



Investigation of individual and environmental factors modulating the chemical communication of positive emotions in humans

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Introduction

Context. Humans communicate information to others via volatile compounds contained in odor naturally produced by our body [1]. An increasing number of reports indicate that human emotional states can be communicated through our body odors (BO). There is evidence that the BO of an individual (namely the “donor”) experiencing fear, as well as other negative emotions, influences the physiology and cognition of another person (namely “perceiver”) and therefore influence his/her emotional state [2-4]. Although positive emotions have been much less explored, there is increasing evidence that their transmission through emitted BO is likely [5,6] as shown by their effects on perceivers’ physiology and behavior. However, the factors affecting this communication are still largely unexplored.

Aim. We created an innovative at-home method by testing dyads in order to investigate whether chemical communication of positive emotions by looking for aspects of the humans communicating which may act as modulating factors. Using an Emotional Induction Procedure (EIP; Positive or Neutral), we examined the emotional communication through BO between “donor-perceiver” dyads and how this was affected by the following factors: nature and duration of the relationship (couples or roommates, short or long), sociability (sociability level: high or low), perfume addition near BO.

Materials & Methods

	Roommates	Couples	Total
Short relationships	2	7	9
mean age (yo) ± SD	21.75 ± 0.86	26.77 ± 6.23	24.50 ± 4.26
Long relationships	3	7	10
mean age (yo) ± SD	27.17 ± 5.48	26.89 ± 3.52	26.97 ± 4.19
Total	5	14	19
mean age (yo) ± SD	25.5 ± 5.02	26.53 ± 3.26	26.31 ± 4.27

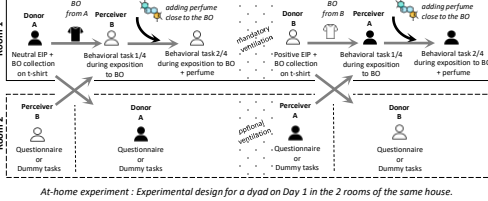
Distribution of the dyads involved in the at-home experiment.

Participants. 19 dyads (38 participants), heterosexual, non-smokers

Nature of relationships. Couples or Roommates

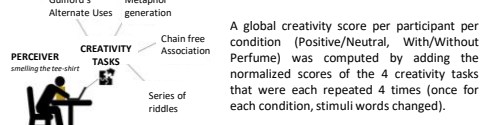
Duration of relationships. Between 0 and 2 years (“short relationships”) or between 2 and 4 years (“long relationships”).

At-home conditions. Natural and hygiene instructions to limit influences on BO quality. House or apartment large enough to allow the assignment of two rooms specifically for the experiment (not including the kitchen).



Procedure. Participant A serves as a donor in the Neutral EIP. Participant B is the perceiver. Then, participant B serves as a donor in the Positive EIP while participant A is the perceiver. BO was presented alone, and then close to specific perfume. On Day 2, the exact same procedure was repeated by swapping participant / the condition combinations. In this study, both participants of the dyads acted as BO donors and as perceivers.

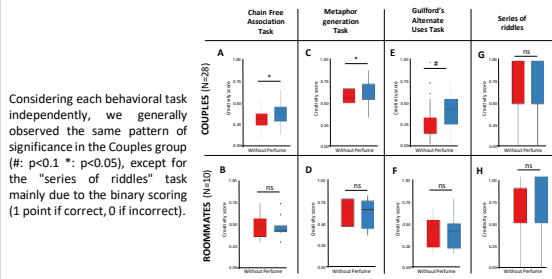
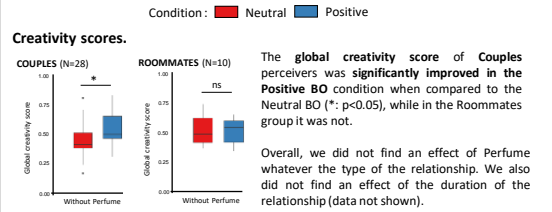
Emotional state measurements. Creativity tasks are used as a proxy of positive emotional contagion because creative problem-solving and divergent thinking have been robustly found to be impacted by positive affect [7].



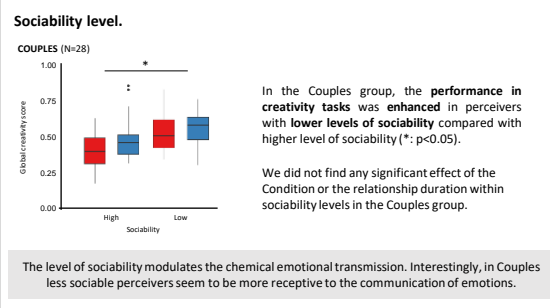
Questionnaires. All participants were asked to complete questionnaires on relationship's characteristics and sociability (McCroskey's Introversiveness and Emotional Intelligence Scale).

Data analysis. Linear mixed-effect models were conducted with the global and individual creativity scores as dependent variables, with Condition (Positive/Neutral BO), Perfume (With/Without), Relationship nature (Couples/Roommates), and Relationship duration (long/short), and Sociability (high/low), as fixed factors, with Subject as a random factor.

Results & Discussion



Considering each behavioral task independently, we generally observed the same pattern of significance in the Couples group (#: p<0.1 *: p<0.05), except for the “series of riddles” task mainly due to the binary scoring (1 point if correct, 0 if incorrect).



Conclusions

- We developed a new ecological methodology to investigate the nonverbal communication of emotion between humans and better understand the modulating factors.
- In a non-stressful environment, the effect of the communication on the emotional state of the perceiver seems to be modulated by the proximity of the relationship and the level of sociability.

As future perspectives, it is interesting to deepen the role of perfume use on BO in the emotional state transmission. Identifying the chemical markers of BO involved in this positive communication will also be a key step in understanding this mechanism.

Our results open new possibilities for cosmetic products adapted to innate nonverbal social communication. This research offers opportunities for developing new cosmetics capable of enhancing social communication, as a new generation of products promoting communication between humans, improving holistic personal beauty and wellbeing benefits for oneself and others.

Acknowledgements

The authors wish to thank Givaudan for providing odorants, and Manon Leygnier and Arnaud Fournel for data collection

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