

## Supplementary Material

### 1. Supplementary Method: Factor analysis on the quality of life items

To analyze the data from the Quality of Life questionnaire, we performed Multivariate Ordinal Regressions (MOR), but due to computation time constraints, it was not possible to run a single MOR for the 16 QoL items. Four MORs were therefore run on 4 sub-groups of items that were identified with a factor analysis as explained hereafter.

To determine the structure underlying the items of the Quality of Life questionnaire, we ran a factor analysis of the polychoric (because all items were measured on an ordinal scale) correlation matrix of the 16 QoL items by using generalized weighted least squares as the factoring method. We used varimax rotation to obtain orthogonal factors. The factor analysis was performed with the *fa* function in the R package *psych* (Revelle, 2020). The number of retained factors was assessed by the empirical Bayesian Information Criteria (eBIC), which reached its minimum for 6 factors. Each of the 16 original QoL items had a loading absolute value of at least 0.3 on at least 1 factor. Once this factor analysis was done, QoL items were grouped based on the underlying factors: each QoL item that shared the same most representative underlying factor (**Fig. S1**) or that shared similar domains were put together as response variables in a MOR. Thanks to this approach, 4 MORs were conducted, one with “Add salt”, “Add sugar”, “Add spices”, and “Add fat” (all items loading mostly on the first factor, representing food compensations), one with “Have domestic accidents”, “Burn clothes while ironing”, “Burn meals”, and “Eat rotten food” (all items loading predominantly on the third factor, representing risks of accidents), one with “Enjoy smelling flowers”, “Smell smokes/gas”, “Enjoy eating”, and “Eat alone” (all items loading predominantly on the second or the fifth factor, representing changes in pleasures) and one with “Control own body odor”,

“Take showers”, “Seek close ones’ odors”, and “Wear perfume” (all items loading predominantly on the fourth or the sixth factor, representing odor control).

## **2. Supplementary results**

### *2.1. Descriptions of the phantom smells*

Analysis of the descriptions of the phantom smells (N = 1077 responses) showed that the vast majority of the participants smelled something burning (43.4%: burnt item, smoke/smoked item, cigarette/tobacco, fire, grilled/toasted item), something rotten (15.8%: rotten item, sewer, garbage, dirt, sulfur smell, etc.), air pollution (9.3%: gasoline, gas, exhaust pipe, pollution, etc.), chemical products (8.1%: ammoniac, chlorine, bleach, medication, etc.) and metal-like odors (4.6%: iron, metal, blood, etc.). Adjectives spontaneously used to qualify the phantom smells were more often negatively (19.1%) than positively (1.8%) connoted. Some participants mentioned food odors (13.7%). Here, it must be noted that some participants reported what has previously been defined as a “re-experience” (Bernhardson et al., 2009), or flashbacks, that are triggered either by the sight of an odorous object (a food most of the times) or by other triggers (mechanical like yawning or blowing one’s nose, suggestion like reading/talking about a smell). These perceptions are very ephemeral and can be assimilated to odor imagery (Bensafi et al., 2003). Phantom smells were twice more often described as constant (9.9%) than fluctuating (5.6%). Finally, while some reports indicated that phantom smells appeared after the total loss of olfaction (either just after or sometimes several months after having recovered a perfectly normal sense of smell), some others explained that a phantom smell occurred just before the loss of olfaction.

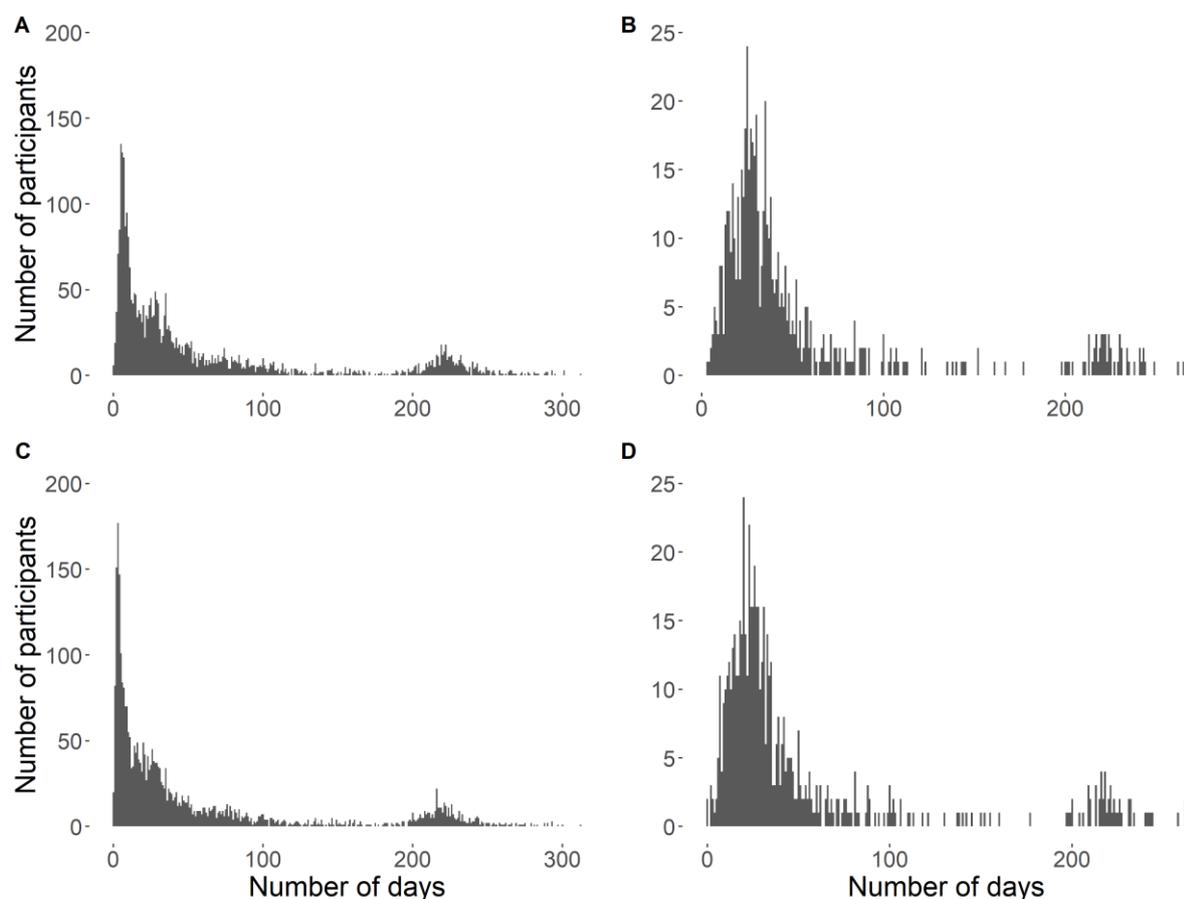
### *2.2. Factors associated with the impact of OD on the 16 Quality of Life items*

Here we report to what extent the following 9 factors are associated with significant variations in quality of life: participant’s (i) age, (ii) gender, (iii) BMI, (iv) smoking status,

(v) OD type, (vi) OD onset speed, (vii) OD constancy, (viii) age by gender interaction, and (ix) the duration of OD. OD duration was playing a major role for most items. A long OD increased the probability to report adding more salt, more sugar, more spices or more fat to a participant's plate. It is also associated with a greater propensity to report more domestic accidents, burn meals more often and eat more rotten food. In the intimate sphere, a prolonged OD induced to control one's body odor more often, to take more showers and to seek more often the smell of one's loved ones. Gender was another important predictor of the impact of OD on quality of life: women more often reported adding more salt to their plates, having more domestic accidents or burning dishes. On the other hand, women reported having less pleasure smelling flowers and wearing perfume less often. Women also more often controlled their body odor and that of their loved ones, as well as taking more showers. There was an interaction between gender and age for the propensity to eat alone: men reported more frequently to eat less often alone as they aged, whereas women showed no variation with age. Additionally, younger men sought less often the smell of their loved ones than other gender:age categories. Age on its own influenced a few other aspects of quality of life: younger participants reported more often a variation in their salting habits and in their eating pleasure (either more or less). They also reported eating more often rotten food than older participants. The Body Mass Index (BMI) of the participants explained part of the variation for the impact of OD on quality of life for the following items. Participants with lower BMI reported eating rotten food more often and a lesser eating pleasure. They also reported to control less their body odor and to wear less perfume. Smoking habits of the participants impacted only one item of quality of life: smokers reported to control their body odor more frequently. The characteristics of the OD modified the impact on quality of life. A total OD reduced the amount of fat participants added to their plates and increased the frequency of burning dishes. A total OD also decreased the joy of smelling flowers and of

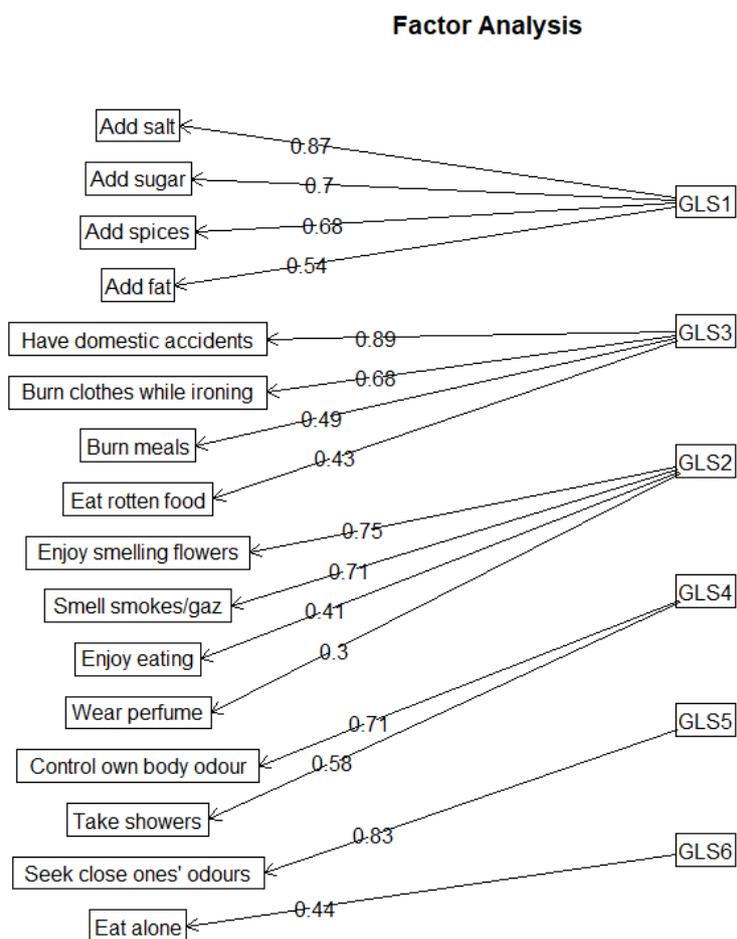
eating, as well as the ability to detect smoke or gas. Participants with total OD sought the smell of their loved ones more frequently and wore less perfume. Participants with constant OD reported less joy in eating and smelling flowers, as well as a lower ability to detect smoke or gas. Participants with a sudden onset OD reported to have more frequently burned their dishes. Finally, burning clothes while ironing was the only item of the questionnaire on quality of life that was not affected by any of the explanatory variables, potentially because there was little variation in the answers with most participants reporting no change for this item.

### 3. Supplementary figures



**Fig. S1.** Number of days between the onset date of COVID-19 and the date the questionnaire was completed by (A) all the participants (N=3111) and (B) participants who reported that they recovered from OD (N=609). Number of days between the onset date of COVID-19

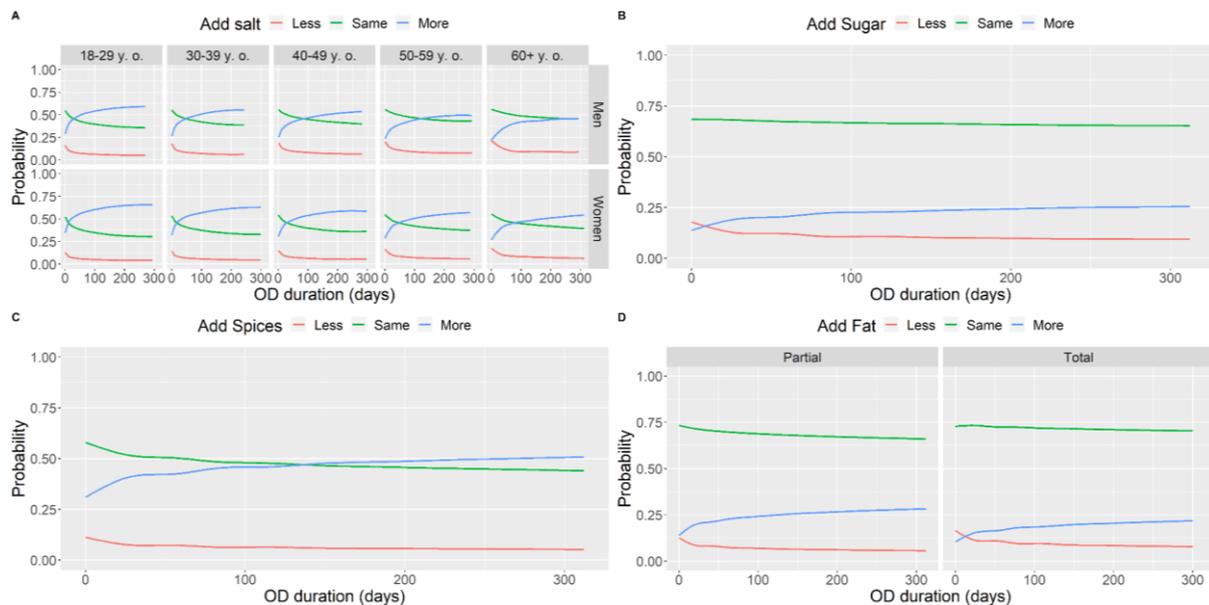
related OD and the date the questionnaire was completed by **(C)** all the participants (N=3111) and **(D)** participants who reported that they recovered from OD (N=609).



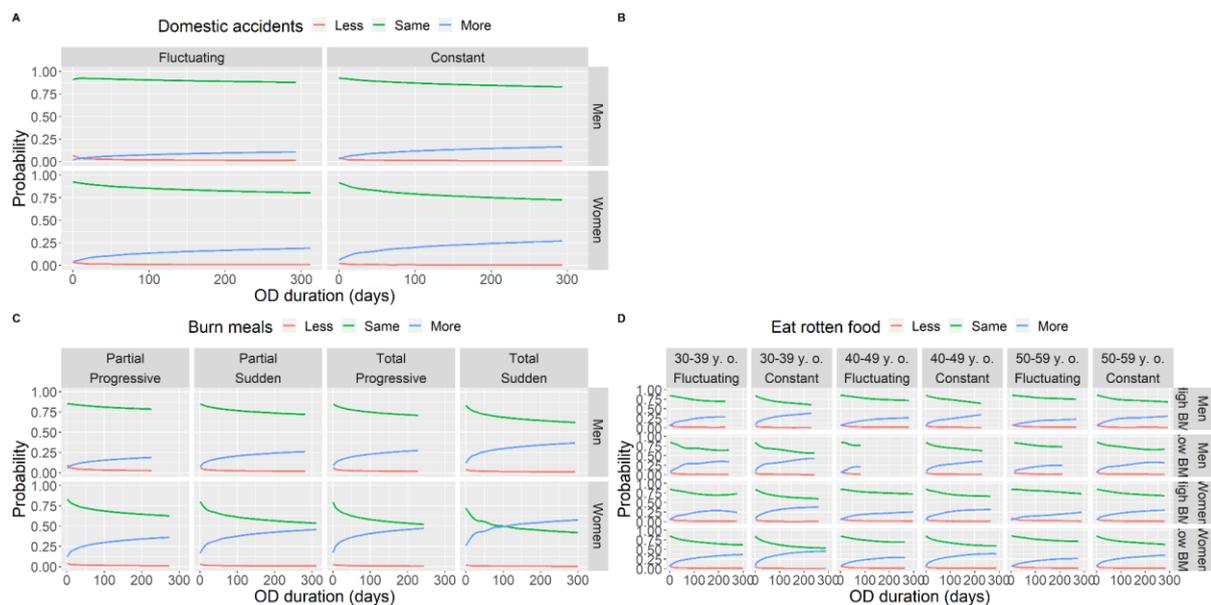
**Fig. S2.** Factors derived from the factor analysis (GLS1 to GLS6), with their relationship with the original 16 Quality of Life items. GLS1 represent food compensations, GLS2 represent pleasurable moments, GLS3 represent risks of accidents, GLS4 represent odor control, GLS5 represents eating alone and GLS6 represent wearing perfume.



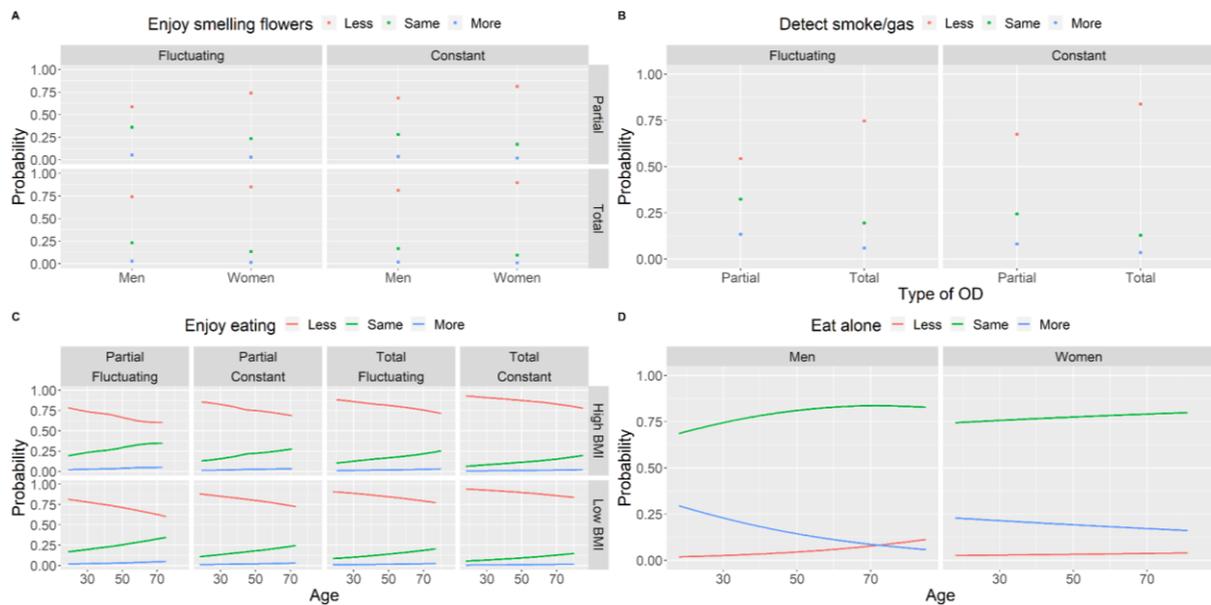
**Fig. S3.** Response frequency for the 16 items of the quality of life questionnaire (N = 3111). Items with dark blue background received more “more than usual” than “less than usual” answers, and items with light blue background had the reverse pattern (significant  $\chi^2$ -tests).



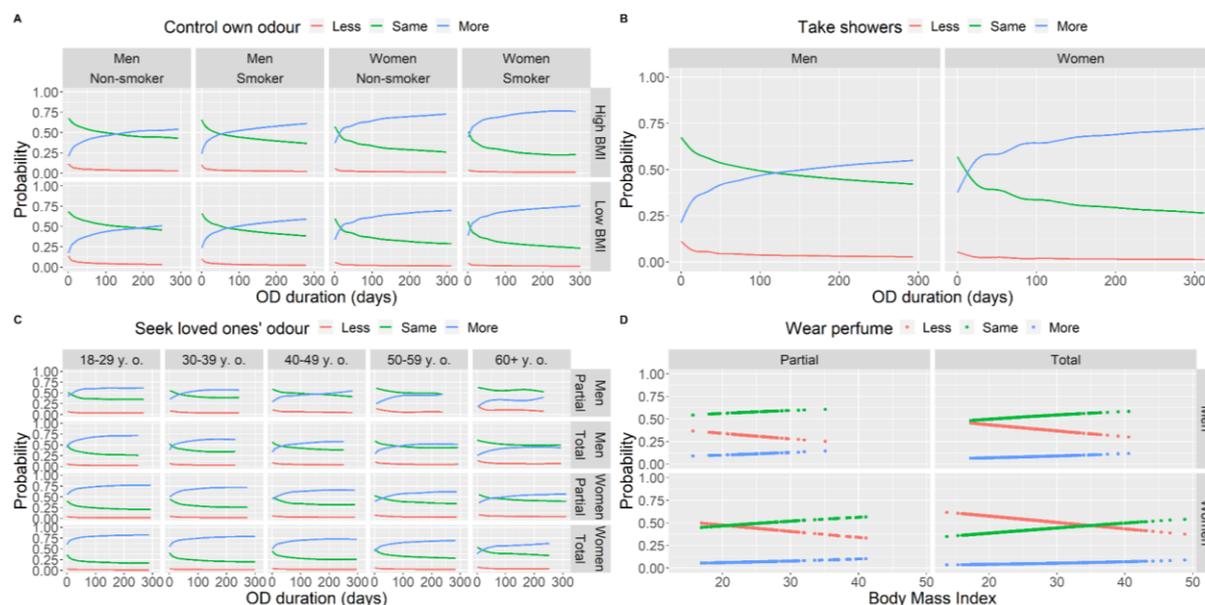
**Fig. S4.** Presentation of the significant effects on the four items concerning food compensation. **A)** Effects of gender, age and OD duration on adding salt, **B)** Effect of OD duration on adding sugar, **C)** Effect of OD duration on adding spices, and **D)** Effects of OD duration and type of OD on adding fat. Red, green and blue lines correspond to the probability to answer “Less than usual”, “Same as usual” and “More than usual”, respectively, to the corresponding quality of life item.



**Fig. S5.** Presentation of the significant effects on the four items concerning food compensation. **A)** Effects of gender, constancy of OD and OD duration on domestic accidents, **B)** No effects of any variable on burning clothes, **C)** Effect of gender, type of OD, onset speed of OD and OD duration on burning meals, and **D)** Effects of gender, BMI, age, constancy of OD and OD duration on eating rotten food. Red, green and blue lines correspond to the probability to answer “Less than usual”, “Same as usual” and “More than usual”, respectively, to the corresponding quality of life item.



**Fig. S6.** Presentation of the significant effects on the four items concerning pleasurable items. **A)** Effects of gender, type of OD and constancy of OD on enjoying smelling flowers, **B)** Effects of type of OD and constancy of OD on detecting smoke/gas, **C)** Effects of age, BMI, type of OD and constancy of OD on enjoying eating, and **D)** Effects of age and gender on eating alone. Red, green and blue lines or dots correspond to the probability to answer “Less than usual”, “Same as usual” and “More than usual”, respectively, to the corresponding quality of life item.



**Fig. S7.** Presentation of the significant effects on the four items concerning odour items. **A)** Effects of OD duration, gender, BMI and smoking status on controlling one's own odour, **B)** Effects of OD duration and gender on taking showers, **C)** Effects of OD duration, gender, type of OD and age on seeking loved ones' odor, and **D)** Effects of gender, BMI and type of OD on wearing perfume. Red, green and blue lines or dots correspond to the probability to answer "Less than usual", "Same as usual" and "More than usual", respectively, to the corresponding quality of life item.

#### 4. References

- Bensafi, M., Porter, J., Pouliot, S., Mainland, J., Johnson, B., Zelano, C., Young, N., Bremner, E., Aframian, D., Khan, R., et al. 2003. Olfactomotor activity during imagery mimics that during perception. *Nat Neurosci.* 6:1142–1144.
- Bernhardson, B.-M., Tishelman, C., and Rutqvist, L.E. 2009. Olfactory changes among patients receiving chemotherapy. *Eur J Oncol Nurs Off J Eur Oncol Nurs Soc.* 13:9–15.
- Revelle, W. 2020. *psych: procedures for psychological, psychometric, and personality research.* Evanston, Illinois: Northwestern University.