

# A sniff that will make your day:the different effects of natural versus synthetic...

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The olfactory system is directly linked to the oldest parts of the brain, the palaeocortex and the limbic system, in which both account for mood and emotions. Phylogenetically, it was hypothesized that chemo-taxis and olfaction were the first means of communication or finding nutrition, even by protozoa and protists, long before other senses evolved. Thus, the oldest sense, olfaction, is deeply rooted in the human brain [2]. It has been published that in order for an odor to elicit any sort of response from the sniffer, it basically has to be linked to the individual's past experience where beliefs about an odor are more important in determining the individual response to that odor than its actual biochemical properties. Here, the hedonic value of odors is important in inducing mood changes; odors perceived as pleasant can enhance positive mood and decrease anxiety, while those perceived as negative have the opposite effects [3]. Their subjective ratings of pleasantness and unpleasantness affect not only how we feel, but also the quality of our emotional attachments with other humans [4]. Therefore it is expected that the experienced odor quality and not the odor itself modulates mood[5].

However, no study has shown the varied effects of natural versus synthetic odors on an individual's mood, and the effectiveness of the diverse mixtures. The neurological connections behind olfaction are especially doctored for associative learning and emotional processing. In fact, olfaction is a chemoreception occurring at the peripheral level of the olfactory system for the processing of an odorant. Odorants are sampled by a large number of olfactory receptors (ORs) located in the cilia of olfactory sensory neurons/cells (OSNs) along the nasal cavity[6].

The latter thus activate the glomeruli that aggregate these signals and transmit them to the olfactory bulb, where the sensory input cooperates with different brain regions responsible for smell identification, memory, and emotion. Furthermore, the olfactory bulbs are a part of the limbic system, and they directly connect with limbic structures that process emotions i. e. the amygdala and associative learning i. e. the hippocampus [7]. No other sensory system has this type of intimate link with these neural areas, therefore there is a strong neurological basis for why odors trigger emotional connections and affect mood. Additionally, Physiological and psychological effects of essential oils have been acknowledged in folk medicine and aromatherapy for a long time[8], where aromatherapy claims that citrus essential oils exert mood lifting effects. The judgment of an odor's quality as pleasant or unpleasant essentially affects the emotional response to this odor whether natural or synthetic[5].

In the study concerning the effects of synthetic versus natural cat odorant on rodent behavior done in America, the exposure to natural odor elicited typical and persistent anxiety-related behaviors whereas that to synthetic odorant evoked no significant alteration in behavior [9].

The latter could also prove correct concerning the effects of the dissimilar-sourced odorants on mood. The goal of the present study is to tackle the important question whether natural and synthetic odors differ in their effect on an individual's mood. The strong association of odors with emotions, both on the neurophysiological and on the experience level suggests that odors are effective mood regulators[5], where many patients who suffer from

anosmia, a complete loss of the sense of smell, also become depressed. It was hypothesized that a lack of stimuli to the palaeocortex in anosmic patients may account for that deterioration in mood and quality of life, because an odorless life is quite monotonous.

Not many studies in the Middle East were done about this topic; mainly, the studies found were relating to the art of aromatherapy used in Turkey and other regions where aroma and the aroma-active compounds of olive oils were analyzed by gas chromatography–mass spectrometry–olfactometry (GC-MS-O) to compare the geographical effect of these oils on their odorant-active compounds and the qualities they affect [10].

### **Objective:**

- Primary Objective:
- To study the effectiveness of the natural versus the synthetic odors on a person's mood among Lebanese individuals aged between 18 and 60 in Beirut.
- Secondary Objective:
- To study the effectiveness of the different natural odor mixtures versus the mono-odorants on the mood.
- Materials and Methods:

### **Study Design:**

- An experimental prospective case-control study will take place mainly in Beirut, Lebanon between October 2018 and May 2019 among random individuals of age range 18-60. The different groups are going

to be exposed to various odors differing in their origin (natural or synthetic), being mainly the aroma of lavender and orange.

- Population of the Study & Sample Size:
- Individuals residing in Beirut and its suburbs; of age being between 18 and 60 between October 2018 and May 2019 are considered.
- A sample size of 250 individuals will be considered in the study, to keep up the trend used in the previous studies and to get significant results after the individuals are randomized into different groups between control and study conditions.
- Inclusion Criteria:
  - Age ~ 18-60
  - Lebanese nationality
  - Normal nasal and lung conditions
  - No previous lung diseases affecting olfaction

**Exclusion Criteria:**

- Being of age not within the stated range
- Being smokers
- Having a case of common flu or allergies affecting olfaction
- Having nasal or lung deformities affecting sense of smell
- Having weak sense of smell (inability to differentiate dissimilar smells)
- Refusing to participate in the study

**Experimental Design:**

- 250 people of age between 18 and 60 were included in this study. An informed consent form according to the Helsinki Declaration will be required; those subjects will be informed that the purpose of the study

is to find the correlation between undertaking a computerized test and mood in order to decrease bias. After the experiment, the true purpose of the study should be voiced along with the approval of the provided consent.

- The participants will be divided into five groups, each containing 50 individuals, and comparable for age, health, and gender conditions. They should be screened by self-report methods concerning their olfactory conditions and the possibility of any olfactory hindrances
- A learned helplessness procedure will be used to induce a slightly negative mood within the five groups; no other steps will be done for the control group which will provide information about the efficacy of this procedure.
- Helplessness Induction Procedure: In order to affect the participants' emotional state, an unsolvable emotional intelligence test will be introduced. A total of 264 faces will be presented in a facial expression assessment task (100ms duration) in a random order. Participants will be asked to assess within 3s whether the faces express a negative or a positive emotion.