

INVESTIGATION OF THE HUMAN COMPLEX REACTIONS TO ODORANTS

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Introduction

Aroma is a complex sensory attribute which influences product perception, validated both consciously by consumers and subconsciously through testing. Skincare formulation and cosmetics in general concentrate on sensory traits such as texture, consistency, color, spreadability, and aroma. With its demonstrated ability to influence the mood states of subjects, aroma should be considered a primary sensory factor in both the aesthetic and perceived consumer functional success of skincare formulations.

This work is a continuation of previous research on the methodology and assessment of the human sensory response to essential oils [1]. As in the previous research, the current study utilizes Gas Discharge Visualization (GDV) as a means to obtain an objective measurement as a result of one's exposure to an olfactory stimulant. The current study expanded upon the investigation of a correlation between subjective and objective methods for analyzing one's olfactory response to smell.

Methodology

Fourteen test subjects were used to evaluate six essential oils with glycerin as the control. The subjects were male and female volunteers, ages 18-22, who were screened for predisposed allergies through typical allergen testing. The essential oils (odorants) evaluated in the study included the following: Olibanum, Peppermint, Roman Chamomile, Lavender, Lemon, and Blue Chamomile.

In addition to objective measurements obtained through the GDV technique, subjective, descriptive methods in the form of questionnaires were used to evaluate each panelist's response to the odorants. These questionnaires, developed by two separate research facilities, allowed for each panelist to rate separately, on respective scales, the preference and the aroma intensity (or strength) for each odorant.

An olfactory testing box was constructed with controlled air flow both entering and exiting the box. Additionally, a method was developed to deliver a controlled amount of odorant in such a way that the panelist was unaware of the moments when the odorant was introduced and removed. In conjunction with the testing box, GDV measurements were obtained for each panelist before (baseline measurements), during, and after the exposure to the odorant.

Results and Discussion

The main objective of this paper was to investigate the relationship between the subjective evaluation of the oils and the objective GDV parameters. In the two sets of questionnaires, panelists subjectively rated each of the six essential oils for both preference and odor intensity. Peppermint and lemon oils were the two oils most preferred by panelists, and were nearly identical to each other, while blue chamomile was the least preferred. Unexpectedly, the glycerin sample had a level of preference that was similar to that of several test oils (see example in Figure 1). This observation may be attributed to the overall composition of the panel population (e.g., limited age range, cultural similarities, geography, lack of familiarity with some oils, etc.). For odor intensity, most of the oils were statistically similar to each other, although some directional differences were still apparent. As expected, all oils were significantly higher in odor intensity than that of the glycerin control.

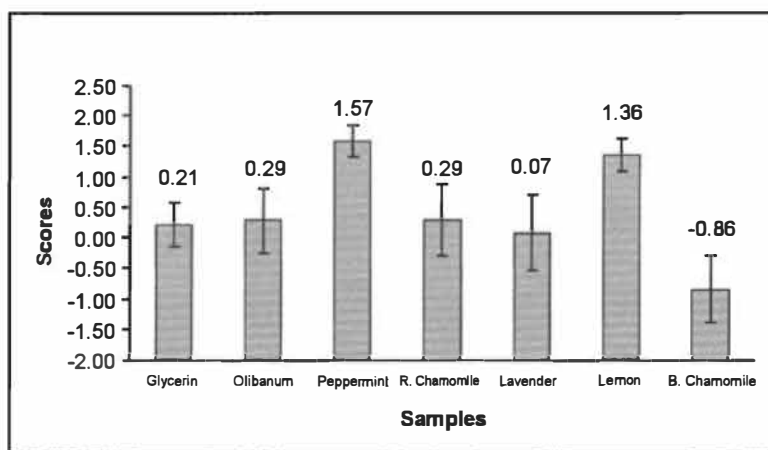


Figure 1. Distribution of the average values (N=14) of the preference rating parameter for various essential oils.

The objective GDV image parameters of area of glow, geometric uniformity of the captured image, and image intensity were measured before, during, and after the panelists were exposed to the oils. In addition, glycerin was used as a control, and a background in which panelists were not exposed to any samples was implemented as a baseline. A multivariable regression analysis was used to correlate the GDV objective measurements to the subjective ratings determined from the two sets of questionnaires. In this type of statistical analysis, the Multiple R value is utilized as a measure of how well independent variables (in this case, preference and odor intensity) correlate to the dependent variable (in this case, a GDV image parameter). The GDV parameter of intensity showed the strongest correlation to the subjective independent variables; the other GDV parameters did not indicate such a correlation. Therefore, based on the analysis, the independent variables explained over 90% of the response in the dependent variable of GDV intensity; that is, Multiple R > 0.9.

Conclusions

Based on the results of this study, a link may exist between panelists' subjective measurements and GDV intensity. When compared individually to GDV intensity, the two independent variables of preference and odor intensity showed only a moderate relationship; however, when taken collectively, they accounted for over 90% of the response in GDV intensity. This may be the result of a biological or physiological response elicited by the panelists after exposure to the oils. This relationship should therefore be explored in greater detail.

In order to further validate this technique, a wider variety of essential oils, comprised of a broad range of notes, needs to be investigated. The composition of the test panel should be expanded further to more closely represent the general population. Additionally, the results of this test suggest that there may be an "ideal" level of exposure to a given oil. In this study, all oils were evaluated "as is". It would be interesting to explore various concentrations of oils, solubilized by a non-aromatic ingredient, and their effects on both the subjective and objective scales. It is possible that a plateau in effect could be reached with certain oils. If such a plateau exists, the addition of oils beyond a particular concentration or exposure level may provide no additional benefit. Such a tool could greatly benefit the formulation of fragrances used in various personal care applications.

References

1. Vainshelboim, A., Hayes, M., Momoh, K., Peirce, S., Raatsi, C., Korotkov, K. Investigation of conscious and subconscious human reactions to pure essential oils, *Proceedings of ISOEN 11th International Symposium on Olfaction and Electronic Nose*, 266-269 (2005).