Alterations in food reward regarding bariatric surgery type and weight loss outcomes: an exploratory study.

Erika Guyot1,2,3, Julie-Anne Nazare2, Pauline Oustric4, Maud Robert5, Emmanuel Disse1,2, Anestis Dougkas3,† and Sylvain ICETA1,6,†,\*

1. Department of Endocrinology Diabetes and Nutrition - Integrated Center for Obesity Hospices Civils de Lyon, Lyon-Sud Hospital, 69310, Pierre-Bénite, France; +33 (0)4 78 86 57 86. erikaguyot.pro@gmail.com, emmanuel.disse@chu-lyon.fr

2. Centre de Recherche en Nutrition Humaine Rhône-Alpes (CRNH-RA), Unité INSERM 1060, Laboratoire Centre Européen Nutrition et Santé (CENS), CarMeN, Université Claude Bernard Lyon 1, 165, Chemin du Grand Revoyet, 69310, Pierre-Bénite, France; +33 (0)4 26 23 59 17. julie-anne.nazare@univ-lyon1.fr

3. Institut Paul Bocuse Research Center, 69130, Ecully, France; +33 (0)4 72 18 02 20. anestis.dougkas@institutpaulbocuse.com

4. School of Psychology, University of Leeds, Leeds, LS2 9JT, UK; +44 (0113) 343 3738. pspjo@leeds.ac.uk

5. Department of Digestive and Bariatric Surgery, Integrated Center for Obesity, Hospices Civils de Lyon, Hôpital Edouard Herriot, 69437 Lyon, France; CarMeN Laboratory, INSERM 1060, Lyon, France; Université Claude Bernard Lyon 1, Lyon, France; +33 (0)4 72 11 62 63. maud.robert@chu-lyon.fr

6. Centre de Recherche de l'Institut Universitaire de Cardiologie et de Pneumologie de Québec-Université Laval, 2725, Chemin Sainte-Foy, Quebec, QC G1V 4G5, Canada; +1 (418) 656-8711. sylvain.iceta.1@ulaval.ca

\* These authors contributed equally to this work and shared last co-authorship

\* Correspondence: sylvain.iceta.1@ulaval.ca; Tel.: +1 (418) 656-8711

Table S1 : Relationship between liking and wanting for foods and bariatric surgery type.

Table S2 : Socioeconomic and behavioral characteristics by Total Weight Loss tercile.

Table S1 : Relationship between liking and wanting for foods and bariatric surgery type

|  |  |  |  |
| --- | --- | --- | --- |
|  | SGn = 30 | RYGBn = 26 | Student-t testp value |
| **Explicit liking** |   |   |   |
| High carb – Solid  | 27.4 ± 22.1 | 24.9 ± 24.3 | 0.69  |
| High carb – Fluid  | 28.2 ± 20.4 | 21.9 ± 21.4 | 0.27  |
| Low carb – Solid  | 34.5 ± 28.2 | 26.0 ± 24.0 | 0.24  |
| Low carb – Fluid  | 22.9 ± 23.4 | 26.2 ± 25.9  | 0.61  |
| Dairy – Color  | 23.9 ± 19.1 | 21.8 ± 25.9 | 0.69  |
| Dairy – No color  | 29.8 ± 21.1  | 26.0 ± 26.9 | 0.56  |
| Nondairy – Color  | 26.5 ± 24.7  | 14.8 ± 15.7 | **0.04** |
| Nondairy – No color  | 28.3 ± 23.5 | 18.5 ± 16.7 | 0.09  |
| High fat – Savory  | 31.6 ± 29.0 | 21.6 ± 21.5 | 0.15  |
| High fat – Sweet  | 26.4 ± 24.2 | 23.2 ± 26.3 | 0.64  |
| Low fat – Savory  | 21.3 ± 20.7  | 16.4 ± 17.8  | 0.36  |
| Low fat – Sweet  | 31.7 ± 24.1 | 24.5 ± 23.8 | 0.27  |
| Fiber – Sauce  | 32.5 ± 26.0  | 25.3 ± 20.9 | 0.27  |
| Fiber – No sauce  | 27.1 ± 24.0  | 24.5 ± 20.5  | 0.66  |
| No fiber – Sauce  | 29.8 ± 23.8 | 25.9 ± 24.8 | 0.55  |
| No fiber – No sauce  | 32.9 ± 24.0 | 29.7 ± 27.6 | 0.64  |
| Meat – High fat  | 30.7 ± 29.3 | 26.8 ± 26.0 | 0.60  |
| Meat – Low fat  | 31.1 ± 29.9 | 31.5 ± 30.2 | 0.96  |
| No meat – High fat   | 30.4 ± 28.5 | 25.1 ± 22.2 | 0.44  |
| No meat – Low fat  | 24.8 ± 22.2 | 22.2 ± 20.1 | 0.64  |
| High protein – Variation  | 32.8 ± 27.1 | 25.9 ± 24.3 | 0.32  |
| High protein – No variation  | 34.7 ± 29.5 | 30.6 ± 28.6 | 0.60  |
| Low protein – Variation  | 32.4 ± 23.3 | 27.3 ± 21.5 | 0.41  |
| Low protein – No variation  | 31.0 ± 20.7 | 31.4 ± 26.5 | 0.95  |
| **Explicit wanting** |   |   |   |
| High carb – Solid  | 25.4 ± 23.2 | 23.2 ± 23.5 | 0.72  |
| High carb – Fluid  | 25.5 ± 19.3 | 19.2 ± 20.5 | 0.24  |
| Low carb – Solid  | 32.3 ± 28.3 | 23.6 ± 23.4 | 0.22  |
| Low carb – Fluid  | 22.6 ± 23.3 | 24.1 ± 26.2  | 0.82  |
| Dairy – Color  | 21.9 ± 20.2 | 20.4 ± 25.4 | 0.81  |
| Dairy – No color  | 28.6 ± 21.8 | 25.1 ± 25.7 | 0.59  |
| Nondairy – Color  | 23.2 ± 23.4 | 15.7 ± 18.8 | 0.20  |
| Nondairy – No color  | 26.7 ± 24.6 | 17.5 ± 16.6 | 0.12  |
| High fat – Savory  | 29.8 ± 28.8 | 20.4 ± 21.1 | 0.17  |
| High fat – Sweet  | 23.5 ± 24.6 | 20.4 ± 23.3 | 0.64  |
| Low fat – Savory  | 19.4 ± 20.6  | 16.5 ± 17.4  | 0.58  |
| Low fat – Sweet  | 30.6 ± 24.7 | 24.5 ± 23.2 | 0.35  |
| Fiber – Sauce  | 32.4 ± 27.3  | 25.6 ± 22.6 | 0.32  |
| Fiber – No sauce  | 25.9 ± 24.6  | 22.0 ± 19.4 | 0.53  |
| No fiber – Sauce  | 28.1 ± 24.5 | 25.5 ± 23.1 | 0.69  |
| No fiber – No sauce  | 32.3 ± 24.9 | 29.6 ± 26.6 | 0.70  |
| Meat – High fat  | 27.6 ± 28.2 | 26.4 ± 25.0 | 0.86  |
| Meat – Low fat  | 29.1 ± 29.8 | 31.6 ± 32.1  | 0.77  |
| No meat – High fat   | 30.0 ± 27.3 | 22.6 ± 20.5 | 0.27  |
| No meat – Low fat  | 23.2 ± 22.0 | 20.4 ± 19.1 | 0.62  |
| High protein – Variation  | 31.6 ± 28.7  | 26.8 ± 26.8 | 0.52  |
| High protein – No variation  | 33.5 ± 30.7 | 30.5 ± 31.1 | 0.21  |
| Low protein – Variation  | 32.3 ± 25.8  | 24.5 ± 19.9 | 0.72  |
| Low protein – No variation  | 33.0 ± 24.9  | 29.1 ± 26.0 | 0.57   |
| **Implicit wanting** |   |   |   |
| High carb – Solid  | -0.4 ± 27.5  | -4.9 ± 26.8  | 0.54  |
| High carb – Fluid  | -4.5 ± 17.7  | -8.1 ± 23.4  | 0.51  |
| Low carb – Solid  | 24.4 ± 25.9  | 15.3 ± 28.8  | 0.22  |
| Low carb – Fluid  | -19.5 ± 32.0  | -2.3 ± 32.8  | 0.05  |
| Dairy – Color  | -5.1 ± 26.0  | -4.0 ± 27.7  | 0.88  |
| Dairy – No color  | 20.4 ± 25.8 | 28.3 ± 21.5 | 0.23  |
| Nondairy – Color  | -17.0 ± 23.7  | -27.6 ± 21.7  | 0.09  |
| Nondairy – No color  | 1.6 ± 24.7  | 3.3 ± 31.6  | 0.83  |
| High fat – Savory  | 10.0 ± 27.6  | 6.8 ± 22.4  | 0.66  |
| High fat – Sweet  | -3.1 ± 24.1 | -5.9 ± 26.9 | 0.69  |
| Low fat – Savory  | -18.2 ± 29.3  | -12.6 ± 33.8  | 0.51  |
| Low fat – Sweet  | 11.2 ± 20.5  | 6.0 ± 22.8  | 0.38  |
| Fiber – Sauce  | 0.3 ± 22.8  | 1.1 ± 18.1  | 0.88  |
| Fiber – No sauce  | -11.6 ± 26.4  | -11.6 ± 22.0  | 0.10  |
| No fiber – Sauce  | -1.9 ± 17.2  | -4.6 ± 22.8  | 0.62  |
| No fiber – No sauce  | 12.7 ± 21.4  | 15.1 ± 18.4  | 0.67  |
| Meat – High fat  | 10.5 ± 19.6  | 4.1 ± 19.8  | 0.23  |
| Meat – Low fat  | 5.8 ± 22.7  | 11.0 ± 17.7  | 0.35  |
| No meat – High fat   | 2.1 ± 24.8  | -2.9 ± 19.4  | 0.41  |
| No meat – Low fat  | -18.4 ± 26.5  | -8.1 ± 29.9  | 0.18  |
| High protein – Variation  | -2.9 ± 26.8  | -1.3 ± 19.3  | 0.79  |
| High protein – No variation  | 14.6 ± 25.1  | 7.9 ± 17.1  | 0.26  |
| Low protein – Variation  | -9.5 ± 20.7  | -5.0 ± 13.4  | 0.34  |
| Low protein – No variation  | -2.2 ± 23.8  | -1.6 ± 16.5  | 0.92  |

SG : Sleeve gastrectomy; RYGB : Roux en Y gastric bypass; results are expressed in mean ± SD

Table S2 : Socioeconomic and behavioral characteristics by Total Weight Loss tercile

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Low reponders< 33% | Middle responders33 – 66% | Good responders> 66% | p-value |
|  | n = 18 | n= 19 | n = 19 |
| Sociodemographic data |   |  |  |  |
| Women (%) | 72.2 (n=13) | 78.9 (n=15) | 73.7(n=14) | 0.883 |
| Age (yr) | 47.2 (9.5) | 43.0 (11.0) | 41.8 (12.4) | 0.309 |
| Smoking status (%) | 0 (n=0) | 31.6 (n=6) | 26.3 (n=5) | 0.038 a  |
| Food budget constraint (%) | 16.7 (n=3) | 21.1 (n=4) | 5.3 (n=1) | 0.364a |
| Follow up visit |  |  |  |  |
| 6-month | 27.8 (n=5) | 42.1 (n=8) | 36.8 (n=7) | 0.877 |
| 12-month | 33.3 (n=6) | 31.6 (n=6) | 26.3 (n=5) |  |
| 24-month | 38.9 (n=7) | 26.3 (n=5) | 36.8 (n=7) |  |
| Anthropometric data |  |  |  |  |
| BMI Before surgery(kg.m-²) | 42.5 (5.4) | 43.4 (5.8) | 44.8 (6.8) | 0.826 |
| Body weight (kg) | 95.4 (12.3) | 87.2 (14.9) | 81.2 (22.4) | 0.050 |
| BMI (kg.m-²) | 33.8 (3.7) | 31.2 (4.0) | 29.2 (4.6) | 0.005 |
| % TWL | 20.0 (4.4) | 27.7 (2.8) | 34.83 (4.9) | <0.001 |
| Appetite sensations |  |  |  |  |
| Mean hunger (mm) | 17.2 (24.9) | 15.4 (22.6) | 30.4 (28.1) | 0.149 |
| Mean fullness (mm) | 70.5 (31.7) | 69.7 (27.6) | 64.6 (25.7) | 0.791 |
| Mean desire to eat (mm) | 18.1 (22.4) | 20.2 (22.5) | 28.0 (29.0) | 0.444 |
| Time since last meal (min) | 117 (215) | 117 (180) | 168 (251) | 0.719 |

**Abbreviations: BMI: Body Mass Index; % TWL: Percentage of Total Weight Loss.** Data are presented as mean (SD). p values are for ANOVA results; a indicates that Kruskal-Wallis one-way analysis of variance was used.