

Perceptual and Semantic Processing of Odors: Evidence from Classification, Identification Tasks and Judgments of Pleasantness

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Introduction

Research on categories and knowledge structures has stressed perceptual similarity as a major principle for categorization, challenged by theory-based approaches. This debate mainly concerns the visually perceived world for which things have names. The less explored olfactive domain (Richardson & Zucco, 1989) seems rather well suited for the investigation of whether the data obtained from the visual modality are specific to that modality.

Experiments

4 pilot experiments were run in order to explore this question : a free sorting task of 16 odorants (every day life aroma), two identification tasks, and judgements on different dimensions for odors (intensity, pleasantness, dangerousness). The free sorting task established that odors, as visual objects, are structured into categories which are stable across subjects, and with typicality gradients.

This last result is further confirmed by data from the identification tasks of smells in which for ex. "lemon" is more accurately identified than "orange", this item being a prototype candidate for the "fruity" and "sweet" class of smells. However, a main difference between odors and visual objects relies in the principles of categorization : if similarity accounts for category structures of visual objects, pleasantness and pragmatic factors of human activities seem more adequate for odors.

The experiment presented at the poster session at the present meeting (Burnet et al., 1997) was precisely designed in order to evaluate whether decision times for pleasantness judgments were rather similar to early low level (perceptual) judgments of intensity or to late high level (semantic) ones such as judgments of "dangerousness", which rely on the previous identification of the odor source. Intensity judgments are significantly faster than both hedonism and danger ones. Analyses of deviations from the means show that whereas intensity judgments are very homogeneous, danger and hedonism distributions are not unimodal. These data confirm that intensity judgments rely on fast processes, whereas hedonism as well as danger judgments are heterogeneous decision processes involving, across subjects, either fast (perceptual?) decisions or late (semantic?) ones.

Conclusion

Results from the 4 tasks suggest that odors may be categorized and identified in a stable and accurate manner, across subjects, at the cognitive level, in a way that fit a prototypical view of cognitive categories, as conceived for visual objects. However, if visual objects are processed as "standing out there", odors are more closely structured as effects on the subjects, as it is also revealed by a linguistic analysis of *corpora* (David et al., in press).

At the linguistic level, the high variability in naming and the use of a number of linguistic devices to talk about odors contrast with the previous agreement in cognitive tasks. Such a "misfit" between stable cognitive categories and variable naming for odors, at least in Indo-European languages, calls for reconsidering the semantic theory of object-name mapping elaborated for visual objects, and therefore the too simple dichotomy of "perceptual" vs "semantic-verbal" processing, as developed in vision. Odors convince us that a strict conception of language as a nomenclature is not relevant for any type of cognitive objects. Naming does not exclusively result from the association between a name and a cognitive representation of an object in the world but also from negotiating a "label" within a group in order to construct the reference. Examples of cultures and languages that do have odor names, such as african languages as well as perfumers and oenologues terminologies confirm that lexical meaning is not only given by referring but also by establishing a shared contract. In short, the mapping hypothesis has to be reconsidered and the complex interactions between symbolic (collective) and perceptual (individual) constraints on the construction of cognitive categories have to be explored further.

References

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