

## Effects of Fragrance on Emotions: Moods and Physiology

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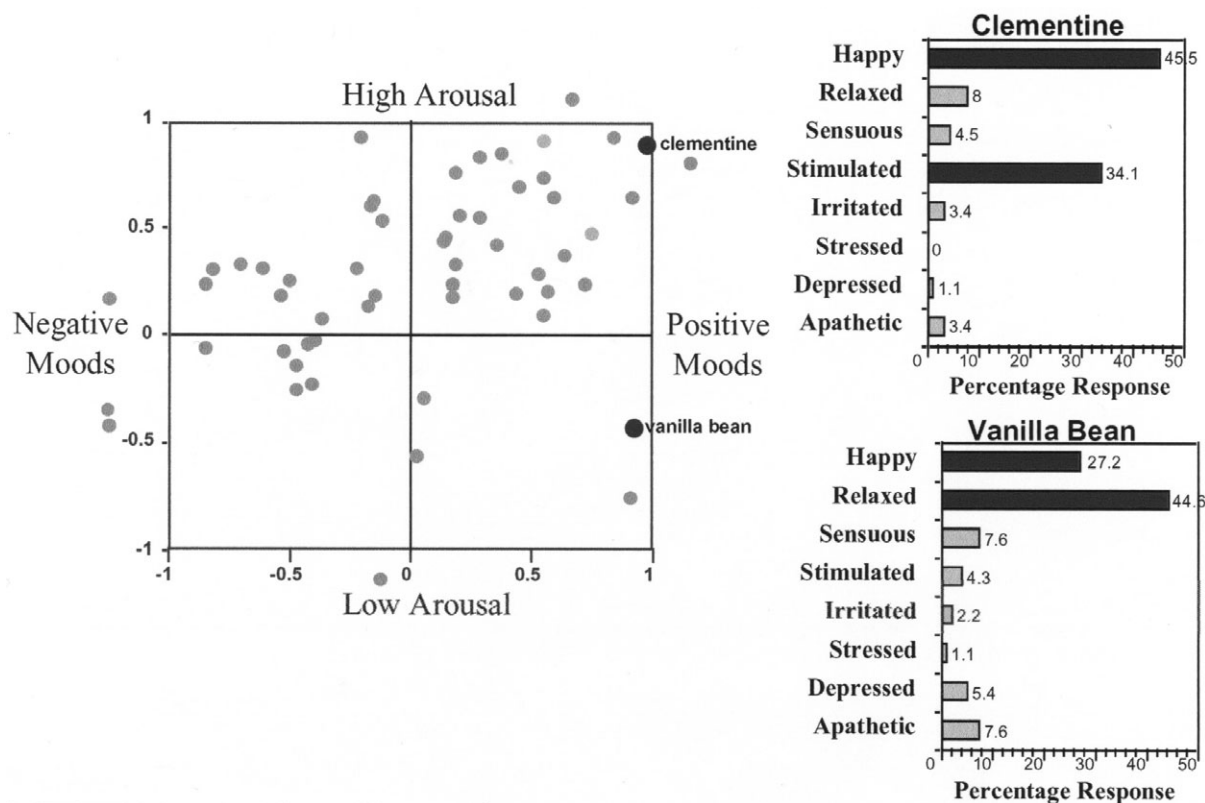
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Smelling a delightful aroma can be a very pleasurable experience, but can it be measured scientifically? Over the past 20 years International Flavors & Fragrances Inc. (IFF) has been working to refine its methods of measuring both the subjective and physiological effects of aromas and fragrances on emotions. We have developed a self-report method called Mood Mapping™ that reliably measures the mood associations of aromas, whether simple ingredients or finished fragrances in consumer products (Warrenburg, 2002). Mood Mapping provides a choice of eight mood categories to panelists, who are asked to smell the aroma of a sample and ‘pick the mood category that best matches the aroma of the sample’. We found that this straightforward voting technique results in clearer and more reliable differentiation among aromas than do techniques that require respondents to rate each mood for each sample being evaluated. The resulting mood profiles of each aroma can be mapped by multi-dimensional scaling or principal component analysis. Figure 1 displays the voting results for clementine, a citrus aroma, versus vanilla. Both are equally pleasant, but the former is more stimulating and the latter more relaxing. The Mood Map reflects these differ-

ences by their positions in the Arousal (*Y*) dimension, yet also shows their hedonic similarity on the Positive/Negative (*X*) dimension. The other points are other aromas that evoke different patterns of the eight moods.

Measurement of moods in this way can be conducted in combination with consumer research of fragranced (or flavored) products. When these results are mapped we have found that the four positive moods identify the major dimensions of the map. Thus, positive consumer reactions tend to reflect the major mood dimensions of happiness, stimulation, relaxation and sensuality that underlie a wide variety of specific attributes identified as applying to such products. Furthermore, we have found that this is true in populations tested around the world. We have built a database for our creative staff, called the Consumer Fragrance Thesaurus, that catalogs the moods, attributes, colors and other qualities of fragrances tested in different areas of the world (Warrenburg, 1999).

One of our principal interests has been to discover whether fragrance can be used as a stress-relief agent in a consumer product. Stress is a global affliction, a fact that is not only acknowledged anec-



**Figure 1** Mood Map results for clementine, a citrus aroma, versus vanilla.

dotally, but is documented by global consumer surveys (Roper, 2003). Whether one resides in the developed or developing world, stress is a problem that reduces the quality of life for a large proportion of the world's citizens as reported by the World Health Organization (2001). Furthermore, there is considerable evidence that stress can either directly or indirectly exacerbate a variety of illnesses and that the reduction of stress has both short- and long-term health benefits.

We were interested to learn whether the most relaxing fragrances in the Consumer Fragrance Thesaurus could be powerful enough to reduce laboratory-induced stress responses measured physiologically. To determine if fragrance can have a physiological effect, further tests were conducted on these subjectively 'relaxing' fragrances using psychophysiological methods (heart rate, blood pressure, skin resistance, muscle tension, etc.) to ascertain whether they are truly stress-reducing. We used a standard laboratory stressor, the Stroop test, in a series of studies of various relaxing fragrances identified by Mood Mapping. We obtained the electromyogram (EMG) from the trapezius muscle (back of the shoulder), which reliably shows an increase during the Stroop test. This measurement was utilized because shoulder and neck tension is universal and is an easily understood consumer measure of stress.

In the course of this testing, we discovered that certain relaxing fragrances are able to reduce stress-induced muscle tension as measured in the shoulder area. We found that a special type of relaxing fragrance, Myo-relax® (patent pending), has a muscle relaxing effect: such fragrances significantly reduce the trapezius EMG stress response. These studies reveal that fragrance is indeed powerful enough to counteract stress in a performance task. This new fragrance technology is being applied to products requiring convincing evidence that a fragrance is physically relaxing, or destressing. Aromatherapy products represent a substantial and growing area of the marketplace and this type of research can strengthen the basis for making stress-relief claims in these products.

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