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Development and Internal Validation of a Fat-, Sweet- and Salt-liking Questionnaire

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Introduction

- Overconsumption of Fat, Sugar or Salt: Risk for Health (WHO/FAO, 2003)
- Positive relationship between dietary consumption and hedonism
- Measure related to fattiness, sweetness and saltiness
 - Dietary consumption: standardized tools (nutritional epidemiology)
 - Overall Liking: no tool (sensory science)
- EpiPref Project: develop & validate tools (sensory tests & questionnaire) to measure the overall liking for saltiness, sweetness and fattiness

Objectives

Development (1) & validation (2) of an internet-based questionnaire (epidemiological approach) measuring the overall liking for fattiness, sweetness and saltiness :

- Literature Review + Expert Consultation + Pre-Tests
- Pilot study to measure
 - Feasibility / Reproducibility
 - Internal Validity

Questionnaire Content

Number of items (questions) per sensory sensation and type of question

Sensory Sensation	Type of Question				Total
	Liking for foods	Preferred level of seasoning	Preferred dishes in a menu	Dietary behaviour	
Fatty-Sweet	22	10	3	4	39
Sweet	20	9	3	4	36
Fatty-Salty	36	13	3	3	55
Salty	0	9	2	6	17
Total	78	41	11	17	147

- Distractors (n=8 items), socio-demographic (n=8) & feasibility questions (n=8)
- Total number of items in the entire questionnaire: 171 items

Participants and Administration

- 198 participants (108 women, 90 men), mean age: 39 years (SD=12)
- Web-based administration in duplicate (test-retest)
- Retest: 24 days (SD=3) after the test, 74% of the participants

Statistical Analysis

- Repeatability: RV coefficient & Pearson Correlation Coefficient
- Data Preparation: linear transformation of the ratings into values $\in [0;1]$ «Never Tasted» point: replaced for each participant by the mean of its ratings over the corresponding sensory sensation
- Internal Validity over each sensory sensation:

- Factorial Structure of the Questionnaire: Exploratory Factor Analysis, SAS[®] Proc Factor, Principal Component Extraction, Oblique Rotation
- Model improvement and Validation: Structural Equation Modeling
 - SAS[®] Proc CALIS (Covariance Analysis of Linear Structural equations), Maximum Likelihood (ML) Estimation
 - Goodness of Fit Indices: Satorra-Bentler correction for non-normality (Robust ML), R software, LAVAAN package

Questionnaire Extract

How much do you like... Liking for foods*

Olives: I do not like them at all I like them very much I have never tasted

How do you prefer your strawberries... Preferred level of seasoning*

Tick the box that corresponds to the way you prefer your strawberries: with no whipped cream with a lot of whipped cream I do not like strawberries

Select the dishes you prefer. Select the 3 dishes you prefer in the list hereafter. If you do not like anything in the list, tick the box labelled as «none»

- Beef steak (entrecôte) and its roquefort or béarnaise sauce
- Beef steak (entrecôte) cooked with thyme
- Chicken in mushroom sauce
- Chicken steamed with lemon
- Pork with creamy mustard sauce
- Pork on the grill
- White fish and its buttery sauce
- White fish in papillote with estragon
- None

Fatty-salty dishes* Preferred dishes in a menu*

*Mention not visible to the participant

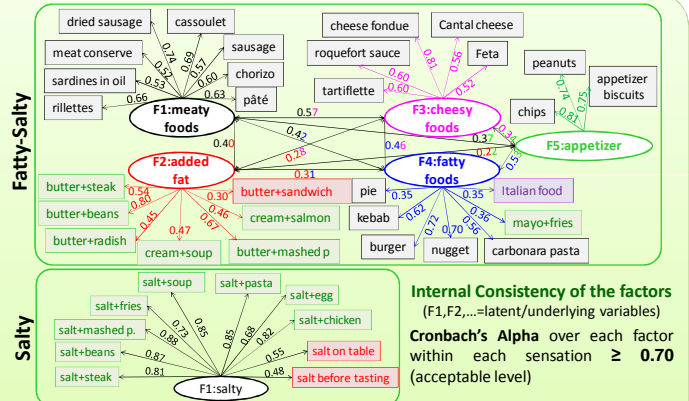
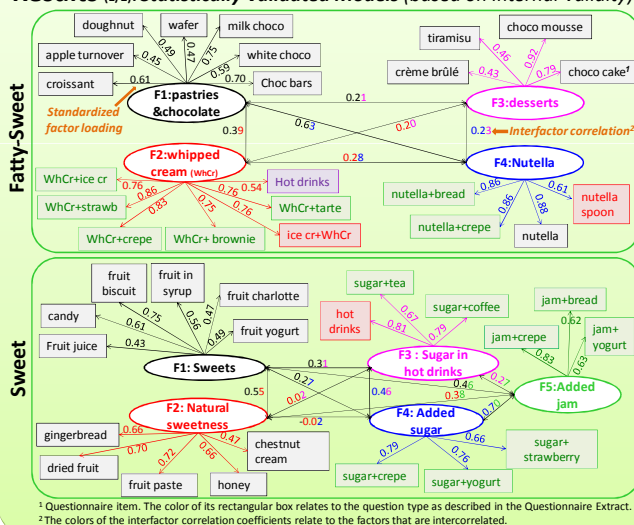
You buy a «butter-ham» sandwich in a bakery. Once in the street, you realize it's a sandwich with ham but no butter. Do you mind eating this sandwich without butter? Dietary behavior*

not at all very much

Do you add some salt to your meal without tasting it?

never rarely some-times often always

Results (1/2): Statistically Validated Models (based on Internal Validity)



Internal Consistency of the factors (F1,F2,...=latent/underlying variables)
Cronbach's Alpha over each factor within each sensation ≥ 0.70 (acceptable level)

Goodness of Fit Indices

- Acceptable level to validate a model
 - Ratio χ^2 : degree of freedom ≤ 2
 - Comparative Fit Index (CFI) ≥ 0.90
 - Root Mean Square Error of Approximation (RMSEA) ≤ 0.08
- Cf. Kline R.B., 2005

Goodness of Fit Indices	Fatty-sweet	Sweet	Fatty-salty	Salty
Satorra-Bentler Scaled χ^2	390	270	611	75
Degree of freedom	203	160	424	35
Ratio χ^2 :df	1.92	1.69	1.44	2.14
CFI	0.90	0.90	0.89	0.96
RMSEA	0.07	0.06	0.05	0.08

Results (2/2)

- Feasibility
 - Mean duration : 28.8 min (SD: 8.9). Too long for 22% participants
 - Questionnaire difficult: 1% participants
 - Questionnaire annoying: 6% participants
- Repeatability
 - Mean Pearson Correlation Coefficient between the test and retest scores based on the rating mean over each factor of each sensory sensation: **0.87** (SD:0.04, P<0.0001)
 - RV-coefficient (generalised correlation coefficient) between test and retest for the judge space: **0.81** (highly significant, permutation test)

Discussion & Conclusion

- In overall: 84 items (out of 147) selected through the factorial analyses
- Feasibility: questionnaire length to be reduced (item deletion, uploading improvement)
- Repeatability: demonstrated
- Internal Validity: demonstrated. Questionnaire applied to thousands of French people : factorial structure relatively similar.
- «External Validity»: liking assessed by the present questionnaire and by sensory tests (not presented here). Within each sensation, correlations between the sensory scores and the questionnaire scores arising from factors based on the «preferred level of seasoning» (mean correlation: 0.51±0.13, P<0.05).

