Fragrance and Consciousness

Lavender, orange and rose increase mental relaxation and work efficiency
Chamomile, eucalyptus, jasmine, lavender, rose, orange and musk were used to test the effects of fragrances on work and mental function. Reaction times were improved by lavender, orange and rose, and they also increased mental relaxation. Chamomile, jasmine and musk increased mental stimulation. The study concluded that the use of lavender, orange and rose would elevate work efficiency and counter the effects of a stressful life.
(Psychophysiological studies of fragrance.; Sugano H, Sato N; Chemical Senses)

Liking a fragrance increases alpha waves in EEG; lavender was found to be more sedative than jasmine.
It was found that the oils had both psychological (subject's preference) and physiological (indigenous) effects and that these two factors should be taken into account during aromatherapy treatment.
(Neurophysiological findings on the effects of fragrance: lavender and jasmine. Yagyu T; Integrative Psychology)

Lavender and α-pinene have a sedative effect; jasmine is stimulant
The effects of lavender, jasmine and α-pinene on mental function were studied using positron emission tomography, rheoencephalography (REG), contingent negative variation (CNV), electroencephalography (EEG) and microvibration. Lavender and α-pinene and increased the α waves of EEG, microvibration and the amplitude of REG, and decreased the amplitude of CNV. Jasmine increased the β waves of EEG and microvibration and increased the amplitude of CNV. The results proved that lavender and α-pinene had a sedative effect whilst jasmine was stimulatory.
(Effects of odours on mental function. Sugano H Chemical Senses)

Lavender is sedative, jasmine is stimulant
Inhalation of lavender oil significantly increased decision time but had no effect on motor time, indicating that the sedative effect was a central one and not peripheral. Lavender

significantly increased reaction times and jasmine significantly decreased them compared to the conditions in which no substance was inhaled. The results clearly proved the sedative influence of lavender and the excitatory effect of jasmine on behavior.
(Excitatory and sedative effects of essential oils on human reaction time performance. Karamat E, Ilmberger J, Buchbauer G, Robhuber K, Rupp C)

Fragrance and concentration at computers
With mental work a sedative fragrance (lemon, lavender, sandalwood) was beneficial to concentration and mental stability, leading to an improvement in productivity. An awakening fragrance (jasmine, ylang ylang, rose, peppermint) mitigated the perceived workload. With static, monotonous work awakening fragrances demonstrated an improvement in productivity and alleviation of workload. Moreover, it was found that exposure to awakening fragrance every three minutes produced the optimum improvement effect. The selection of fragrances for increased workplace performance is therefore dependent to a degree on the type of work being done.
(A study of fragrance on working environment characteristics in VDT work activities. Kawakami M, Aoki S, Ohkubo T; International Journal of Production Economics)

The effect of inhaled jasmine and lavender essential oils on attention
These processes were investigated by means of alertness (measured in conventional reaction time tasks) and vigilance (the ability to sustain attention to a given task with infrequent relevant stimuli). The excitory effects of jasmine and sedative effects of lavender were clearly indicated in the results of the vigilance tests. No effects could be demonstrated regarding alertness tasks. It was postulated that essential oils in general may have differential effects on different areas of human attentional processing.
(Effects of essential oils on human attentional processes. Ilmberger I, Rupp J, Karamat C, Buchbauer G Programme Abstracts - 24th International Symposium on Essential Oils)

Fragrance association helps memory
Forty seven subjects had to learn a list of words whilst sitting in a room into which either jasmine incense or perfume had been previously introduced. Two days later they had to relearn the word list with either the same or alternate odor present. It was found that their memory was superior if the same smell was present on the second occasion. This demonstrated context dependent memory i.e. incidental elements of the learning environment became associated with the learning stimuli. There was no difference between intensity or pleasantness between the two odours.

(Verbal memory elicited by ambient odor.; Smith D G, Standing L, De Man A; Perceptual & Motor Skills)

Subjective feelings of comfort and discomfort affect EEG and perception of fragrance

Results showed that alpha 1 activity significantly decreased under odor conditions in which subjects felt comfortable, and showed no significant change under odor conditions in which subjects felt uncomfortable. These results suggest a possible correlation between alpha 1 activity and subjective evaluation.
(Effects of inhalation of essential oils on EEG activity and sensory evaluation. Masago R, Matsuda T, Kikuchi Y, Miyazaki Y, Iwanaga K, Harada H, Katsuura T. Graduate School of Science and Technology, Chiba University)

Fragrance modulates sympathetic nervous system

Fragrance inhalation of essential oils may modulate sympathetic activity in normal adults. Inhalation of rose and patchouli oil caused a 40% decrease in relative sympathetic activity in normal adult subjects using both power spectral analysis of blood pressure fluctuations and measurement of plasma catecholamine levels; inhalation of rose oil caused a 30% decrease in adrenaline concentration. Fragrance inhalation of essential oils, such as pepper oil, estragon oil, fennel oil or grapefruit oil, resulted in 1.5- to 2.5-fold increase in relative sympathetic activity.
Effects of fragrance inhalation on sympathetic activity in normal adults. Haze S, Sakai K, Gozu Y. Product Development Center, Shiseido Co., Ltd., Hayabuchi, Yokohama, Japan)

Fragrance is perceived differently before and after different types of work

The perceptional change of fragrance of essential oils is described in relation to type of work, i.e. mental work, physical work and hearing environmental (natural) sounds. The essential oils examined in this study were ylang ylang, orange, geranium, cypress, bergamot, spearmint and juniper. It was confirmed that inhalation of essential oil caused a different subjective perception of fragrance depending on the type of work. For example, inhalation of cypress after physical work produced a much more favorable impression than before work, in contrast to orange, which produced an unfavorable impression after physical work when compared with that before work. For mental work, inhalation of juniper seemed to create a favorable impression after work, whereas geranium and orange both produced an unfavorable impression then.
(Alteration of perceived fragrance of essential oils in relation to type of work: a simple screening test for efficacy of aroma.;Sugawara Y, Hino Y, Kawasaki M, Hara C, Tamura

K, Sugimoto N, Yamanishi Y, Miyauchi M, Masujima T, Aoki T.; Department of Health Science, Hiroshima Prefectural Women's University, Japan)

Fragrance restores immunity suppressed by stress

The *in vivo* effects of the fragrances of cardamon, labdanum, jasmine, oak moss and tuberose on suppressed humoral immune response induced by high pressure stress were investigated. Immune suppression due to glucocorticoid released from the adrenal glands due to stimulation by corticotropin-releasing factor derived from the hypothalamus that had been stimulated by stress was restored to normal by inhalation of either labdanum, oak moss or tuberose for four days post-stress. Jasmine and cardamon had no effect.

Previous experiments had demonstrated that pretreatment of the nasal cavity with procain blocked the restoring effect of fragrance. This indicated that the effect was via stimulation of the olfactory system and not via absorption of the odor molecules by the lungs. The current study showed that aromatic fragrances were effective in restoring altered immune response induced by stress. This was achieved by blocking the activation of the hypothalamus via the olfactory bulb.

(Recovery of PFC in mice exposed to high pressure stress by olfactory stimulation with fragrance. Shibata H, Fujiwara R, Iwamoto M, Matsuoka H, Yokoyama M M International Journal of Neuroscience)

A circadian clock in the olfactory bulb controls olfactory responsivity.

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Recently, it has been shown that multiple mammalian cell types express daily rhythms in vitro. Although the suprachiasmatic nucleus (SCN) of the hypothalamus is known to regulate a wide range of circadian behaviors, the role for intrinsic rhythmicity in other tissues is unknown. We tested whether the main olfactory bulb (OB) of mice mediates daily changes in olfaction. We found circadian rhythms in cedar oil-induced c-Fos, a protein marker of cellular excitation, in the mitral and granular layers of the OB and in the piriform cortex (PC). These oscillations persisted in constant darkness with a fourfold change in amplitude and a peak approximately 4 h after the onset of daily locomotor activity. Electrolytic lesions of the SCN abolished circadian locomotor rhythms, but not odor-induced c-Fos rhythms in the OB or PC. Furthermore, removal of the OB abolished spontaneous circadian cycling of c-Fos in the PC, shortened the free-running period of locomotor rhythms, and accelerated re-entrainment after a 6 h

advance and slowed re-entrainment after a 6 h delay in the light schedule. OB ablation or odorant altered the amplitude of c-Fos rhythms in the SCN and ablation of one OB abolished c-Fos rhythms in the ipsilateral PC, but not in the contralateral OB and PC. We conclude that the OB comprises a master circadian pacemaker, which enhances olfactory responsivity each night, drives rhythms in the PC, and interacts with the SCN to coordinate other daily behaviors.