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# The Effects of Peppermint and Orange Aromas on Mood and Task Performance: A Research Study and Process Narration

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**The Effects of Peppermint and Orange Aromas on Mood and Task Performance:  
A Research Study and Process Narration**

By  
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An Honors Thesis Submitted in Partial Fulfillment  
of the Requirements for Graduation from the  
Western Oregon University Honors Program

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**Abstract**

The purpose of this study is to determine if peppermint and orange aromas can improve mood and task performance. The participants for this study were 26 female and 11 male students (Mage = 22.05 years, SD = 5.00). This study utilized a mixed design. Participants completed practice GRE questions while being exposed to peppermint, orange, or no scent. Pre and post mood were measured using the Quick Mood Scale (Woodruffe-Peacock, Turnbull, Johnson, Elahi, & Preston, 1998) and task performance was measured based on responses to the GRE questions. Exposure to peppermint and orange was not found to improve the cheerfulness component of mood  $F(2, 34) = .19, p > .05, \eta^2 = .19$ , or task performance  $F(2, 34) = .15, p > .05, \eta^2 = .01$ . Based on the effect size for this study, aromas could potentially be used in the workplace to improve mood but further research with more participants is needed.

## The Effects of Peppermint and Orange Aromas on Mood and Task Performance

Mood includes things like happiness, sadness, excitement, nervousness, and calmness. A given mood can range from lasting for a short period of time, like a few hours to a relatively long period of time, like a few weeks. Mood is a short lived, dynamic psychological state. Mood is known for affecting memory and influencing how people perceive their environment. People who are in a good mood are more likely to help others and to respond to tasks/problems with creative solutions than people who are in a bad mood (Mood, 2008).

One way that mood can be improved or altered is through aromas. Essential oils are commonly used in aromatherapy to promote physical and psychological well being. This works because essential oils stimulate the olfactory system, sending signals to the limbic system of the brain, which controls emotions and learned memories. This process causes the release of chemicals that allows people to feel relaxed, calm, or stimulated (Nordqvist, 2009). Sweet orange essential oil in particular is known for its ability to improve mood and relieve stress (Ford-Martin & Odle, 2005). Peppermint is known for its cooling, relaxing effects, and because it is an effective relaxant it is commonly used to treat stress, anxiety, and restlessness (Wurges & Odle, 2005). The ultimate goal of this research is to determine if implementing these scents into the workplace could increase job satisfaction (via improving mood), without jeopardizing

accuracy and productivity.

A lot of prior research has been done on scent influencing mood. One of these studies--done in 2005--looked at the effects of a lavender gel on relaxation (Field, Diego, Hernandez-Reif, Cisneros, Feijo, Vera, & ... He, 2005). The researchers hypothesized that participants would have a less depressed mood, greater relaxation, increased beta power, and an enhanced ability to perform math computations after being exposed to lavender, in this within subjects design experiment. Their independent variable was a lavender aroma and their dependent variables were alertness, mood, and math performance.

The independent variable was manipulated by having participants hold a vial of lavender shower gel near their nose for a two minute period during one part of the experiment, while not being exposed to a scent during the rest of the experiment. Anxiety was measured using the State-Trait Anxiety Inventory. Mood was measured with the Profile of Mood States and two visual analogue scales (measuring tense/relaxed and drowsy/alert). The speed and accuracy of math computations was also taken into consideration and an EEG assessment was used to analyze changes in beta power. These factors were measured both before and after exposure to lavender.

The researchers found that participants had decreased anxiety levels, decreased depressed mood levels, increased relaxation and accuracy, increased

beta power, and faster computation time after being exposed to the scent. Based on these results, they did support their hypothesis. The researchers suggest assessing the ability of other fragrance ingredients to improve mood and to further assess the impact of improved mood and relaxation on physiological and biochemical measures.

In 2009 Raudenbush, Grayhem, Sears, and Wilson conducted a study to see if using scents would be an effective way to make drivers more awake and capable of paying attention. The researchers in this study hypothesized that the presentation of odors would stimulate the central nervous system, allowing participants to have increased attention and motivation, decreased workload demands, decreased fatigue, and increased alertness while driving. The main variables were the scents (independent variable) and alertness, mood, and task workload (dependent variables).

The independent variable was manipulated by administering scent through an oxygen concentrator via nasal cannulas. The scent was administered for 30 seconds every 15 minutes during the two hour period that participants used the driving simulator. Each participant was tested three times, once with cinnamon, once with peppermint, and once with only oxygen. The order of the exposure to scents was counterbalanced and there was 48 hours in between testing periods for the same participant. Workload was measured using the

NASA-Task Load Index, mood was measured with the Profile of Mood States (POMS), and alertness was measured by self-report from the participants.

The researchers found that the participants had higher ratings of alertness in the peppermint and cinnamon conditions in comparison to the oxygen control condition. Additionally, according to the NASA-Task Load Index they also had reduced temporal demand and frustration, in comparison to when no scent was being administered. Peppermint also produced lower ratings of anxiety and fatigue than the other two conditions, as assessed by the POMS. These findings indicate that the researchers did support their hypothesis. The authors suggest future research should look at specific EEG activity accompanying the administration of peppermint and cinnamon and to pay special attention to the type of scent being administered. The results of this study indicate that different scents are associated with different effects.

In 2011 McCombs, Raudenbush, Bova, and Sappington conducted a study looking at the effects of peppermint scent on cognitive video game performance. Additionally they looked at how the scent affected physiology, mood, and task load. The researchers hypothesized that the group exposed to peppermint scent would have greater performance during game play for cognitive and judgment based games than the group that wasn't exposed to a scent.

The researchers used the Profile of Mood States to assess mood and the



NASA Task Load Index to assess workload. Scent was administered via a nasal cannula administering oxygen. At one visit the participants played three Wii Fit games while being exposed to peppermint. On a second occasion they played the same three games again while not being exposed to any scent.

McCombs et al. (2011) found that the participants completed significantly more levels while being exposed to peppermint in comparison to no scent. They also found that participants in the peppermint condition indicated higher mental demand and perceived effort, but also were more anxious, suggesting that the peppermint kept them more engaged in the task. These results suggest that peppermint may be useful in engaging people in tasks and enhancing their ability to be productive.

In a 2008 study, Moss, Hewitt, Moss, and Wesnes looked at how the aromas peppermint and ylang-ylang affect cognitive performance. The purpose of their study was to assess the impact of these scents on a variety of cognitive performance measures and subjective mood. Moss et al. (2008) used an electric aromatherapy diffuser and essential oils to administer the scents for the 25 minute testing period.

The tests given to participants were word presentation, immediate word recall, picture presentation, simple reaction time, digit vigilance, choice reaction time, spatial working memory, memory scanning, delayed word recall, word

recognition, picture recognition, and visual analogue scales. Participants' results were assessed for quality of memory (divided up into working memory and secondary memory), speed of memory, speed of attention, and accuracy of attention. Major findings in this study were that peppermint enhanced memory and increased alertness, while ylang-ylang impaired memory, lengthened processing speed, and increased calmness. These results suggest that peppermint and ylang-ylang may both be beneficial depending on the desired effect. Peppermint should be used in cases that call for memory and alertness, while ylang-ylang can be used for its calming effects.

Lehrner, Marwinski, Lehr, Jhren, and Deecke, (2005) conducted a study looking at the effects of lavender and orange aromas on patients waiting for dental treatment. The researchers diffused the essential oils through an electrical dispenser in the waiting room and had participants complete a questionnaire regarding the amount of pain they were in, the State Trait Anxiety Inventory, and the Mehrdimensionale Befindlichkeitsfragebogen (a German assessment of current mood, alertness, and calmness). They found that the patients who were exposed to orange or lavender scent had lower levels of state anxiety, a more positive mood, and higher levels of calmness than the control condition that was not exposed to a scent. This implies that lavender and orange can effectively be used in settings where calmness, improved mood, and reduced anxiety are

desired.

Prior research found that scents are capable of greatly impacting mood and performance. Specifically, peppermint increases memory and alertness (Moss et al., 2008) and decreases anxiety and fatigue (Raudenbush et al., 2009). Orange scent lowers anxiety, elevates mood, and increases calmness (Lehrner et al., 2005). Additionally, McCombs et al. (2011) found that participants who were exposed to peppermint had better cognitive performance.

The purpose of the current study is to see if peppermint and orange scents affect the mood and task performance of individuals. Based on these prior studies, the current study expects to find that the mood and task performance of participants who are exposed to peppermint and orange aroma will differ from participants who are not exposed to a scent.

## **Method**

### **Participants**

The participants for this study were students at Western Oregon University. Students without scent sensitivities or allergies were recruited using a signup sheet in the psychology building and were offered extra credit for their participation. There were a total of 37 participants, 26 of whom were female and 11 were male. The mean age was 22.05 years ( $SD = 5.00$ ). Twenty one point six percent of participants were freshmen, 21.6% were sophomores, 21.6% were

juniors, and the remaining 35.1% were seniors.

### **Materials**

The aromas used for this study were Wyndmere Naturals peppermint and orange essential oils. Orange essential oil was chosen due to its relaxing, refreshing, uplifting, and cheering nature (Ford-Martin & Odle, 2005). Peppermint essential oil was used for its cooling, relaxing effects, and because it is an effective relaxant that is commonly used to treat stress, anxiety, and restlessness (Wurges & Odle, 2005). The essential oils were administered using Wyndmere's electric diffuser. This diffuser plugs into an electric outlet and silently disperses scent into a room within a few minutes of being turned on, similarly to the one used by Moss et al. (2008). It was placed under a table in the test room in a location not visible to participants. Ten minutes prior to each data collection session, six drops of the appropriate essential oil were put into the diffuser and it was switched on.

A packet of 11 Graduate Record Examination (GRE) practice questions/problems was assembled for participants to work on while being exposed to the condition they were assigned. Of the 11 problems there were 16 possible points (some of the questions had multiple parts). These questions were made up of reading comprehension, text completion, and sentence equivalence questions adapted from the Educational Testing Services website ("Introduction

to the Verbal Reasoning Measure”) and from the Kaplan Test Prep website (“Free GRE Prep Tools”, 2008). The verbal reasoning section of the GRE measures one’s ability to analyze and draw conclusions from discourse, understand multiple levels of meaning, and select important points in a timely manner (“Introduction to the Verbal Reasoning Measure”). It is therefore applicable to work related tasks because it is important in a variety of types of jobs to be able to read instructions, determine what they mean, and make a decision in a timely manner. Task performance was measured based on the responses to the GRE practice questions. Productivity was assessed by adding up the number of questions they were able to answer during the 12 minute time period and accuracy was measured by how many questions they answered correctly.

The Quick Mood Scale (Woodruffe-Peacock, Turnbull, Johnson, Elahi, & Preston, 1998) was used to measure the dependent variable mood. This scale is made up of 12 items for participants to rate from not at all to extremely, depending on how much they think it is currently true of their mood. The items on this scale are wide awake, relaxed, depressed, friendly, anxious, clumsy, cheerful, aggressive, drowsy, clear-headed, well-coordinated, and confused.

Additionally, participants were given a questionnaire designed by the researcher that can be found in the appendix. This questionnaire addressed whether or not participants noticed and could identify the scent. It also asked

participants to rate a series of questions about the scent (on a scale from 1-5) and to list the top three scents they think have the ability to improve their mood.

### **Procedure**

This study underwent an IRB review. When participants first arrived to the study they were given an informed consent form to read and sign. The consent form told them that the study is investigating whether or not there are differences in accuracy and productivity on GRE practice questions depending on if participants have a time limit or not. It also warned students that they may feel slightly stressed or anxious during the study, but that they are free to leave at any time and should not participate if they have any scent allergies or sensitivities.

Participants were then asked to take the Quick Mood Scale (Woodruffe-Peacock et al., 1998) and were randomly assigned to one of the conditions. Two out of the three conditions were available each day of data collection and participants were randomly assigned to either of the two conditions available on that given day. The conditions that were available were rotated equally so that some days both of the scents were available while other days one scent and the control were available. Only two conditions were available each day to prevent the scents from lingering from the scent condition to the control condition and to prevent the interaction of the scents with each other. Participants selected a piece of paper with a number on it to be randomly assigned to one of the two

groups available that day. If they selected an odd number they were assigned to one condition, if they selected an even number they went in the other condition.

Once assigned to a group, participants were handed the packet of GRE practice questions, along with another copy of the Quick Mood Scale. At this point they were sent alone into the room with the stimulant they were assigned to and were told that they are being timed and would have 12 minutes to complete as many of the GRE practice questions as they can and then I will knock on the door to let them know their time is up, at which point they should take the Quick Mood Scale a second time.

Once this was over participants returned to me to answer the questions on the Scent Recognition and Perceptions Questionnaire and to be debriefed. During the debriefing it was clarified that the study was really looking at the effects of aroma on mood and task performance, not on whether or not they were being timed and that this deception was necessary to avoid participants going into the study paying special attention to the scent, possibly altering the results. Once participation had been completed, the participants were given an extra credit slip.

## **Results**

To test the hypothesis that participants exposed to peppermint and orange aromas would have different mood scores in comparison to the control

group, a repeated measures ANOVA was performed on the mood factor “cheerful.” Contrary to what was expected, a significant difference was not found between the orange, peppermint, and control conditions, repeated measures ANOVA  $F(2, 34) = .19, p > .05, \eta^2 = .19$  (see Figure 1). A one way ANOVA was performed in order to test for differences among the three conditions in task performance. No significant differences were found for the orange condition ( $M = 7.73, SD = 3.23$ ), peppermint condition ( $M = 7.15, SD = 3.63$ ), and control condition ( $M = 7.00, SD = 3.37$ ),  $F(2, 34) = .15, p > .05, \eta^2 = .01$  (see Figure 2).

The pre and post means and standard deviations for each mood item can be viewed in Table 1. Means and standard deviations for the questionnaire responses can be seen in Table 2.

The top three scents participants said they think have the ability to improve their mood were vanilla, lavender, and mint. Vanilla and lavender were listed by 32.4% of participants and mint was listed by 24.3% of participants.

### **Discussion**

The hypothesis that mood and task performance would differ from the control group for participants exposed to peppermint and orange aromas was not supported by the data. While the data does show that mood and task performance were slightly better in the scent conditions than in the control condition, it is only by a very slight amount that is not significant. It is possible



based on the effect size for mood that significant results may be found with a larger sample size, but as it is the data suggests that scents may not be an effective way to improve mood or task performance in the workplace.

One limitation of this study is that not all three conditions were available at all times during data collection. This means that there was not perfect random assignment so it is possible that the groups were not all equal to start with. This prohibited each participant from having an equal opportunity to be in any condition, as there were only two possible conditions that participants could be assigned to at any given time. For example, this means that it is possible perhaps that one condition was absent on a day when there were more midterms being administered on campus so hypothetically two of the conditions could have ended up with participants who were more stressed out from the beginning. In fact, it is evident that there were some differences in the groups to start off with based on the pre mood tests. For the mood factor “wide awake” participants in the peppermint condition started out with a mean score of 3.69, while the orange condition had a mean of 3.45, and the control condition was only 3.23.

Another limitation is that there were no prior studies to mimic that administered scent in the same way in the same size room. This made it difficult to know what the ideal amount of essential oils would be for that size study room. Therefore the strength of the aromas--while consistent across conditions

and across data collection days--may not have been the ideal strength to optimally influence the mood and performance of participants.

This study's findings overall do not fit with prior research because most of the past research has found significant differences related to scent and mood or task performance. Differences in results are likely due to differences in task choice, scent administration, and scent choice. The past research in this area is quite varied so there have been many different scents and tasks used, making it difficult to compare amongst studies.

The current study supports the findings of McCombs et al. (2011) in that the peppermint ( $M = 14.38$ ,  $SD = 1.85$ ) and orange ( $M = 14.9$ ,  $SD = 1.38$ ) conditions were able to complete more of the task than the control condition ( $M = 14.08$ ,  $SD = 1.75$ ). While these were not significant differences they are in the same direction as the differences found by McCombs et al. (2011). These results of an enhanced mood also align with the findings of Field et al. (2005) who found that scent allowed participants to have a less depressed mood and greater relaxation. Once again Field et al.'s study found significant differences whereas the study at hand did not. The theories on aromatherapy are fitting with the findings of this study, though again, only to a small extent. Peppermint and orange aromas were able to alter relaxation, calmness, and stimulation as was explained by Nordqvist (2009).

Further research may want to look at other scents. The results from the Scent Recognition and Perceptions Questionnaire showed that many participants think vanilla and lavender are able to affect their mood. These scents may be worth studying in relation to mood and task performance. Additionally, further research could look at whether a participant liking a scent or not plays a role in how it effects them.

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Figure 1. Mean group differences in mood based on scent condition. Standard errors are presented in the figure by the error bars attached to each column.

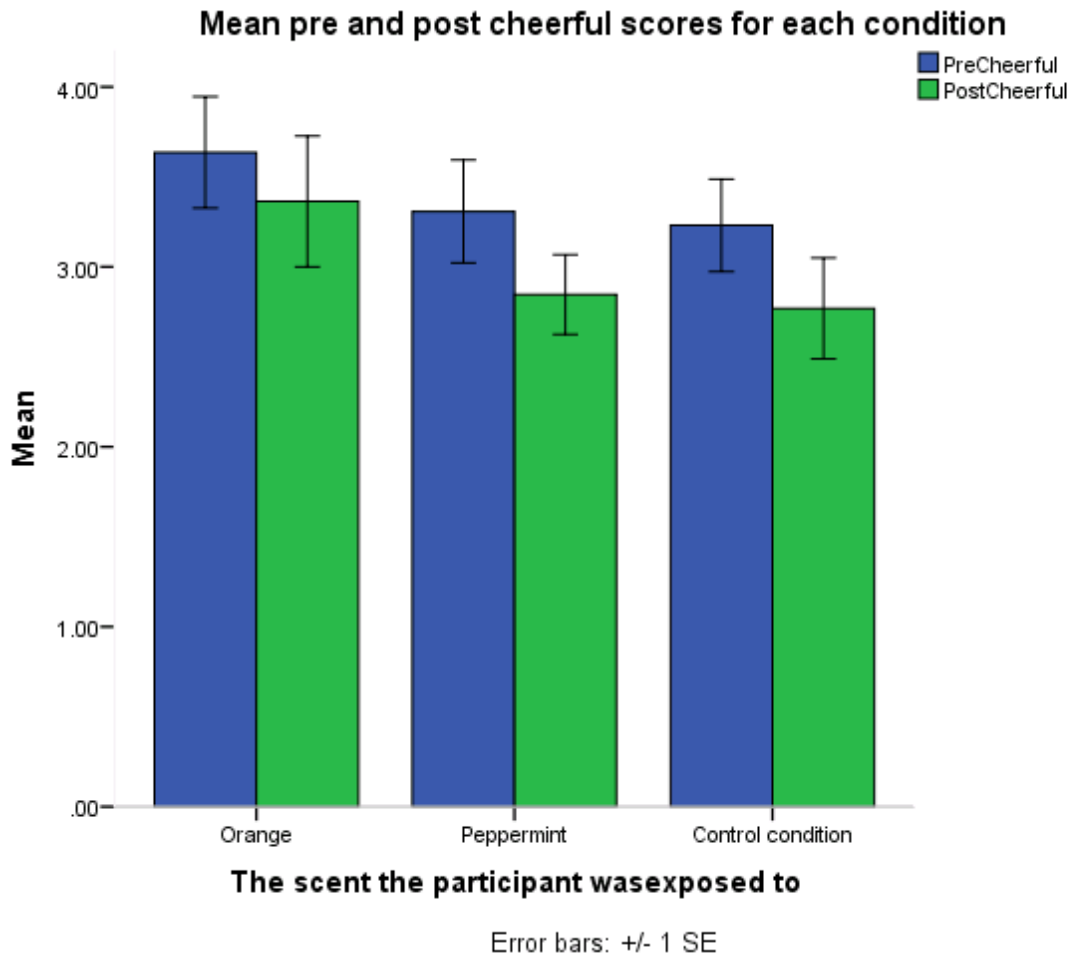


Figure 2. Mean group differences in number of correct answers based on scent condition. Standard errors are presented in the figure by the error bars attached to each column.

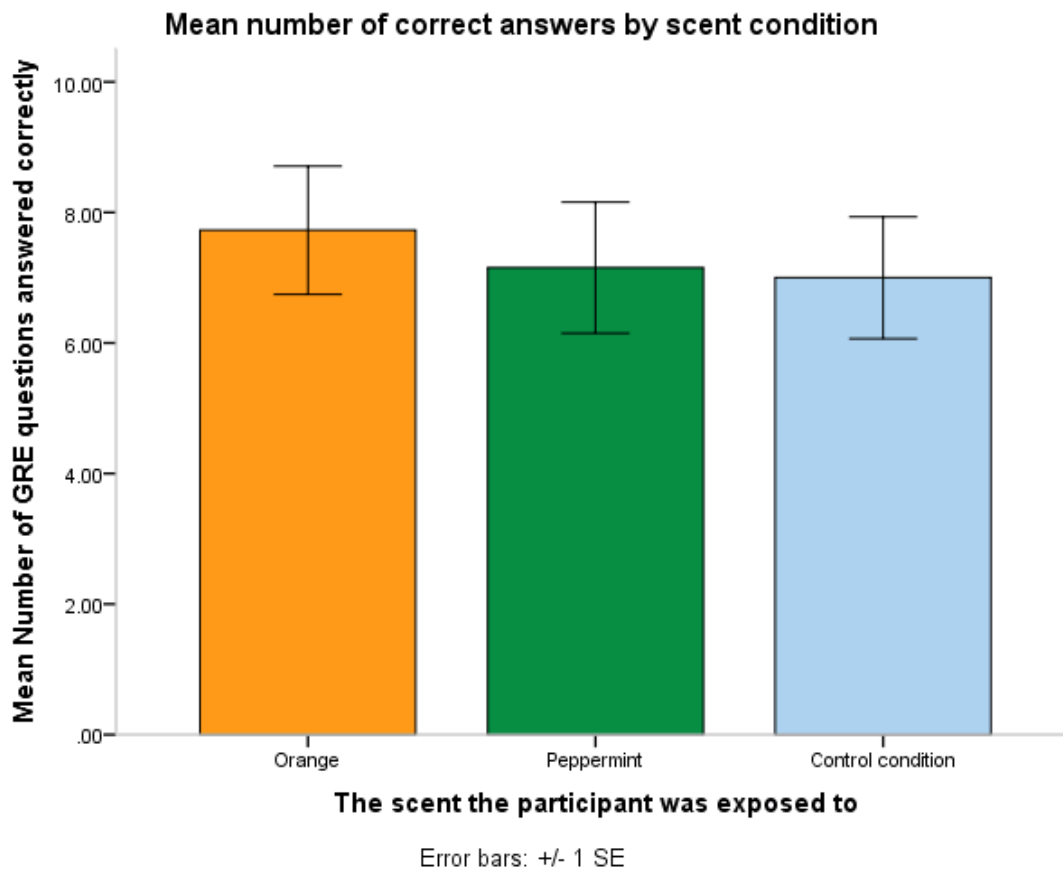


Table 1. Pre and post Means and Standard Deviations for each mood item.

Mood Item	Before Task			After Task		
	Control	Orange	Peppermint	Control	Orange	Peppermint
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Cheerful	3.23 (.93)	3.64 (1.03)	3.31 (1.03)	2.77 (1.01)	3.36 (1.21)	2.85 (.80)
Relaxed	2.85 (.69)	3.18 (.60)	3.15 (1.07)	2.08 (.86)	2.63 (1.12)	2.92 (.95)
Wide Awake	3.23 (.73)	3.45 (.69)	3.69 (.85)	3.62 (.65)	3.45 (1.37)	3.46 (.66)
Friendly	3.54 (1.05)	3.82 (.60)	4.08 (.64)	2.69 (.75)	3.36 (.92)	3.46 (.52)
Clearheaded	3.23 (.60)	3.27 (.79)	3.23 (.93)	2.69 (1.11)	2.55 (.93)	3.00 (.71)
Anxious	2.01 (.95)	1.64 (.81)	2.00 (1.00)	2.38 (1.260)	2.27 (.65)	2.31 (.95)
Depressed	1.38 (.77)	1.36 (.67)	1.46 (.66)	1.31 (.63)	1.45 (.69)	1.54 (.66)
Drowsy	2.08 (1.04)	1.82 (.98)	2.23 (1.09)	1.92 (.86)	2.27 (1.01)	2.23 (.93)
Well- Coordinated	3.00 (.71)	3.36 (.81)	3.38 (.96)	2.62 (.77)	3.00 (.89)	3.00 (1.00)
Aggressive	1.08 (.28)	1.09 (.30)	1.46 (.78)	1.38 (.77)	1.00 (.00)	1.38 (.77)



Table 2. Means and standard deviations for questionnaire responses.

	Rating from 1-5 of how much they would like the scent in their workplace	
	Mean	Standard Deviation
Orange	3.36	1.25
Peppermint	2.92	1.31
	Rating from 1-5 of how pleasant participants found the scent	
	Mean	Standard Deviation
Orange	3.79	1.29
Peppermint	3.38	1.26
	Rating from 1-5 of how much participants felt the scent influenced their enjoyment	
	Mean	Standard Deviation
Orange	2.57	0.98
Peppermint	2.42	1.51
	Rating from 1-5 of how much participants think scent can improve mood	
	Mean	Standard Deviation
All participants	3.58	1.15

## Appendix A

**Scent Recognition and Perceptions Questionnaire**

Sex: Male Female Other

Age \_\_\_\_\_

Major \_\_\_\_\_

Class standing: Freshman Sophomore Junior Senior

Other

1. Did you notice a scent in the room?

Yes \_\_\_\_\_

No \_\_\_\_\_

**If you answered yes to question #1, please answer questions 2-5, otherwise you may skip to question #6.**

2. Could you identify what the scent was?

Yes, it was \_\_\_\_\_

No

3. On a scale of 1-5, how pleasant did you find the scent (with 1 being not pleasant at all and 5 being very pleasant)? \_\_\_\_\_

4. On a scale of 1-5, how much was your enjoyment of the task positively impacted by the scent (with 1 being it did not at all impact your enjoyment and 5 being it strongly impacted your enjoyment)? \_\_\_\_\_

5. On a scale of 1-5, how much would you like for this scent to be present in your workplace (with 1 being you would not at all like this and 5 being you would strongly like this)? \_\_\_\_\_

6. On a scale of 1-5, how much do you think scents can improve your mood (with 1 being you think they cannot improve your mood and 5 being you think they can greatly improve your mood)? \_\_\_\_\_

Please list the top three scents that you think have the ability to improve your mood.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

## Appendix B

**Questions 1-3 are based on the following passage:**

Reviving the practice of using elements of popular music in classical composition, an approach that had been in hibernation in the United States during the 1960s, composer Philip Glass (born 1937) embraced the ethos of popular music in his compositions. Glass based two symphonies on music by rock musicians David Bowie and Brian Eno, but the symphonies' sound is distinctively his. Popular elements do not appear out of place in Glass's classical music, which from its early days has shared certain harmonies and rhythms with rock music. Yet this use of popular elements has not made Glass a composer of popular music. His music is not a version of popular music packaged to attract classical listeners; it is high art for listeners steeped in rock rather than the classics.

**1. Select only one answer choice.**

The passage addresses which of the following issues related to Glass's use of popular elements in his classical compositions?

- A. How it is regarded by listeners who prefer rock to the classics
- B. How it has affected the commercial success of Glass's music
- C. Whether it has contributed to a revival of interest among other composers in using popular elements in their compositions
- D. Whether it has had a detrimental effect on Glass's reputation as a composer of classical music
- E. Whether it has caused certain of Glass's works to be derivative in quality

**2. Consider each of the three choices separately and select ALL that apply.**

The passage suggests that Glass's work displays which of the following qualities?

- A. A return to the use of popular music in classical compositions
- B. An attempt to elevate rock music to an artistic status more closely approximating that of classical music
- C. A long-standing tendency to incorporate elements from two apparently disparate musical styles

**3. Circle the sentence in the paragraph above that distinguishes two ways of integrating rock and classical music.**

**Questions 4-6 are based on the following passage:**

Although the schooling of fish is a familiar form of animal social behavior, how the school is formed and maintained is only beginning to be understood in detail. It had been thought that each fish maintains its position chiefly by means of vision. Our work has shown that, as each fish maintains its position, the lateral line, an organ sensitive to transitory changes in water displacement, is as important as vision. In each species a fish has a "preferred" distance and angle from its nearest neighbor. The ideal separation and bearing, however, are not maintained rigidly. The result is a probabilistic arrangement that appears like a random aggregation. The tendency of the fish to remain at the preferred distance and angle, however, serves to maintain the structure. Each fish, having established its position, uses its eyes and its lateral lines simultaneously to measure the speed of all the other fish in the school. It then adjusts its own speed to match a weighted average that emphasizes the contribution of nearby fish.

**4. According to the passage, the structure of a fish school is dependent upon which of the following:**

- I. Rigidly formed random aggregations
  - II. The tendency of each fish to remain at a preferred distance from neighboring fish
  - III. Measurement of a weighted average by individual fish
- A. II only
  - B. III only
  - C. I and II only
  - D. I and III only
  - E. II and III only

**5. Which of the following best describes the author's attitude toward the theory that the structure of fish schools is maintained primarily through vision?**

- A. Heated opposition
- B. Careful neutrality
- C. Considered dissatisfaction
- D. Cautious approval
- E. Unqualified enthusiasm

**6. The passage suggests that, after establishing its position in the school formation, an individual fish will subsequently:**

- A. Maintain its preferred position primarily by visual and auditory means
- B. Rigorously avoid changes that would interfere with the overall structure of the school
- C. Make conscious sensory readjustments to its position within the school
- D. Make unexpected shifts in position only if threatened by external danger
- E. Surrender its ability to make quick, instinctive judgements

**For each blank select one entry from the corresponding column of choices.  
Fill all blanks in the way that best completes the text.**

7. It is refreshing to read a book about our planet by an author who does not allow facts to be (i)\_\_\_\_\_ by politics: well aware of the political disputes about the effects of human activities on climate and biodiversity, this author does not permit them to (ii)\_\_\_\_\_ his comprehensive description of what we know about our biosphere. He emphasizes the enormous gaps in our knowledge, the sparseness of our observations, and the (iii)\_\_\_\_\_, calling attention to the many aspects of planetary evolution that must be better understood before we can accurately diagnose the condition of our planet.

Blank (i)	Blank (ii)	Blank (iii)
(A) overshadowed	(D) enhance	(G) plausibility of our hypotheses
(B) invalidated	(E) obscure	(H) certainty of our entitlement
(C) illuminated	(F) underscore	(I) superficiality of our theories

8. Vain and prone to violence, Caravaggio could not handle success: the more his (i)\_\_\_\_\_ as an artist increased, the more (ii)\_\_\_\_\_ his life became.

Blank (i)	Blank (ii)
(A) temperance	(D) tumultuous
(B) notoriety	(E) providential
(C) eminence	(F) dispassionate

9. In parts of the Arctic, the land grades into the landfast ice so \_\_\_\_\_ that you can walk off the coast and not know you are over the hidden sea.

(A) permanently
(B) imperceptibly
(C) irregularly
(D) precariously
(E) slightly

**Select the *two* answer choices that, when used to complete the sentence, fit the meaning of the sentence as a whole *and* produce completed sentences that are alike in meaning.**

10. Although it does contain some pioneering ideas, one would hardly characterize the work as \_\_\_\_\_.

- A. orthodox
- B. eccentric
- C. original
- D. trifling
- E. conventional
- F. innovative

11. It was her view that the country's problems had been \_\_\_\_\_ by foreign technocrats, so that to ask for such assistance again would be counterproductive.

- A. ameliorated
- B. ascertained
- C. diagnosed
- D. exacerbated
- E. overlooked
- F. worsened

## Process Narration

### Why I chose this topic

I am intending to pursue a career in Industrial Organizational (I/O) Psychology. I have been very interested in looking at job satisfaction and ways to improve the workplace in general ever since I learned about this field. During a practicum in Human Resources I got basic exposure to the importance of good recruitment and training as a way of improving organizations. That experience was really intriguing to me and since then I have sought to explore other factors that contribute to satisfaction and success within organizations.

Since the average person spends a great deal of their life at work, I think it is critically important that our time at work positively impacts us. I chose this topic to gain insight into ways to make the work experience more pleasant, without sacrificing productivity. My hope was for the results of my study to potentially help the decision makers in businesses to improve the mood and performance of their employees.

A positive mood has the ability to impact both performance and satisfaction. This means that employees who are regularly in a good mood could potentially be more likely to stay with a company longer, be more productive, and be healthier and happier in other aspects of their life. This is good for the company because they will have lower turnover and save time and money on



recruiting, hiring, and training. Because mood impacts satisfaction, establishing ways to improve mood is one way to help individuals, as well as the workplace (El-Nasser, 2010).

One day I was working on homework in my room and I flipped on my Scentsy<sup>®</sup>. Soon after that I realized how much more enjoyable it was just because of the aroma, even with everything else in my environment exactly the same. I figured that if the aroma was able to have such a positive impact for me then it likely would for other people as well and I took interest in this as an area of research.

A number of past studies have looked at scent as a means of improving mood, but the bulk of them look to improve the mood of customers/patients in settings like retail stores, dentist offices, and senior centers. Few of these studies have focused on improving mood in employees. My study made a contribution to this area of research by applying it to the workplace.

### **Writing the Research Paper**

The first page of a psychology research paper (after the cover page) is the abstract. The abstract in simplest terms is a summary of the rest of the paper. It should cover the purpose of the study, information about the participants, the method and design of the study, major findings, an explanation of what the findings mean, and suggestions for further research. All of this should be done

within about 150 words. Though this section appears first in the paper it is written last because you have to write the other sections before you can summarize them. The abstract for my paper can be seen on page one.

The next part of the paper is the introduction. The purpose of this section is to explain any theories that are related to the variables as well as discuss relevant prior research that lays a foundation for the current study. You want to make sure that the hypotheses for your study are supported by the research you discuss in this section. This is a way to provide support for the hypothesis you are proposing. After you have described the prior research, you will talk explain what you are planning to study and how it fits in with the prior research. Lastly, you will formally state your hypotheses. My Introduction can be seen on page two.

The middle of the paper will discuss the method. This section needs to be written very specifically and accurately to ensure that someone could replicate it. It should focus only on describing what you did rather than explaining why you chose to do that, as that should have already been justified when talking about prior research in the introduction. This section covers the design, the participants, materials, and the procedure. Explain what type of study was conducted and who the participants were. This should cover how you got your participants and statistics about the sample as a whole like how many participants you had, the age range, and anything else that might be relevant to

the research. The subsection “materials” should include any materials you used for your participants. This would include any pictures you show to them, questionnaires you give them, music you have them listen to, etc. The materials vary vastly depending on the nature of the study. In my case this included scents, scent diffusers, a mood scale, GRE practice questions, and a questionnaire. The final subsection is the procedures which details in order everything you did with the participants. This can be viewed on page eight.

The fourth section is the results. This is where you get to summarize the data and provide the results of any statistics that were performed. The results will be interpreted in the discussion section so for this section you merely need to say what the results are. This should include what type of statistical tests were used; the means, standard deviations, and 95% confidence intervals for each independent variable level; whether there was a significant difference or not (and in what direction); the mean difference and 95% confidence intervals; and the effect size. My results are shown on page 12.

The final part of the paper is the discussion section. This is where you get to explain the results and whether or not your hypotheses were supported. This is also the time to compare the results to the prior research that was discussed in the introduction. Explain whether or not it fits with the past studies and why or why not that may be. Talk about any limitations to the study that might help

explain any differences between the current study and the past studies. At this point you can make recommendations for ways to improve your study and discuss the implications of your findings (McLeod, 2011). My discussion section can be seen on page 13.

## **Consent**

In order to use participants as research subjects it is important that participants know what to expect in order to make an educated decision about whether or not they want to participate. This is why consent forms are an important part of research studies. When conducting research that involves participants you should create a consent form that you will have them sign prior to their participation. The following should be done in the consent form:

- Explain the purpose of the research
- Let them know the expected duration of their participation
- Describe the procedures, identifying any procedures that are experimental
- Describe any reasonably foreseeable risks or discomforts
- Describe any potential benefits to the subject or to others
- Disclose any alternative procedures or courses of treatment that could be advantageous to the subject
- Describe the extent of confidentiality that will be maintained
- Provide contact information in case they have any questions about the study or their rights as a participant
- Explain that participation is voluntary and that there are no penalties for withdrawing from the study even after it has started

Consent forms must be written in plain language so that the participant will clearly be able to see the terms they are agreeing to. It cannot ask subjects to

waive any legal rights or release the investigator(s)/sponsor(s)/institution(s) from liability for negligence. When working with certain populations or conducting research that requires more than minimal risk, there are additional criteria that will need to be added to the consent form (“Tips on Informed Consent”). For an example of a consent form see Appendix A.

In the case of my consent form you can see that I let participants know that the study was approved by the Institutional Review Board so that they could be comforted by the fact that officials have reviewed the procedures and deemed it safe for the participants to take part in. Something to keep in mind is that in some studies you cannot let participants know the true nature of the study ahead of time or else it could potentially alter your results.

For instance, if you are studying how frequently males blink while they are talking verses how frequently females blink, if they knew that was what you were looking for they could consciously or subconsciously change their blinking frequency. However, if they thought the purpose of the study was something else entirely and didn’t know anything about the fact that you were actually going to be paying attention their blinking then you would get more accurate results.

In cases like this you will need to give a different purpose of the study in the consent form so that they do not know the true nature of the study. This deception is only acceptable if the results of your study would be inaccurate

otherwise. When deception is used you must explain to the participant why it was necessary after the study is over so that they are not upset and do not lose trust in you for deceiving them.

You can see in my consent form that I used deception. I informed participants that the study was to see if there was a difference in performance based on whether the amount of time was restricted or unrestricted, when really I was looking at whether or not they were affected by the aroma in the room. If I had told them the true nature of the study then they would have focused on the scent and that could have changed the results. Because I was using scents and some people have scent allergies I had to make sure when recruiting participants that I excluded anyone with scent allergies or sensitivities and I also put this in the consent form to prevent any of my participants from having reactions while participating.

### **Debriefing**

After the conclusion of a study that has human participants, the researcher must debrief the subjects. This is a conversation that happens between the two parties regarding the nature of the study, such as the purpose of the study and the hypothesis. This is also when you reveal any deception that may have been used (McLeod, 2010). In my case I had to inform participants that

I had mislead them about the nature of my study and explain to them why it was necessary.

The goal of debriefing is to make the subjects feel good about their participation in the study by counteracting any negative thoughts or experiences they may have had. You will want to answer any questions the participants may have and provide them with a debriefing form that addresses everything you covered in your conversation with them.

Something else you might consider in the debriefing form is asking participants not to discuss the research with others. If they go tell their friends about your study and then their friends participate in it that could potentially compromise your data. Lastly, you will want to let them know when your study will conclude and how they can find out what the results were in case they are interested in seeing what their participation helped find. The debriefing form from my study can be seen in Appendix B.

### **Institutional Review Board**

An Institutional Review Board (IRB) is responsible for ensuring the protection of research participants. In most cases any study that uses human subjects must be approved by an IRB before data collection begins. As part of the application process I completed a training course through the National Institute of Health on protecting human research participants. This course covered topics

in codes and regulations, respect for persons, beneficence, and justice (“Protecting Human Research Participants”, 2011).

The IRB requires this certification to make sure researchers are aware of ethical research practices and know what they can and cannot do when using human subjects. As part of the process to get a research project approved by the IRB you have to tell them the purpose and design of your study so they can get a better understanding of what you will be doing and why (“Institutional Review Board”). The purpose and design for my study can be seen in Appendix C.

**What I have learned through the process of completing my thesis:**

- The importance of being aware of participants’ rights and conducting ethical research in order to protect the researcher, the university, and the subjects.
- The importance of writing and utilizing a script in order to be consistent in how you deal with each participant.
- The importance of using random assignment so that each participant has an equal opportunity to be put in any of the conditions.
- How to conduct multiple different kinds of statistics both by hand and in the Statistical Package for the Social Sciences (SPSS), as well as how to know when to use each type of statistic.
- The importance of conducting and explaining your research in a way that can be repeated by others.
- How to find assessments that are reliable and valid.
- How to find good quality prior research that can be trusted.



## References

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## Appendix A

### GRE Practice Questions and Task Performance.

Western Oregon University and the Department of Psychological Sciences support the practice of protecting research participants' rights. Accordingly, this project was reviewed and approved by the WOU Institutional Review Board. The information in this consent form is provided so that you can decide whether you wish to participate in our study. It is important that you understand that your participation is considered voluntary. This means that even if you agree to participate you are free to withdraw from the experiment at any time, without penalty.

This study is an investigation into whether participants perform better on a task if time is restricted or not restricted. For this study, you will complete some GRE practice questions and will either have 12 minutes to complete as many questions as you can, or will have an unlimited amount of time, depending on which group you are randomly assigned to. You will also fill out a couple of questionnaires about your experience.

Your responses will only be viewed by the researchers listed below and they will be kept in a secure location. This study poses no known risks to your health and your name will not be associated with the findings, however you may feel embarrassed or uncomfortable during participation. Remember that you can end your participation at any time if you feel uncomfortable. For participation in this research project, you will receive extra credit at the end of the session. Also, upon completion of your participation in this study you will be provided with a brief explanation of the question this study addresses. If you have any questions not addressed by this consent form, please do not hesitate to ask. You will receive a copy of this form, which you should keep for your records.

Thank you for your time.

Reina Morgan  
remorgan10@wou.edu

Chehalis Strapp, PhD  
Professor  
Todd 309, 503-838-8316  
strappc@wou.edu

**CONSENT STATEMENT:**

I have read the above comments and agree to participate in this experiment. I understand that if I have any questions or concerns regarding this project I can contact the researchers listed above or the WOU Institutional Review Board at (503) 838-8271

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(Participant's signature)

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(date)

## Appendix B

### GRE Practice Questions and Task Performance

Thank you for participating in my study. At this point I wanted to provide you with a little more detail regarding the focus of this study. The consent form stated that this study is looking at how being timed or not affects task performance. In reality this study is actually looking at if peppermint and orange scents affect mood and task performance. You were not told this prior to the study in an attempt to keep you from focusing on the scent and thus possibly altering the results.

For the current study, I asked you to complete some practice GRE questions. While you did this you were either exposed to peppermint, orange, or no scent. I expect to find differences between the scent conditions and the control condition in regard to mood and task performance. The ultimate purpose of this study is to determine which condition would be most beneficial to implement into workplaces in order to improve mood in employees without sacrificing performance.

Thank you again for participating in this study. Please refrain from discussing this study with other individuals who might participate until June 6, 2013, as doing so might compromise my data collection.

I will be giving a poster presentation of the results of this study at Academic Excellence Showcase Thursday May 14 (time and location provided in the showcase program). You are welcome to come to the poster session to see how the study turned out. If you have additional questions about the study, please feel free to contact:

Reina Morgan  
remorgan10@wou.edu

## Appendix C

### Purpose:

The purpose of this study is to see if peppermint and orange scents affect the mood and task performance of individuals. My hope is to determine if implementing these scents into the workplace could increase job satisfaction without jeopardizing accuracy and productivity. The task used in this study (practice questions for the GRE) is applicable to work related tasks because it is very important in a variety of types of jobs to be able to read instructions, determine what they mean, and make a decision in a timely manner.

### Design:

This study will use a between subjects design. Participants will first be given a consent form to read and sign. The consent form will tell them that the study is investigating whether or not there are differences in accuracy and productivity on GRE practice questions depending on if participants have a time limit or not. It will also warn students that they may feel slightly stressed or anxious during the study, but they are free to leave at any time and should not participate if they have any scent allergies or sensitivities.

After signing the consent form, participants will be asked to complete the Quick Mood Scale. After completion of the Quick Mood Scale participants will be randomly assigned to a control/no scent condition or a scent condition. Once they have been assigned a group they will be handed the packet of GRE practice questions that was put together for this study, along with another copy of the Quick Mood Scale.

At this point they will be sent into the room they were assigned to and will be told that they are being timed and will have 12 minutes to complete as much of the GRE practice questions as they can and then I will knock on the door to let

them know their time is up, at which point they should take the Quick Mood Scale a second time. Once participants have completed 12 minutes of the GRE questions and have filled out the Quick Mood Scale for the second time, participants will be asked to complete the Scent Recognition and Perceptions Questionnaire. Finally, participants will be debriefed regarding the study.