected

  neurosteroid? *Trends in Neurosciences, 24*, 570-571.

Morris, Desmond. (1996). *The Human Zoo: A Zoologist's Classic Study of the Urban Animal.*
New York: Kodansha International.

Muchinsky, P. (2006). *Psychology applied to work.* Eighth Edition. Belmont, California:
Thomson Wadsworth.

Nicholson, N. (1997). Evolutionary psychology: Toward a new view of human nature and
organizational society. *Human Nature, 50(9)*, 1053-1078.

Nimer, J., & Lundahl, B. (2007). Animal-assisted therapy: A meta-analysis. *Anthrozoos, 20(3),*
225-238.

Radloff, L.S. (1977). The CES-D scale: A self-report depression scale for research in the general
population. *Applied Psychological Measurement, 1*, 385-401.

Raffaello, M., & Maass, A. (2002). Chronic exposure to noise in industry: The effects on
satisfaction, stress symptoms, and company attachment. *Environment and Behavior*,
*34,*651-671.

Spector, P. E., & Jex, S. M. (1998). Development of Four Self-Report Measures of Job Stressors
and Strain: Interpersonal Conflict at Work Scale, Organizational Constraints Scale,
Quantitative Workload Inventory, and Physical Symptoms Inventory. *Journal of
Occupational Health Psychology*, *3*, 356-367.

Spirduso, W. W., Poon, L. W., & Chodzko-Zajko, W. (Eds.). (2008). *Exercise and its
remediating effects on cognition* (Vol. 2). Champaign, IL: Human Kinetics.

Stumpf, W. E., Privette, T. H. (1989). Light, vitamin D and psychiatry: Role of 1,25
dihydroxyvitamin D-sub-3 (soltriol) in etiology and therapy of seasonal affective disorder
and other mental processes. *Psychopharmacology, 97(3),* 285-294.

Van Praag, H. (2006). Exercise, neurgenesis, and learning in rodents. In E.O. Acevedo & P.

APPENDIX A

Workplace Characteristics Survey

        The following questions are designed to assess your workplace on the basis of several different variables. Please respond to each question taking into account your *current* work environment. Please note the meanings of 1 through 5 on each scale.

1.) **While working**, how often are you exposed to sunlight directly? (i.e., working **directly outdoors**)

1	2	3	4	5
Never	1-2hrs	About 20hrs	21-39hrs	40+ hrs
	Per Week	Per Week	Per Week	Per Week

2.) How often are you exposed to natural sunlight through windows in your workplace?

1	2	3	4	5
Never	1-2hrs	About 20hrs	21-39hrs	40+ hrs
	Per Week	Per Week	Per Week	Per Week

3.) How much time do you have *during work breaks* to be exposed to sunlight during your work day? (i.e., smoke breaks, outdoor errands, etc.)

1	2	3	4	5
Never	1-2hrs	About 20hrs	21-39hrs	40+ hrs
	Per Week	Per Week	Per Week	Per Week

4.) How would you rate the lighting in your workplace?

1	2	3	4	5
Very Weak		Somewhat Strong		Very Strong

How often do each of the following disturb you *while at work*?	Never disturbs		Occasionally disturbs		Constantly disturbs
5.) Air conditioning	1	2	3	4	5
6.) Telephones	1	2	3	4	5
7.) Office machines	1	2	3	4	5
8.) People talking	1	2	3	4	5
9.) Noise from the street	1	2	3	4	5

10.) How much are you disturbed by noise in your workplace?

1	2	3	4	5
Not At All		Somewhat		Very Much

11.) Are you exposed to living plants in your workplace?

1	2	3	4	5
Plants are Never in my line of vision		Plants are in my line of vision approximately 50% of the workday		Plants are continuously in my line of vision

12.) How much are you exposed to natural greenery (plants, grass, trees) during your work day?

1	2	3	4	5
Greenery is Never in my line of vision		Greenery is in my line of vision approximately 50% of the workday		Greenery is continuously in my line of vision

13.) Are you exposed to pictures of landscapes or outdoor settings in your workplace?

1	2	3	4	5
These are Never in my line of vision		These are in my line of vision approximately 50% of the workday		These are continuously in my line of vision

How many nights in the previous four weeks have you experienced the following symptoms?	Never		Occasionally		Every Night
14.) Having trouble falling asleep	1	2	3	4	5
15.) Waking up several times per night	1	2	3	4	5
16.) Having trouble staying asleep	1	2	3	4	5
17.) Waking up after the usual amount of sleep feeling tired and worn out	1	2	3	4	5

18.) How often do you have the opportunity (i.e., time) to exercise at work?

1	2	3	4	5
Never		2-3 Times Per Week		Every Day

19.) How often do you take time to exercise while at work?

1	2	3	4	5
Never		2-3 Times Per Week		Every Day

20.) How much physical activity (involving increased heart rate; ex: brisk walking or lifting—not including repetitive physical tasks) would you say your job consists of?

1	2	3	4	5
None		Some		A Great Deal

21.) How **enjoyable** would you say your typical interactions with other individuals (customers, clients, other employees, etc.) in your workplace are?

1	2	3	4	5
Not at All Enjoyable		Somewhat Enjoyable		Very Enjoyable

22.) **How well** do you know the typical individual you interact with during the workday?

1	2	3	4	5
Not at All		Somewhat		Very Well

23.) If you interact with animals during your work day, what **type of animals** are they? (List all that apply.) _____

24.) ***Approximately*** what percentage of your daily communications are with the following groups? **For the following questions, your percentages must equal 100%. For example, if 60% of your daily communication is with adults, then you could say your communication with teenagers accounted for 20% of the day, and communication with infants counted for 20% of the day.**

a) What percentage of your day is spent interacting with **infants?**

1	2	3	4	5	6
0%	20%	40%	60%	80%	100%

b) What percentage of your day is spent interacting with **children?**

1	2	3	4	5	6
0%	20%	40%	60%	80%	100%

c) What percentage of your day is spent interacting with **teenagers?**

1	2	3	4	5	6
0%	20%	40%	60%	80%	100%

d) What percentage of your day is spent interacting with **adults?**

1	2	3	4	5	6
0%	20%	40%	60%	80%	100%

e) What percentage of your day is spent interacting with **the elderly?**

1	2	3	4	5	6
0%	20%	40%	60%	80%	100%

f) What percentage of your day is spent interacting with **animals?**

1	2	3	4	5	6
0%	20%	40%	60%	80%	100%

25.) ***Approximately*** what percentage of your daily communications are in the following forms? **For the following questions, your percentages must equal 100%. For example, if 60% of your daily communication is face to face, then you could say your phone communication accounted for 20% of the day, and electronic communication counted for 20% of the day. You could not, however, say that phone and electronic communication combined accounted for more than 50%, as that would result in a total of over 100%.**

a.) *Approximately* how much of your daily communication is **face to face**?

1	2	3	4	5	6
0%	20%	40%	60%	80%	100%

b.) *Approximately* how much of your daily communication is **over the phone**?

1	2	3	4	5	6
0%	20%	40%	60%	80%	100%

c.) *Approximately* how much of your daily communication is **done electronically (ex: e-mail, Facebook, Twitter, etc)**?

1	2	3	4	5	6
0%	20%	40%	60%	80%	100%

Below is a list of some of the ways you may have felt or behaved. Please indicate how often you have felt this way during the **past week**.

	Rarely or none of the time (< 1 Day)	Some or a little of the time (1-2 Days)	Occasionally or a moderate amount of the time (3-4 Days)	Most or all of the time (5-7 Days)
1. I was bothered by things that don't usually bother me.				
2. I did not feel like eating; my appetite was poor.				
3. I felt that I could not shake off the blues even with the help of my family or friends.				
4. I felt that I was just as good as other people.				
5. I had trouble keeping my mind on what I was doing.				
6. I felt depressed.				
7. I felt everything I did was an effort.				
8. I felt hopeful about the future.				
9. I thought my life had been a failure.				
10. I felt fearful.				
11. My sleep was restless.				
12. I was happy.				
13. I talked less than usual.				
14. I felt lonely.				
15. People were unfriendly.				
16. I enjoyed life.				
17. I had crying spells.				
18. I felt sad.				
19. I felt that people disliked me.				
20. I could not get "going".				

Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today, by **circling the number** in the corresponding space in the column next to each symptom.

	Not At All	Mildly but it didn't bother me much.	Moderately - it wasn't pleasant at times	Severely – it bothered me a lot
1. Numbness or tingling	0	1	2	3
2. Feeling hot	0	1	2	3
3. Wobbliness in legs	0	1	2	3
4. Unable to relax	0	1	2	3
5. Fear of worst happening	0	1	2	3
6. Dizzy or lightheaded	0	1	2	3
7. Heart pounding/racing	0	1	2	3
8. Unsteady	0	1	2	3
9. Terrified or afraid	0	1	2	3
10. Nervous	0	1	2	3
11. Feeling of choking	0	1	2	3
12. Hands trembling	0	1	2	3
13. Shaky / unsteady	0	1	2	3
14. Fear of losing control	0	1	2	3
15. Difficulty in breathing	0	1	2	3
16. Fear of dying	0	1	2	3
17. Scared	0	1	2	3
18. Indigestion	0	1	2	3
19. Faint / lightheaded	0	1	2	3
20. Face flushed	0	1	2	3
21. Hot/cold sweats	0	1	2	3

Physical Symptoms Inventory, PSI

During the past **30 days** did you have any of the following symptoms? If you did have the symptom, did you see a doctor about it? **During the past 30 days did you have?**	No	Yes, but I didn't see	Yes, and I saw doctor
1. An upset stomach or nausea			
2. A backache			
3. Trouble sleeping			
4. A skin rash			
5. Shortness of breath			
6. Chest pain			
7. Headache			
8. Fever			
9. Acid indigestion or heartburn			
10. Eye strain			
11. Diarrhea			
12. Stomach cramps (Not menstrual)			
13. Constipation			
14. Heart pounding when not exercising			
15. An infection			
16. Loss of appetite			
17. Dizziness			
18. Tiredness or fatique			

Before completing the survey, please provide the following demographical information.

Age:_____

Sex: Male   Female   Other

How much money do you make in a year? (circle one)

      a. Under $10, 000   e. $75,000-$99,999
      b. $10,001-$24,999   f. $100,000-$124,999
      c. $25, 000-$49,999   g. $125,000 and up
      d. $50,000-$74,999

What industry do you work in? (For example, education, agriculture, business, etc.)_____

What is your job title?_____

Do you have your own office? (circle one)

   Yes   No

How secure do you feel in your current position?

1	2	3	4	5
Very		Neither insecure		Very
insecure		Nor Secure		secure

How likely do you think it is that you will be laid off within the next six months?

1	2	3	4	5
Not At		Somewhat Likely		Very Likely
All Likely				

Approximately how many hours do you work per week? _____

What is your typical work schedule most like? (Circle all that apply)
    Days (8am-4pm)
    Afternoons/Evenings (4pm-Midnight)
    Late Nights (Midnight-8am)

Approximately what percentage of your work time **per month** is spent working each of these shifts?
    Days (8am-4pm)_____
    Afternoons/Evenings (4pm-Midnight)_____
    Late Nights (Midnight-8am)____

Have you been clinically diagnosed with any mental disorder?   Yes   No

If yes, are you currently taking any medication for this disorder?   Yes   No   N/A