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SOUNDSCAPES: THE EFFECTS OF NATURAL SOUNDS AND UNNATURAL NOISE ON HEART RATE, POSITIVE AFFECT AND NEGATIVE AFFECT, IN RELATION TO STRESS RECOVERY

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ABSTRACT

The area of natural sounds and unnatural, otherwise referred to as man-made noise, is a relatively new field of study. Specifically, the restorative aspects of sound and noise, after exposure to a stressor, have not been studied. In order to better understand the restorative aspects of sound and noise, this study assessed three different conditions, sound, noise and control, and their effects on stress recovery through positive affect, negative affect, and heart rate analysis. By examining both psychological and physiological reactions it is possible to delve into the importance of auditory environments in relation to health. For heart rate, it was hypothesized that sound would cause the fastest rate of recovery, followed by control, then noise. In regards to positive and negative affect, it was hypothesized that the sound condition would produce the highest positive and lowest negative affect, followed by control and finally noise. Heart rate data was continuously recorded and examined for the recovery task period. Current mood and arousal questionnaires were given during four predetermined periods, baseline, following the TSST, following the recovery task, and at the end of the study, to assess positive and negative affect. The study found no significant differences in arousal or heart rate between groups. Interestingly, there was a statistical trend in mood following the recovery task between the noise and control conditions, with the noise group reporting more positive mood than both sound and control. Nonetheless, the slopes of heart rate showed a faster recovery rate for sound, followed by control and lastly noise.

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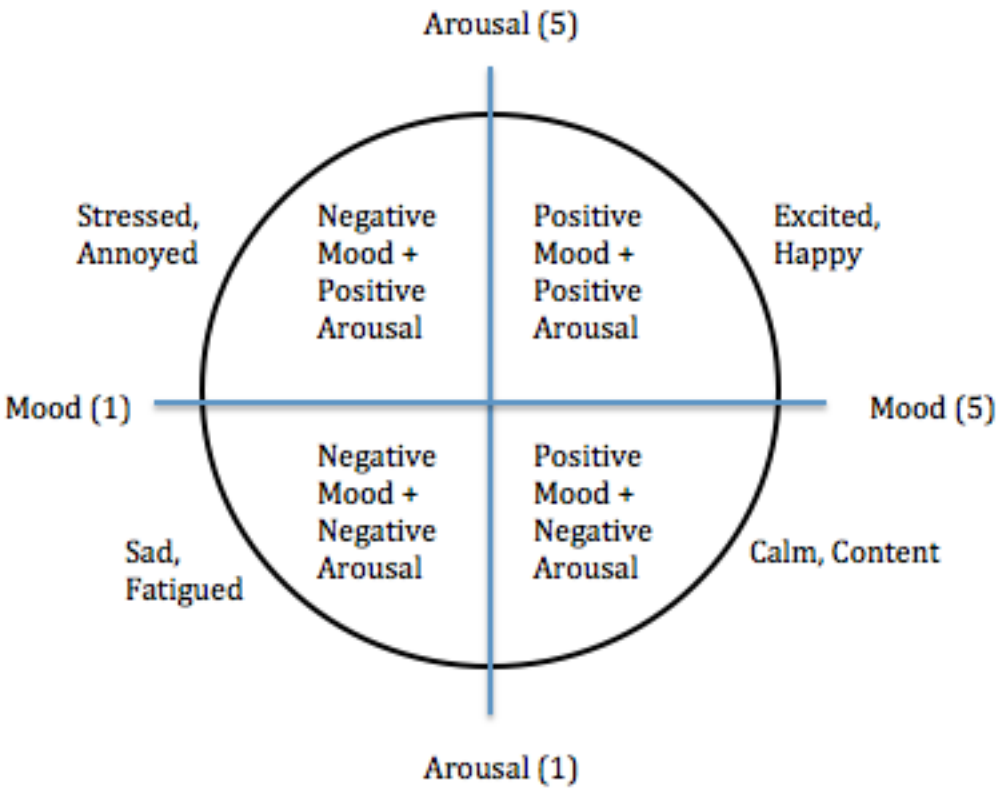
Chapter 1

Introduction

Sound and noise are two terms commonly used interchangeably. However, for the purpose of this study and the future of sound studies it is important to not only differentiate them through a definition, but also to differentiate their effects on the human body. Sounds are natural, such as wind and water, while noise will be referenced as man-made sounds, such as airplanes and machines. Although there have been many studies on the preference of sounds for focus and relaxation as well as the displeasure and disruption caused by noise, there have been few studies on the comparison of noise and sound as restorative factors. In this study, the specific psychological variables, positive and negative affect, and the physiological variable of heart rate, are being measured. This study is taken from a larger IRB study approved under the Penn State institutional review board, protocol number 00000614.

Throughout this study, mood will be assessed using the circumplex model, which encompasses current mood and level of arousal questionnaires. The circumplex model, Figure 1, is comprised of two scales that in-turn make a graph. The mood scale ranges from one to five, one being very negative mood and five being very positive mood. Similarly, the arousal scale ranges from one to five, one being very low/no arousal to five, high arousal. The combination of ratings is mapped on the graph to determine valence at the time of measurement.

Figure 1. Circumplex Model



*Redrawn from Russell (1980)

Importance of Restorative Factors

The hormones adrenaline, norepinephrine and cortisol, all commonly referred to as stress hormones, play an integral role in the autonomic system of the body. The increase of these hormones are risk factors for hypertension, arteriosclerosis or myocardial infarction through their impact on heart activity as well as blood pressure, lipids, glucose, clotting, and viscosity (Chrousos and Gold, 1992; Baum and Grunberg, 1995). Day-to-day behavior and mood is

adversely affected by high cortisol levels, which increase with stress (Robinso, Ode, & Hilmert, 2010). Increased cortisol levels are also linked to psychological burnout, which leads to both physical, emotional, and cognitive exhaustion (Melamed, Ugarten, Shirom, Kahana, Lerman, & Froom, 1999). Psychosocial stress is a risk factor for the development of cardiovascular disease (Black & Garbutt, 2002). Therefore, relieving an individual's stress may improve their long-term health.

Sound vs. Noise

Although studies of the effects of sound and noise as a restorative aspect are relatively new, there have been studies on the effects of noise exposure as a potential health hazards. For example, the consequences of industrial noise in urban areas have been found to be hazardous to health (Babisch, 2003). People that are exposed to a large amount of noise have been shown to have an increase in stress hormones (Babisch, 2003). Subsequently, an earlier study concluded that intermittent noise reflected a stronger stress response than consistent noise (Buczynski & Kedziora, 1983) Traffic noise, even at low levels, can affect a person during sleep and increase normal stress hormone levels (Babisch, 2003). However, research shows that habituation may occur after prolonged exposure and lead to a reduction of acute stress effects (Babisch, 2003).

Therefore, short-term studies on acute noises and their effect on long-term health have been limited. Longitudinal studies on consistent exposure of aircraft noise on children have shown higher concentrations of stress hormones (Evans, Bullinger, & Hygge, 1998). Meanwhile, one longitudinal study did not find higher concentrations of stress hormones in children exposed to aircraft noise, although it is possible it was due to low noise exposure (Braun, 2000).

In contrast, natural sounds are perceived by people to be beneficial in the stress recovery process (Ratcliffe, Gatersleben, & Sowden, 2013). Although there has been a lack of testing on the actual effects of natural sound on stress recovery, birds singing were considered the leading factor of natural sounds that aided stress reduction (Ratcliffe, Gatersleben, & Sowden, 2013). When people in urban parks were asked about their perceptions of different natural sounds and their effect on stress recovery, the restorative rating increased as more natural sounds were added (Payne, 2008, 2013).

In a study by Jahncke, Hygge, Halin, Green, and Dimberg (2011), the negative effects of office noise were tested, but the study also included a natural sound restoration condition. Although physiologically there was little evidence of detrimental effects from noise, aside from performance on memory tasks, following the post restoration period participants in the natural sound condition self-reported less fatigue and greater motivation in comparison to those exposed to office noise (Jahncke, Hygge, Halin, Green, & Dimberg, 2011). However, there was no physiological evidence to support this perception (Jahncke, Hygge, Halin, Green, & Dimberg, 2011). Surprisingly cortisol levels decreased during the office noise exposure even though it was intended to be a stressor (Jahncke, Hygge, Halin, Green, & Dimberg, 2011). There are two potential explanations for this anomaly, either the participants did not have a significant stress response because they started out initially stressed or were not stressed enough during the task, or inconclusive restorative effect from natural sound (Benfield, Taff, Newman, & Smyth, 2014).

National Parks

One of the options for stress recovery that has not fully been explored is National Parks. Although National Parks have been studied for the positive effects they have on their visitors, they have not been assessed through the general population, or for the potential restorative aspects from stress. In regards to imagery, there have been many studies validating the benefits of viewing nature on mood and physiological stress recovery (Devlin & Arneill, 2003). Specifically in college students, having a window exposing a nature view in their dormitory expressed greater focus and received higher scores on multiple measures of directed attention than those without a window (Tennessen & Cimprich, 1995). Also, college students were shown to perform better during a semester long course when there was a window with a nature view over students in the same course but in a room with only concrete walls (Benfield, Rainbolt, Bell, & Donovan, 2014). Firstly, it is important to assess whether natural imagery and sounds from National Parks improve individual's recovery from a stressful state, compared to an individual's unstressed recovery. Although National Parks have been shown to have a positive effect on recovery, there are many elements that may be responsible, such as the imagery and/or sounds. One of the leading motivational factors for visiting National Parks is natural sound (Marin, Newman, Manning, Vaske, & Stack, 2011). Therefore, it is vital to further analyze the noise and sound outcomes, while maintaining the same imagery in an attempt to pinpoint the source of the effects.

Through the modernization of society, noise has become a much bigger presence, even in National Parks. National Park visitors have shown a decrease in acceptability and motivation to visit the park when man-made sound was present (Marin, Newman, Manning, Vaske, & Stack, 2011). With a decrease in acceptability and motivation, it raises the question of whether there is

only a preferential issue or if there is something being experienced on a biopsychosocial level. To analyze this question, the present study aims to examine whether noise disrupts the restorative potential of National Parks.

Hypotheses

The restorative aspects of natural sound and potential hindrance of noise is interesting for new legislature throughout the United States and Europe regarding better noise management in urban and natural areas (Jensen & Thompson, 2004), as well as promotion of natural recreation areas as a health source (National Park Service Health and Wellness Executive Steering Committee, 2011). In order to promote this legislature it is vital to have empirical evidence to endorse the laws. In addition, the knowledge gained from this study holds potential as a future behavioral intervention that may aid in decreasing stress. By bringing this study to a controlled environment through a lab setting, the results attained may encourage future studies in a real life setting. The goal of this study is to examine whether natural sounds can diminish the stress response and improve stress recovery.

It is hypothesized that there will be a significant difference in the heart rate recovery period between sound and noise, with sound increasing the rate of recovery to lower heart rate, while the control condition will have a slower recovery rate than sound, but a faster recovery rate than noise. It is also hypothesized that the sound condition will produce a higher positive affect following the visual (also referred to as the recovery task) and a lower negative affect than both the control and noise conditions respectively.

Chapter 2

Methods

Participants

Participants, between the ages of 18-24, were recruited from The Pennsylvania State University through the use of flyers. For the purpose of this study, 30 of the participant's data were used. The flyers were posted throughout campus and the surrounding downtown area. Eligibility requirements for participants included fluency in English and enrollment as a Penn State student. Exclusion criteria included diagnosis of any psychological disorder, use of medication for psychological disorder, hearing impairment, or involvement in a similar study involving an interview type speech. Individuals, who were using estrogen-containing contraceptives, had any visual impairment, or cardiovascular disorder that would have affected the heart rate monitor, were placed on a separate list to be further evaluated for potential participation by the principal investigator. Additionally, eligible participants were required to abstain from moderate physical activity, drinking, smoking, ingesting caffeine, and eating between a day and an hour prior to the start of the study.

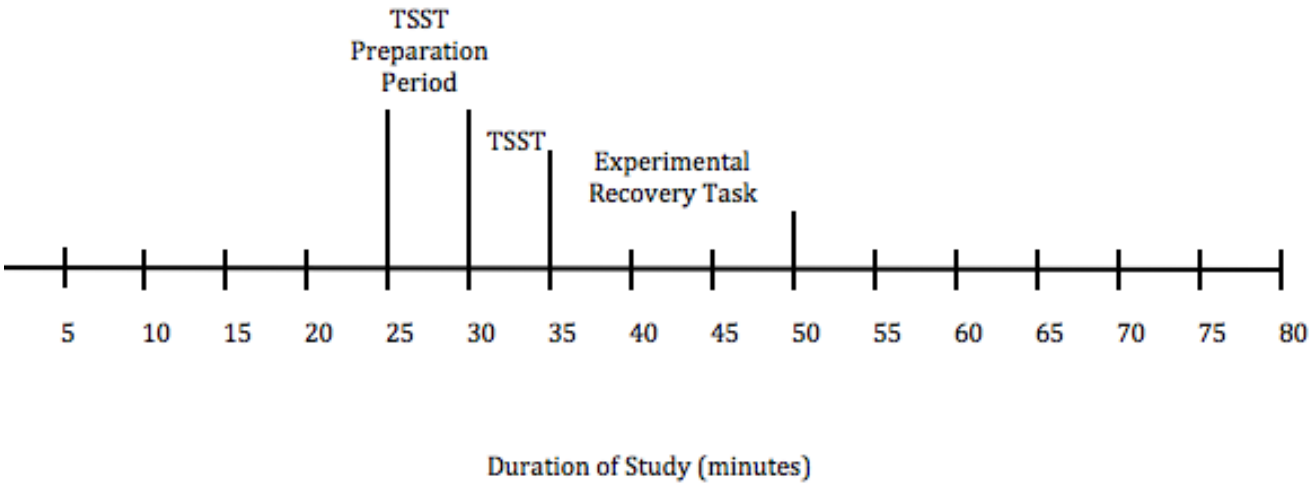
The screening process began after interested participants contacted trained research assistants by either phone or email. All interested participants were informed of the purpose of the study and tasks to be completed during the study. After a participant was determined to be eligible, they were scheduled for a laboratory visit lasting approximately 1.5 hours per participant.

At the beginning of the study, if a participant was eligible, they were given a copy of the informed consent form to read and sign. RA's reiterated the purpose of the study and briefly discussed procedures, potential risks and discomfort, privacy, confidentiality, voluntary participation, right to ask questions, benefits, and compensation. Participants were asked to thoroughly read the informed consent form and ask questions before deciding to continue or withdraw from the study. Participants who chose to continue signed two copies of the informed consent: one to take with them, and one to return to the RA to be filed away securely in a locked lab room.

Participants were randomly assigned to one of three groups: sound, noise, or control. Two of the three groups watched the same still frame video of a National Park, accompanied by either natural sound, (ex., birds singing, wind, and a stream) with or without the addition of unnatural noise (ex., motor vehicles and airplane engines). The final group, the control group, was assigned to read three articles about National Parks. All groups were required to wear noise-canceling headphone, although the control group used them solely for the noise-cancellation purpose. The comparison of the control group to the video without noise will examine whether natural sound facilitates a quicker recovery from a stress response, while the video with noise will be compared to all groups to determine whether noise diminishes the recovery pattern.

Procedure

Figure 2. Timeline of Study



During the scheduled visits a trained research assistants (RA) greeted participants. The RA conducted a day-of screening questionnaire, which included yes or no questions about the exclusion criteria: 1) Are you feeling healthy, well and alert today? 2) Do you have a highly stressful event occurring today which you may be anxious about now, such as: an exam, presentation, or job interview? 3) Have you consumed any caffeine in the past 2 hours? 4) Have you drunk alcohol in the past 12 hours? 5) Have you smoked a cigarette in the past 2 hours? 6) Have you eaten in the last 60 minutes? 7) Have you participated in any moderate physical activity in the past 2 hours? If the participant answered “no” to question 1, or “yes” to any of the

questions 2-7 listed above, they were considered ineligible and asked to reschedule for another day.

After obtaining consent, participants were instructed on proper method of putting on the heart rate monitoring system. After being set up with the heart rate monitor, participants were asked to complete a series of initial questionnaires, which included measures about demographics, general attitude towards nature and sound, personal health, quality of life, personal characteristics, and current mood and arousal.

For the TSST preparation period, labeled on the timeline in Figure 2, participants were given pen, paper, and 5 minutes to prepare a 5-minute speech for a job interview. After 5 minutes, participants were asked to leave their preparation materials and then taken to a separate room containing white walls, no windows, and a one-way mirror. Participants were informed that a trained research assistant would be evaluating their speech content and body language from the other side of the one-way mirror. Upon entering the second room, labeled TSST in Figure 2, participants performed a variation of the Trier Social Stress Test (TSST) to induce stress. The TSST has been scientifically proven to heighten levels of stress response and is one of the best-known stressors of the hypothalamus-pituitary-adrenal axis (Kudielka et al., 2007). For this study, the TSST was modified and participants were asked to perform a speech task in front of a one-way mirror, while they were being evaluated. During the speech research assistants evaluated the participant on their speech from behind the one-way mirror. Immediately upon completion of the speech participants completed the second mood and arousal questionnaire to assess their affect after the TSST.

Following the TSST, participants partook in one of three potential conditions, which lasted approximately 15 minutes each. All participants wore noise-canceling headphones, which

aided in drowning out unwanted background noise. The first condition had participants watch a nature scene while hearing natural background sounds, such as birds chirping and water falls. The second condition required participants to watch the same nature scene but with background sounds including unnatural noise, such as airplane, jets or truck, cars, and motorcycle engines. Participants in the third condition read an article on National Parks. The environment in this portion of the study was free from distractions, with only the basic necessities like the computer, desk, chair, and a filing cabinet. The lights were turned off to enhance relaxation and remove a potential distraction. Following completion of the virtual portion of the study, participants completed the third mood and arousal questionnaire, as well as a follow up questionnaire to capture perceptions and attitudes about the nature scene or article they were shown.

Participants were taken back to the initial room and were asked to read an article on the Hopewell Furnace National Historic Site, which is under the administration of the National Park Service. The intention of the Hopewell Furnace task was used to increase relaxation and the stress recovery period. Participants were also asked to fill out a short questionnaire on the article they read, which assessed attitudes towards the article and nature, as well as the final mood and arousal questionnaire.

Measures

Data was collected throughout the study during different tasks to assess the changes in mood and relative stress levels. For comparison purposes, both psychological and physical data were collected. The mood and arousal assessment was taken at baseline, following the TSST,

following the recovery task, and at the end of the study. Each mood and arousal score was combined and assessed through the use of the circumplex model, as shown in Figure 1.

The participant's heart rate was monitored throughout the duration of the study and corresponded to the times marked down for the duration of the tasks. Heart rate was measured continuously throughout the study using the Polar RS800 Heart Rate Monitoring System™. Upon completion of the study, heart rate data were transferred to the Polar Pro-Trainer software from the watch, which was input into Microsoft Excel™.

Data Analysis

During the analysis process the first 30 participant's data was used. The only data used was participant number, condition (i.e., sound, noise and control), circumplex responses, and heart rate. The study was divided into four critical points, baseline, after TSST, after recovery task, and end of study. However, the main time period being assessed is between "after TSST" and "after visual", because these points exhibit the stress recovery response. The conditions were divided and averages for mood and arousal were calculated. Heart rate calculations were done by averaging heart rate of each participant per five-minute intervals. The heart rate data between 35 minutes and 50 minutes corresponded with the experimental recovery task, and therefore was examined further to compare recovery rate.

Descriptive statistics were assessed for each of the variables (mood, arousal and heart rate) during the recovery task. For both mood and arousal data the four assessment points were separately analyzed for one-way group contrasts using ANOVA, while heart rate was analyzed using one way group contrasts using ANOVA for the five-minute intervals during the recovery

period (35, 40, 45, and 50 minutes). Upon discovery of statistical significance or a statistical trend, a post hoc test was performed to confirm where the differences occurred between groups. Similarly, an ANOVA analysis was used on the slope of heart rate during the recovery period, seen in Figure 3, to examine group differences in recovery rate.

Chapter 3

Results

Descriptive Statistics

Table 1. Descriptive Statistics

		Sound	Noise	Control	Total Sample
		Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)
Mood	Baseline	4.182 (0.751)	4.444 (0.726)	3.889 (0.782)	4.172 (0.759)
	Post-TSST	3.636 (1.206)	3.778 (0.833)	3.000 (1.658)	3.483 (1.271)
	Post-Recovery Task	4.00 (1.000)	4.333 (0.707)	3.333 (0.866)	3.897 (1.045)
	Final	3.909 (1.044)	4.222 (0.833)	3.667 (0.866)	3.931 (0.923)
Arousal	Baseline	2.364 (1.027)	2.778 (1.394)	2.444 (0.882)	2.500 (1.075)
	Post-TSST	3.636 (1.206)	3.222 (1.302)	4.333 (0.707)	3.733 (1.143)
	Post-Recovery Task	2.455 (1.036)	2.222 (1.202)	2.000 (0.707)	2.233 (0.971)
	Final	2.546 (1.293)	2.111 (1.167)	2.111 (0.782)	2.276 (1.099)
Heart Rate	35 min	86.01 (12.06)	94.6 (18.74)	86.20 (17.07)	89.15 (15.75)
	40 min	85.77 (17.58)	90.47 (18.67)	80.32 (14.90)	87.01 (17.15)
	45 min	75.62 (16.81)	82.48 (18.06)	72.82 (9.91)	78.07 (15.54)
	50 min	72.93 (12.35)	73.37 (11.37)	68.99 (6.87)	72.76 (10.65)

For all the variables, n=30.

Both mood and arousal data were taken at four intervals. Mood 1 and arousal 1 signify the baseline mood and arousal, taken at the beginning of the study. The second time-point, mood 2 and arousal 2, were taken following the TSST. The third time-point, mood 3 and arousal 3, were taken following the recovery task, sound, noise or control. The final time-point, mood 4 and arousal 4, were taken toward the end of the study following an additional relaxation task. Missing data for one participant at fourth time-point for both

mood and arousal. When assessing the total means of mood for each time-point, there is an evident decline after the TSST, followed by consistent increases (4.172, 3.483, 3.897, 3.931). When assessing the total means of arousal for each time-point, there is an evident spike in arousal after the TSST, followed by consistent decreases (2.517, 3.724, 2.241, 2.256).

One-way ANOVA testing

Mood

There was no significant difference in mood at baseline assessment between the three groups, $F(2,27)1.269$, $p=0.297$. There was no significant difference in mood following the TSST between the three groups, $F(2,27)0.952$, $p=0.399$. A statistical trend was isolated between the noise (4.333 ± 0.707) and control (3.333 ± 0.866) groups (4.333 ± 1.000, $p=0.058$). There was no significant difference in mood at the end of the study between the three groups, $F(2,26)0.809$, $p=0.456$.

Arousal

There was no significant difference in arousal at baseline assessment between the three groups, $F(2,27)0.439$, $p=0.649$. There was no significant difference in arousal following the TSST between the three groups, $F(2,27)2.365$, $p=0.113$. There was no significant difference in arousal following the relaxation task between the three groups, $F(2,27)0.456$, $p=0.639$. There was no significant difference in arousal at the end of the study between the three groups, $F(2,26)0.515$, $p=0.603$.

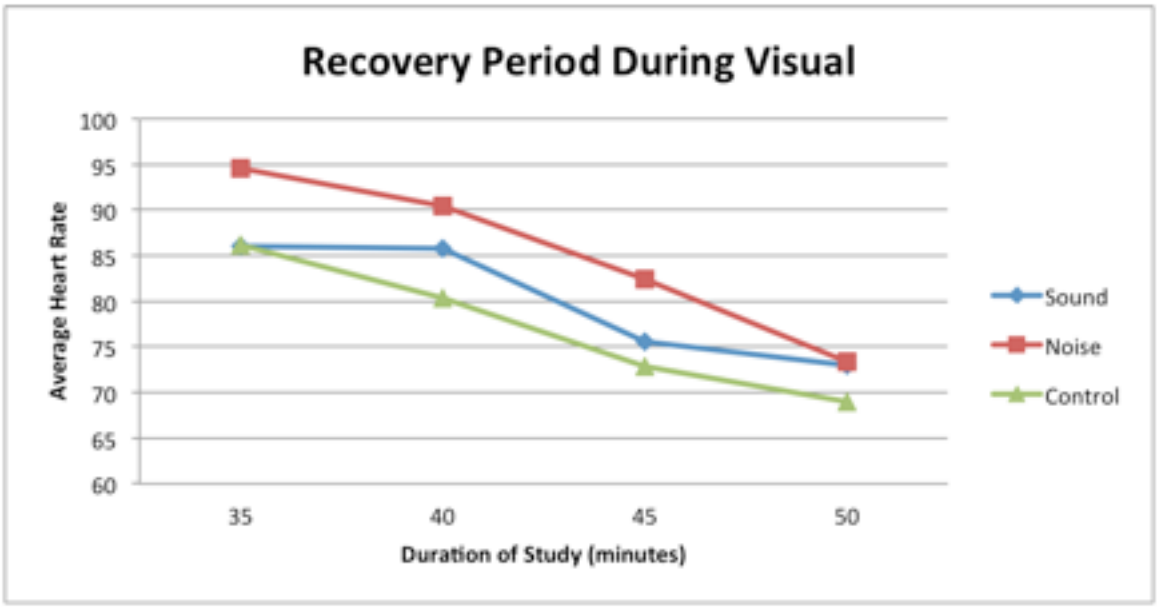
Heart Rate

There was no significant difference in heart rate at beginning of recovery task, minute 35, between the three groups, $F(2,25)0.785$, $p=0.467$. There was no significant difference in heart rate after 5 minutes of exposure to the recovery task, minute 40, between the three groups, $F(2,25)0.860$, $p=0.435$. There was no significant difference in heart rate after 10 minutes of exposure to the recovery task, minute 45, between the three groups, $F(2,25)0.808$, $p=0.457$. There was no significant difference in heart rate at the end of the recovery task, minute 50, between the three groups, $F(2,25)0.746$, $p=0.485$.

Heart Rate Recovery Task Slopes

Heart rate slopes were calculated for each group: sound= -0.891, noise= -0.680, control= -0.834, as shown in Figure 2. On an individual basis, heart rate had both a statistically significant linear trend, $p=0.000$, and cubic trend, $p=0.009$. Upon further testing of heart rate between groups, a statistical trend was isolated as a cubic trend, $p=0.071$, while the linear trend was not statistically significant. The slope from figure 2 suggests the highest rate of recovery being induced by the sound recovery task, followed by control and finally noise.

Figure 3. Graph of Average Heart Rate During Recovery Task



Chapter 4

Discussion

In order to better understand the restorative aspects of sound and the potential hindrance of noise, this study assessed three different conditions, sound, noise and control, and their effects on stress recovery. For heart rate, it was hypothesized that sound would have a significantly faster rate of recovery than noise, and control would have a slower recovery rate than sound but faster than noise. In regards to positive and negative affect, it was hypothesized that the sound condition would produce the highest positive and lowest negative affect levels, followed by control and finally noise.

After examining the results, the only statistical trend in relation to positive and negative affect was found in mood following the stress recovery task. Contrary to initial predictions, subjects exposed to the noise recovery task reported, on average, a more positive mood. The sound exposure followed with the next greatest positivity, while control reported the least positive mood. Interestingly, these results do not correspond with the heart rate findings or with the arousal findings. The arousal ratings following the recovery task showed no significant difference between the groups, as did heart rate. However, the slopes of heart rate during the recovery period showed a faster rate for the sound group, followed by control and finally noise. These results are interesting because they contradict past studies that found little physiological evidence but found significant differences in self-report measures regarding less fatigue and

greater motivation in subjects that were not exposed to noise (Jahncke, Hygge, Halin, Green, & Dimberg, 2011).

Past studies have shown that habituation may occur following prolonged exposure, which may lead to a reduction of acute stress effects (Babisch, 2003). Accordingly, this study found that mood and arousal levels seemed to agree with the previous statement, but the heart rate data painted another picture. Although the perceived stress of noise may lead to habituation, the physiological response seems to take a little longer to recover. Continual exposures producing such reactions may add up to potential health hazards. As stated by Robinso, Ode, and Hilmert (2010), high cortisol levels, which increase stress, are adversely linked to day-to-day behavior and mood. Psychological burnout is another symptom of increased cortisol levels (Melamed, Ugarten, Shirom, Kahana, Lerman, & Froom, 1999). Therefore, even though mood and arousal were not affected significantly in this study, it is possible that heart rate was an inclination of increased stress, which if continued for a longer period of time would have become evident in valence. Another precaution linked to the heart rate findings is that increased stress on the heart and increased heart rate is linked to cardiovascular disease and hypertension. This brings up the previous notion that the long-term health effects of noise needs to be further investigated, specifically the physiological effects.

These results, as well as those found in past studies, continue to confirm the benefits of National Parks on valence. Although mood and arousal were not found completely significant after exposure to the virtual task, the control group continuously showed the most negative mood and arousal. It is possible the imagery, as found by Devlin and Arneill (2003), is the cause of the benefits on mood, even though one of the leading motivational factors for visiting National Parks is natural sound (Marin, Newman, Manning, Vaske, & Stack, 2011).

Limitations

One of the most evident limitations was sample size. The small sample size may have played a role in the lack of statistical significance. The statistical trend found in mood following the recovery task needed to be further evaluated to determine whether there was a significant relationship or not. Additionally, this study intended to represent a large population, therefore the small sample size was not desired.

Aside from sample size, another limitation that potentially had an effect on the study was the frequency and amplification of man-made noise. Previous studies have shown intermittent noise caused a stronger stress response in comparison to consistent noise (Buczynski & Kedziora, 1983). It is possible that the intended frequency was too consistent and the amplitude was too low, lowering the stress response. Although in theory there still would have been some stress reaction because even low amplitude traffic noise affected stress hormone levels of a sleeping person (Babisch, 2003). If the amplitude was too low it may explain the mood ratings following the recovery task. Natural sounds are typically perceived by people to be beneficial in the stress recovery process (Ratcliffe, Gatersleben, & Sowden, 2013). Even those living in urban areas have rated natural sounds with noise to be less acceptable than natural sounds without noise (Payne, 2008, 2013). Potentially the lack of comparison may be causing participants to rate any sound or noise better than none (control). However, that still does not explain the why mood was found to be more positive for participants who experienced the noise exposure over those in the sound exposure group.

What is more problematic is the lack of stress reported through the mood and arousal ratings following the TSST. According to the circumplex model, the addition of mood and arousal for all three group placed participants in the upper right quadrant. In essence, on average,

following the TSST task participants felt excited and happy. The goal of the TSST task was to place participants in the upper left quadrant, causing them to feel stress and annoyed. It is not entirely clear if there was a robust enough stress manipulation. The decreased stress may have affected the recovery process. Also, this data does not correspond with previous data on the perception of mood after exposure to natural sounds and man-made noise. Previously, subjects report a more positive mood and arousal self-response to natural sounds than to noise (Jahncke, Hygge, Halin, Green, & Dimberg, 2011). Natural sounds are also perceived as more enjoyable and relaxing than man-made noise (Ratcliffe, Gatersleben, & Sowden, 2013). Interestingly, in this study mood was rated more positive in the noise exposure than sound, although arousal was higher in sound than noise.

Future Studies

The results found in this study are interesting to compare because the physiological results do not match the psychological results, which poses a new question on whether our perceptions of sound and noise have any validity on the physiological perception. In future studies it will be interesting to examine physiological data over a long-term period. With the new technology it is plausible to make heart rate data easily attainable and to gather it on a consistent basis for a longitudinal study. Although perception of noise and overall mood is fascinating, this study shows that it is not necessarily a reliable source of measurement for long-term health. Another potential future study would be increasing the stressor from this study, as well as enlarging the sample size. The statistical trends found could be further examined to discover

whether they are truly statistically significant. Also, by increasing the stressor the magnitude for rate of recovery may be amplified.

Appendix A

Questionnaire Packet

Instructions: Please answer the following questions using the scale provided by circling or filling information in the blanks.

1. Gender (circle one): Female Male

2. Age: _____

3. What kind of area were you raised in?

A. Rural B. Small town C. Suburban D. Urban

3. What kind of area do you currently live in?

A. Rural B. Small town C. Suburban D. Urban

4. Political orientation:

A. Very conservative B. Conservative C. Moderate

D. Liberal E. Very liberal

5. Marital status of parents:

A. Married B. Separated C. Divorced D. Never married

E. Other: _____

6. Please answer both parts of this question as you identify yourself:

6a. Ethnicity:

___ Hispanic or Latino

___ Not Hispanic or Latino

6b. Race (You may choose more than one):

____ African American or Black

____ Asian

____ White

____ American Indian or Alaska Native

____ Native Hawaiian or other Pacific Islander

Other: _____

7. Please report an estimate of your family's combined annual income:

A. Under $20,000 B. Between $20,000 and $40,000

C. Between $40,000 and $70,000 D. Between $70,000 and $100,000

E. Between $100,000 and $150,000 F. Greater than $150,000

Instructions: Please answer the following questions using the scale provided by circling the number that best describes your attitude towards the statement. These are personal preferences and have no right or wrong answer.

1. How frequently are you outdoors (circle one):

Not at all		Moderate		Very Frequently
1	2	3	4	5

2. Please rate your general interest towards environmental issues on the following scale (circle one):

Not Interested		Moderate		Very Interested
1	2	3	4	5

3. When visiting National Parks, how important is...

a) Enjoying peace and quiet (circle one):

Not at all	Important		Extremely Important
1	2	3	4

b) Hearing sounds of nature (circle one):

Not at all	Important		Extremely Important
1	2	3	4

c) Experiencing solitude (circle one):

Not at all	Important		Extremely Important
1	2	3	4

Instructions: Please answer the following questions using the scale provided by checking the number that best describes your attitude towards the statement. These are personal preferences and have no right or wrong answer.

		Strongly Disagree						**Strongly Agree**
		1	**2**	**3**	**4**	**5**	**6**	**7**
1	Beautiful scenery has always been a significant part of my life.	○	○	○	○	○	○	○
2	The smells of outdoors give me no pleasure.	○	○	○	○	○	○	○
3	Experiencing nature is central to my life.	○	○	○	○	○	○	○
4	I have found the sound of rustling leaves to be pleasant.	○	○	○	○	○	○	○
5	I enjoy long walks.	○	○	○	○	○	○	○

Instructions: Please answer the following questions using the scale provided by checking the number that best describes your attitude towards the statement. These are personal preferences and have no right or wrong answer.

		Strongly Disagree 1	2	3	4	5	**Strongly Agree** 6
1	I am sensitive to noise.	○	○	○	○	○	○
2	I find it hard to relax in a place that's noisy.	○	○	○	○	○	○
3	I get mad at people who make noise that keeps me from falling asleep or getting work done.	○	○	○	○	○	○
4	I get annoyed when my neighbors are noisy.	○	○	○	○	○	○
5	I get used to most noises without much difficulty.	○	○	○	○	○	○

Instructions: Please answer the following questions using the scale provided by checking the number that best describes your attitude towards the statement. These are personal preferences and have no right or wrong answer.

		Poor				**Excellent**
		1	**2**	**3**	**4**	**5**
1	In general, how would you describe your health over the past month?	○	○	○	○	○

Instructions: Please answer the following questions using the scale provided by checking the number that best describes your attitude towards the statement. These are personal preferences and have no right or wrong answer.

Using the scale below, indicate from 1 to 5 which statement is <u>most true</u> for you right now.

		Utterly meaningless, without purpose				**Purposeful and meaningful**
		1	**2**	**3**	**4**	**5**
1	My personal existence is:	○	○	○	○	○

Instructions: Please answer the following questions using the scale provided by checking the number that best describes your attitude towards the statement. These are personal preferences and have no right or wrong answer.

Please imagine a ladder with steps numbered from 0 at the bottom to 10 at the top. Suppose we say that the top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. Please check the number that corresponds with your response to the statements below.													
		Worst Possible Life										**Best Possible Life**	**Don't Know**
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	On which step of the ladder would you say you personally feel you stand at this time, assuming that the higher the step the better you feel about your life, and the lower the step the worse you feel about it? Which step comes closest to the way you feel?	○	○	○	○	○	○	○	○	○	○	○	○
2	Just your best guess, on which step do you think you will stand in the future, say about five years from now?	○	○	○	○	○	○	○	○	○	○	○	○

Instructions: Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence.

Using the scale to the right, how accurate are each of the following statements when you think about yourself:		**Very Inaccurate**				**Very Accurate**
		1	**2**	**3**	**4**	**5**
1	Am the life of the party.	○	○	○	○	○
2	Feel little concern for others.	○	○	○	○	○
3	Am always prepared.	○	○	○	○	○
4	Get stressed out easily.	○	○	○	○	○
5	Have a rich vocabulary.	○	○	○	○	○
6	Don't talk a lot.	○	○	○	○	○
7	Am interested in people.	○	○	○	○	○
8	Leave my belongings around	○	○	○	○	○
9	Am relaxed most of the time.	○	○	○	○	○
10	Have difficulty understanding abstract ideas.	○	○	○	○	○
11	Feel comfortable around people.	○	○	○	○	○
12	Insult people.	○	○	○	○	○
13	Pay attention to details.	○	○	○	○	○
14	Worry about things.	○	○	○	○	○
15	Have a vivid imagination	○	○	○	○	○
16	Keep in the background.	○	○	○	○	○
17	Sympathize with others' feelings.	○	○	○	○	○
18	Make a mess of things.	○	○	○	○	○
19	Seldom feel blue.	○	○	○	○	○

Using the scale to the right, how accurate are each of the following statements when you think about yourself:		Very Inaccurate 1	2	3	4	Very Accurate 5
20	Am not interested in abstract ideas.	○	○	○	○	○
21	Start conversations.	○	○	○	○	○
22	Am not interested in other people's problems.	○	○	○	○	○
23	Get chores done right away.	○	○	○	○	○
24	Am easily disturbed.	○	○	○	○	○
25	Have excellent ideas.	○	○	○	○	○
26	Have little to say.	○	○	○	○	○
27	Have a soft heart.	○	○	○	○	○
28	Often forget to put things back in their proper place.	○	○	○	○	○
29	Get upset easily.	○	○	○	○	○
30	Do not have a good imagination.	○	○	○	○	○
31	Talk to a lot of different people at parties.	○	○	○	○	○
32	Am not really interested in others.	○	○	○	○	○
33	Like order.	○	○	○	○	○
34	Change my mood a lot.	○	○	○	○	○
35	Am quick to understand things.	○	○	○	○	○
36	Don't like to draw attention to myself.	○	○	○	○	○
37	Take time out for others.	○	○	○	○	○
38	Shirk my duties.	○	○	○	○	○
39	Have frequent mood swings.	○	○	○	○	○
40	Use difficult words.	○	○	○	○	○
41	Don't mind being the center of attention.	○	○	○	○	○

42	Feel others' emotions.	○	○	○	○	○
Using the scale to the right, how accurate are each of the following statements when you think about yourself:		**Very Inaccurate 1**	**2**	**3**	**4**	**Very Accurate 5**
43	Follow a schedule.	○	○	○	○	○
44	Get irritated easily.	○	○	○	○	○
45	Spend time reflecting on things.	○	○	○	○	○
46	Am quiet around strangers.	○	○	○	○	○
47	Make people feel at ease.	○	○	○	○	○
48	Am exacting in my work.	○	○	○	○	○
49	Often feel blue.	○	○	○	○	○
50	Am full of ideas.	○	○	○	○	○

#1

Instructions: Please answer the following questions using the scale provided by checking the number that best describes your attitude towards the statement. These are personal preferences and have no right or wrong answer.

Using the scale below, indicate from 1 to 5 which statement is <u>most true</u> for you right now.						
		Negative				**Positive**
		1	**2**	**3**	**4**	**5**
1	At the current moment my mood is	○	○	○	○	○

Using the scale below, indicate from 1 to 5 which statement is <u>most true</u> for you right now.						
		Low (i.e., quiet or passive)				**High (i.e., active or aroused)**
		1	**2**	**3**	**4**	**5**
1	At the current moment my level of arousal is	○	○	○	○	○

#1

Instructions: Please answer the following questions using the scale provided by checking the number that best describes your attitude towards the statement. These are personal preferences and have no right or wrong answer.

Using the scale below, indicate from 1 to 5 how intensely you are feeling the listed emotions <u>right now</u>				
Very Slightly or Not At All	**A Little**	**Moderately**	**Quite a Bit**	**Extremely**
1	2	3	4	5

1. Interested _____
2. Distressed _____
3. Excited _____
4. Upset _____
5. Strong _____
6. Guilty _____
7. Scared _____
8. Hostile _____
9. Enthusiastic _____
10. Proud _____
11. Irritable _____
12. Alert _____
13. Ashamed _____
14. Inspired _____
15. Nervous _____
16. Determined _____
17. Attentive _____
18. Jittery _____
19. Active _____
20. Afraid _____

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The Pennsylvania State University
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SHADE Laboratory, State College, PA
Research Assistant (August 2013-Present)
• Completing and Submitting IRB
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• Taking phone calls and scheduling
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• Data Analysis

Teaching Assistant, State College, PA
Sociology 119 (August-December 2013)
• Creating activities
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ACTIVITIES

• Health and Human Development Honor Society, *President (2014-2015), Treasurer (2013-2014)*
• IES Study Abroad Barcelona *(Summer 2014)*
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