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Recovery of olfactory capacity following a COVID-19 infection

Sourced from the technical article "Récupération des capacités olfactives : un entraînement particulier est possible chez les professionnels du vin !" (Revue Française d'Œnologie, 2020).

>>> The loss of the sense of smell related to COVID-19 is not irreversible. It appears to last between eight and nine days on average, but can go on for several weeks for some patients. In order to help with the optimal recovery of your sense of smell and avoid qualitative disorders that sometimes arise after a period of anosmia, it is possible to train using simple exercises. However, the exercise protocols must be suited to the way in which the virus acts on the olfactory system by tapping into the specific skills of wine professionals. <<<

Up to 86 % of individuals suffering from COVID-19 describe a loss of their olfactory performance. This loss of smell is not irremediable. It appears to last between eight and nine days on average, but can go on for several weeks for some patients[1].

It is possible to strengthen or help olfactory recovery through simple exercises. Although disorders do not last very long for some COVID-19 sufferers, olfactory training should ease the functional recovery of smell insofar as it improves sensitivity to odors, their recognition and their identification. It so happens that people who use their sense of smell professionally quite often unintentionally develop exceptional olfactory abilities. We can draw on their experience to our benefit. Among other things, the exercise protocols must be suited to the way the virus acts on the olfactory system, which appears to be indirectly affected in the case of COVID-19. In fact, tissue inflammation leads to the obstruction of the nasal cavities and thus hinders access to the receptor cells (olfactory neurons), affecting the subjects' ability to detect and identify smells.

■ Which training methods can be used?

➔ Training through olfactory mental imaging

To begin with, given that the nasal cavities are obstructed, it would be ineffective to try smelling fragrant samples - these sessions will take place at a later stage. We do, however, believe that it would be healthy to continue exercising the process of air sampling that we call sniffing.

In the absence of actual, objective perception, the first useful exercise could be an olfactory mental imaging task. Its objective is to stimulate the ability to imagine smells in the absence of the odorant source.

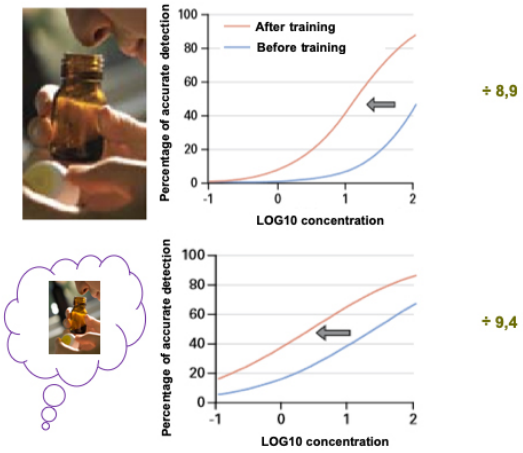


Figure 1. Reduction in detection thresholds through learning. Here we compare the effect of training through repeated exposure (A) and through olfactory mental imaging (B) on sensitivity to 1-octen-3-one (an earthy-moldy defect in wines; giving off a mushroom-like odor). In both cases, a decrease in the detection threshold, therefore an increase in sensitivity, is observed. The gains obtained (8.9 and 9.4) through both methods are very similar (adaptation of Tempere *et al.*, 2014)[2].

We then create a sort of olfactory hallucination on-demand, that does not involve smelling the oder, instead *perceiving* it. This competence is particularly well developed in olfactory experts, such as wine professionals[2]. We have suggested, and tested, for the first time, this type of training exercise. To carry it out, we advised choosing a calm moment, and an environment with a neutral fragrance (particularly for hyposmic individuals) and trying to imagine a familiar smell, that you find pleasant or unpleasant. It is not about mentally visualizing the odorant source (although that may help) but trying to perceive the smell. Because the creation of an olfactory mental image is not a common exercise, it may help to close your eyes, mimic sniffing a scent and imagine a setting (e.g. to summon the smell of lemon, imagine that you are in the kitchen slicing the fruit). The "olfactory" mental image activates and recruits certain neurophysiological mechanisms that are used during objective perception. It has been proven thanks to brain imaging measurements that the areas of the brain activated during olfactory mental imaging are similar to those activated by smelling a real odorant[3].
In a study carried out with enologists, we showed that this mental task, which requires no equipment, is just as effective as tasks involving repeated exposure to real odorants[2].

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Finally, in this case, olfactory mental imaging showed its operational reality! By imagining different smells, over the course of this experiment, subjects clearly increased their sensitivity as well as their ability to identify them. Interestingly, the results from this type of strengthening remain specific to the smells imagined. Note that this study was carried out on subjects who had a normal sense of smell, but using odorant sources of which they had a weaker perception, such as specific anosmia or hyposmia.

It is important to carry out this exercise daily and to focus for about ten days on the same odors (in the aforementioned study, the tasters were instructed to imagine two smells daily, for several minutes at a time). In the following days, it is possible to attempt to carry out the same task with two new smells.

The purpose of this exercise is to stimulate your olfactory system, which is no longer able to be activated by everyday smells, in order to maintain its abilities.

➔ Training through repeated exposure to odors

Later on, having regained olfactory sensitivity, a training exercise involving repeated exposure to various odorant sources can be set up. Daily exposure to odorants (perfumes, spices, essential oils, pastry flavorings, etc.) can alter the sensitivity, the ability to discern and identify the smells to be 'relearned'. Training through repeated exposure can enable specific anosmic subjects to recover some degree of sensitivity. Furthermore, the repeated scenting of wines (as well as their tasting) can improve the ability to differentiate them[4].
In 2006, Li *et al.*[5] showed that prolonged exposure to a single odorant (for less than 5 minutes) increased the ability to differentiate between odorous substances that are similar in terms of their olfactory quality or their chemical structure (molecules with identical chemical functions). It is easy to draw on this work by attempting to distinguish between and compare certain smells: for example, the smell of orange zest and lemon zest; the aroma of coffee and that of chocolate; the fragrance of cloves and that of nutmeg; etc. So, focus your attention on the difference between these smells, and try to describe this difference.

The physiological effects of such simple training through repeated exposure are directly highlighted in the olfactory epithelium, the olfactory bulb, which can lead to neuronal alterations that influence the brain pathway of olfactory information.

To make the most of this training, certain precautions should be taken (Tempere *et al.*, 2012)[6]: choose a calm moment (in the morning before breakfast and before applying perfume, to avoid competing smells), in a fragrantly neutral place, then smell the odorants you have selected. We recommend that you choose intense smells for this type of training, in order to introduce physiological changes. However, it is not necessary to use precise concentrations. Patel *et al.* (2017)[7] demonstrated the effectiveness of using essential oils (rose, eucalyptus, lemon and clove) in non-specific concentrations for olfactory training exercises, in subjects suffering from general olfactory disorders.
Repeatedly sniff each odorant for about thirty seconds. Repeat this exercise daily for several weeks (from 1 to 3 months). It is then possible to extend the training by repeating the exercise with other odorant sources.
Finally, these exercises can either be carried out blindly, or by mentioning the name of the odorant. Indeed, the descriptor-smell association facilitates recollection.

Note that these exercises can be carried out even under regular perceptive conditions, in the absence of generalized olfactory disorders. For example, they are effective in the recovery of specific anosmic afflictions[2,6]. ■

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