The Effects of Odor on Compliance and Willingness to Volunteer

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The present study focused on the effects of lavender and peppermint ambient odor on compliance and volunteerism. It was hypothesized that participants exposed to peppermint oil versus lavender oil versus no odor would be likely to render behaviors commensurate with the properties (either stimulating or calming) of that odor. Sixty undergraduate students participated by answering a questionnaire that had been saturated or not saturated with odor. Helping behavior was assessed by the participants' willingness to take part in a brief telephone survey and to mail back food labels. Significant results were obtained for odor on both compliance and willingness to volunteer. Post hoc analyses found the peppermint group to be significantly more compliant and willing to volunteer than the lavender group and significantly more willing to volunteer than the no odor group. Significant results were also obtained when participants' age was analyzed with regard to volunteerism but not for compliance.

The need to stimulate positive and productive interpersonal relations has always been of interest to researchers, but as technological advances link diverse cultures and peoples more closely and more often, facilitating positive social behaviors seems to take on a poignant sense of urgency. It is in this vein that the present research on the factors involved in influencing a person's willingness to engage in compliant and volunteer behavior is examined. Specifically, this study examines the effect ambient odors of either lavender or peppermint have on the willingness of a person to volunteer and to acquiesce to simple requests. Compliance and the volunteer spirit respectively represent aspects of common courtesy and loftier philanthropic endeavors and they are examined as two sides of the same coin. It was hypothesized that peppermint would stimulate the participant's willingness to comply with simple requests and to volunteer for environmental and philanthropic causes and lavender would inhibit these same behaviors.

Communication via pheromones and body odor is often found with both animals and humans. For example, Belding squirrels, when they meet, sniff each other in order to determine kinship (Wilson, 2002). This primal relationship between personal odor and social behavior in animals may have influenced Chen and Haviland-Jones (2000) to explore human olfactory communication of emotion. In their study the underarm odors of both men and women were collected during happy and frightened occasions, and one week later those same participants were asked to identify the odors according to the previous week's underarm emissions. The findings suggest that emotional states can be distinguished based on body odor more often than would be expected by chance.

In another relevant study regarding personal odor and identification of allies, elementary school children assessed the smells of their classmates' t-shirts and were most likely to render a positive reaction to the scent of a familiar classmate rather than that of an unfamiliar one, and identification of gender by smell was correct in both boys and girls more often than by chance (Mallet & Schaal, 1998). Yet another pheromone and interpersonal relationship study was conducted in which individuals were exposed to both amyl acetate (banana oil) and the male hormone androsterone (Pierce, Cohen, & Ulrich, 2004). Participants who could detect the androsterone reported, via the Affective Impact of Odor Scale, having negative interpersonal interactions as opposed to those who could not smell it. Similarly, those who could smell the amyl acetate were more likely to associate the odors as having a positive effect on relationships.

Research on the relationship between ambient odor and improved task performance and cognition is numerous and well documented. It contributes to the theoretical foundation for the present study as improved performance in any form, be it cognition or interpersonal relations, moves research in this area towards a fuller understanding of its complexities. Researchers have examined the role of odor in everything from driving performance (Baron & Kalsher, 1998) to clerical efficiency (Baron, 1990; Gilbert, Knasko, & Sabini, 1997) and information processing (DeBono, 1992). In an interesting study inspired by previous research from Stroop (1935) in which Stroop explored the parallel cognitive functions of reading and naming, Pauli, Bourne,
Diekmann and Birbaumer (1999) studied olfaction and vision by pairing the stimuli (pleasant/unpleasant odor and odor congruent/incongruent words) on Stroop cards. The findings indicate that odor disrupts performance on odor congruent cards and demonstrate that aroma affects cognition.

Ambient or environmental odor and its impact on mood is another important aspect of odor and human olfaction. Moss, Cook, Wesnes, and Duckett (2003) tested mood and cognition using lavender and rosemary essential oils against a control condition of no scent, and their findings suggest therosemary condition produced self-reported contentment versus the control condition, and exposure to lavender resulted in participants being less alert. Motomura, Sakurai, and Yotsuya (2001) also tested the calming effects of lavender as they sought to lessen the stress of the participants under study. Mental stress was induced by leaving the participants alone and requesting them to remain silent in a room with either lavender or no ambient odor for 20 minutes. A nonstressful condition, which did not require a 20-minute wait or silence, was also employed as a control. Mental stress was measured by blood pressure and heart rate, and analysis of the data dramatically supported the researchers’ hypothesis by revealing that participants exposed to a lavender odorant while put under stress recorded lower blood pressure and heart rate than that recorded at baseline. In another study investigating mood and odor (Campenni, Crawley, & Meier, 2004) participants were exposed to either lavender, neroli, or no odor and were informed as to the qualities (i.e., calming or stimulating) of each scent. The suggestion of lavender’s calming properties resulted in relaxation as measured by heart rate and skin conductivity and the suggestion of the stimulating properties of neroli yielded increased physiological responses.

Asmus and Bell (1999) explored ambient odor and individual coping styles as mediating factors on mood, anger, arousal, and escape. Whereas the previous studies used only pleasant or no scent conditions, Asmus and Bell studied how mood and the need to escape were affected by a noxious odor. The results appear to lend support that although anger was a function of coping style, the desire to escape the situation and negative affect rose in direct correlation to the increased strength of foul odor regardless of coping personality. It may appear that noxious odor and its relationship to negative affect is obvious, but if research endeavors to discover the environment most suited to positive interaction, then those factors that would inhibit positive social behavior must also be explored.

The study of aromatherapy has yielded results indicating the positive effects of pleasant scents, and it would seem logical that pleasant fragrance might also be utilized to quell angry emotions or perhaps inhibit aggressive behavior. Baron (1980) tested this hypothesis in an experiment in which males and females were either provoked to anger or not by a confederate and were later given the opportunity, in the presence of very pleasant odor, pleasant odor or no odor, to aggress against the confederate. Counterintuitively, the pleasant odor enhanced the level of aggression towards both male and female victims, however, aggression was reduced when the victim was male and the participant had not been provoked. Aggression against female victims was enhanced in the pleasant aroma condition, regardless of previous provocation. Clearly, pleasant scent interacts with other factors and does not have a simple or consistent positive effect on behavior. It should also be noted that the participants were exposed to scent while reading an odor saturated paper that contained the confederate’s unknow assessment of them. This clever way to deliver the fragrance was effective as participants did report room odor detection, but could not pinpoint its source.

More research on the mediating factors involved in odor exposure was conducted by Baron and Thomley (1994), who added the receipt of a gift or not to stressful or moderately stressful odor conditions and measured task performance when help was requested from the experimenter. The results showed higher task performance scores for those participants who received a small gift under both stressful pleasant aroma conditions. Additionally, participants exposed to pleasant aroma who received a gift were also more willing to aid the experimenter when help was requested. Both reward and pleasant fragrance played roles in enhancing affect and, consequently, behavior. One might conclude from these two experiments that although pleasant odor does not decrease aggressive behavior (apparently especially so if the victim is a woman), odor can enhance positive social behavior if coupled with another positive social behavior, as in the receiving of a gift.

Continuing his investigation into odor and behavior, Baron (1997) conducted a field study in a mall where shoppers were presented with an opportunity to help a confederate either in the presence or not in the presence of ambient odors such as cookies baking or coffee roasting. The unwitting participants were significantly more likely to make change for a dollar or to retrieve a dropped personal item if near the pleasant aroma and they reported higher levels of positive mood when asked. The investigators of this study did admit that it is difficult to pinpoint which factors were a direct result of another. Helping may have enhanced affect; aroma may have impacted affect which in turn increased the likelihood of helping, and so on. Another field study sought to test the willingness of passersby to alert a confederate, who was either heavily or lightly perfumed, about a dropped item yielded similar results (Gueguen, 2001).

The present research modeled various aspects of many of the previously mentioned studies, but attempted to add to the theoretical foundation by examining not only odor’s effect on compliance, but also studying that altruistic and often elusive human behavior: the motivation to volunteer. Whereas stimulating essential oil of peppermint was predicted to increase a participant’s willingness to comply and volunteer, the soporific qualities associated with lavender oil were predicted to decrease the likelihood of those behaviors.

Method

Participants and Design

Sixty undergraduate students from a northeastern public university participated in the study. Participants were eligible to receive course credit for their participation.
**Materials**

A packet containing a consent form, instruction sheet and questionnaire designed specifically for this research was employed to assess helping behaviors (see Appendices A and B for instructions and questionnaire). Participants were asked to return the questionnaire and various other materials by mail and a stamped and addressed envelope was provided for that purpose. Essential oils of lavender and peppermint were employed as the odors, to ensure their potency and longevity.

**Procedure**

Randomly assigned participants completed a questionnaire that had been saturated with either lavender, peppermint, or was not saturated with any odorant. In order for the participant to be exposed to the odorant for a sufficient length of time, the questionnaire consisted mainly of time-consuming filler questions that were not used for data analysis. Filler questions included topics concerned with political opinion, such as, “If you were eligible to vote in the last election, did you?” as well as academic aspirations, such as, “Do you intend to pursue a graduate degree?” The participants were instructed to complete the survey in a specific fashion (i.e., blue ink pen only) and asked to mail the survey back to the researcher, also in a slightly arduous manner (i.e., folding the survey in a particular way). Compliance with each of the requests set forth by the instruction page received a score of one point. The range of scores for compliance was 0-6. Helping behavior was assessed by the participant’s willingness to take part in a brief telephone survey concerning the homeless and to mail back food labels or candy wrappers to assist with a new recycling process being developed by a large corporation. Each phone call and each set of mailed-in food labels indicated willingness to volunteer and was awarded 3 points, making the available scores a 0 (doing nothing), 3 (doing one of the volunteer behaviors), or 6 (doing both). These point values were chosen in an effort to keep both compliance and volunteerism score scales equally weighted for easier visual interpretation of the raw data. Due to the fictitious scenarios of the volunteer condition, the telephone answering machine message debriefed the participants who called to volunteer by describing the true nature of the research and thanking them for their participation.

**Results**

Although age and gender of the participants were not factors this research was initially concerned with, both were analyzed with a one-way ANOVA to determine their possible influence on the two dependent variables. No significant results were obtained for gender with respect to compliance or willingness to volunteer $F(1,37) = .67, ns$, and $F(1,37) = .13, ns$, but participant age produced significant differences in willingness to volunteer $F(3,37) = 3.19, p = .03$. After collapsing the four age categories into two groups (young = < 30; old = 30 or higher), a 2 (age) x 3 (odor) ANOVA confirmed main effects for age and odor on willingness to volunteer, but no interaction effect. It appears that the effect of age on volunteerism was independent of odor and perhaps the significant effect was due to the unequal distribution of young respondents ($n = 27$) to older respondents ($n = 2$).

Odor was found to have a significant effect on willingness to volunteer $F(2,59) = 15.05, p = .000$, as well as on compliance, $F(2,59) = 3.53, p = .036$. The Tukey HSD ANOVA differentiated the odor groups even further. Alpha was set at .05 and significant differences between the lavender and peppermint groups with regard to both compliance and willingness to volunteer were revealed, ($p = .032$ and $p = .000$, respectively). In addition, a significant difference between the peppermint group and the no odor group ($p = .000$) was revealed with regard to willingness to volunteer. Participants exposed to peppermint scored higher for both dependent variables than those exposed to lavender or no odor.

**Table 1**

*Odor Group Means for Compliance and Volunteerism*

<table>
<thead>
<tr>
<th>Odor Group</th>
<th>Means</th>
<th>Standard Deviations</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lav</td>
<td>No</td>
<td>Pep</td>
</tr>
<tr>
<td>Comp</td>
<td>2.70</td>
<td>3.40</td>
<td>4.95</td>
</tr>
<tr>
<td>Volun</td>
<td>.30</td>
<td>.45</td>
<td>2.40</td>
</tr>
</tbody>
</table>

 Ninety percent of the early responses from the peppermint condition answered the odor perception manipulation check question in the negative, meaning they did not detect the scent. Therefore, an attempt was made to correct the weak saturation of the peppermint condition by running this condition again on a new set of participants. This time, 100% responded to the IV manipulation check in the positive. No significant differences between the first peppermint group and the second were obtained with regard to compliance and willingness to volunteer, $F(1,8) = 2.5, ns$ and $F(1,8) = .38, ns$, respectively. Mean scores of respondents for the first peppermint group ($N = 10$) and respondents of the second peppermint group ($N = 17$) demonstrate no difference in mean scores with regard to compliance but enough of a difference between the two groups with regard to volunteerism to create the significant results when analyzed overall (See Table 2 for means of first and second wave peppermint respondents).

**Table 2**

*Means for First and Second Peppermint Conditions*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Respondents</th>
<th>Compliance</th>
<th>Volunteerism</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Peppermint</td>
<td>10</td>
<td>5.8</td>
<td>.06</td>
</tr>
<tr>
<td>Second Peppermint</td>
<td>17</td>
<td>5.8</td>
<td>2.8</td>
</tr>
</tbody>
</table>
Discussion

Results from the present study indicate support for the hypothesis. It does appear that the peppermint and lavender odors had the expected effect on both compliance and volunteerism. The researcher concluded that the high rate of compliance was due at least in part to the peppermint odorant and quite possibly to high levels of common courtesy in the general population, but it may be more likely that the requests intending to measure compliance need to be reevaluated to ensure validity. Perhaps compliance to the specific requests of the present study was too easily accomplished and as such, exaggerated the results. The spirit of volunteerism also appears to have been significantly affected by odor, but the raw data show that, while most participants were willing to send in two candy wrappers, only two of the rerun peppermint group volunteered more of their time to take part in the fictitious telephone survey.

It is important to mention that 60 survey packets were distributed and only 38 were returned. In order to maintain equal sample size in all odor groups, the 22 nonrespondent participants were given zeros for compliance and volunteerism, making them unwitting contributors of data. It should be noted that the compliance scores of nonresponders may reflect a different dimension of the compliance construct than the compliance scores of active willing participants. Simply put, there is a difference between being a nonrespondent and being noncompliant respondent. This potential confound revealed itself while the study was underway and would need to be addressed in future studies.

The weak odor saturation problem was yet another challenging design flaw discovered during data collection. A pretest to better gauge the level of perceivable odor is advised prior to replication so as to avoid future problems not only with data collection, but also with possible oversaturation of the test materials that may alter the participants’ reactions in a number of ways.

Future studies should include exploration of scent and its effect in areas most conducive to placing stress on common courtesy, that is, a crowded subway train or elevator. Field studies may more accurately reflect the effect of aroma on human behavior than packet studies.

More importantly, and despite its design flaws, the present study of odor and behavior contributes empirical information of a scientific nature to the genre which supplements the rather anecdotal research driven by the commercial interests of aromatherapy proponents. Practical applications of the present research in the workplace or other public environments may render improved human relations whose positive ramifications cannot be overstated.

References


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**Appendix A**

Instructions

1. Please read all instructions before beginning the survey.

2. Please allot enough time to complete the entire survey in one sitting.

3. Due to weight and postage considerations, please discard the Instruction page and mail back only the survey, the informed consent form, the green class credit form, and the optional materials you are asked to send in the envelope provided.

4. Please fold the survey and arrange the other materials, in any way you prefer, so that the colored dot on the back of the survey is the first thing the researcher will see upon opening the return envelope.

5. Please complete the survey with blue ink, only.

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**Appendix B**

**Questionnaire**

Check one:

Age:  20 years or less____  21-29 years____  30-39 years____  40 years or more____  

Circle one:

Gender: Male Female

A. A large local corporation has agreed to sponsor a public awareness campaign about the environmental benefits of recycling and will use the food labels and wrappers in a new recycling process it is developing. If you would be interested in assisting: Please enclose in the envelope provided two (2) food labels (including candy wrappers) from your home or dorm.

B. A service oriented organization made up of WCSU students needs help collecting opinions about the Danbury homeless population. If you wish to participate in a brief telephone survey about this issue: Please call (203) 512-3070 to voice your ideas and opinions.