## ONLINE SUPPORTING MATERIAL

# Associations between taste perception profiles and empirically derived dietary patterns: An exploratory analysis among older adults with metabolic syndrome

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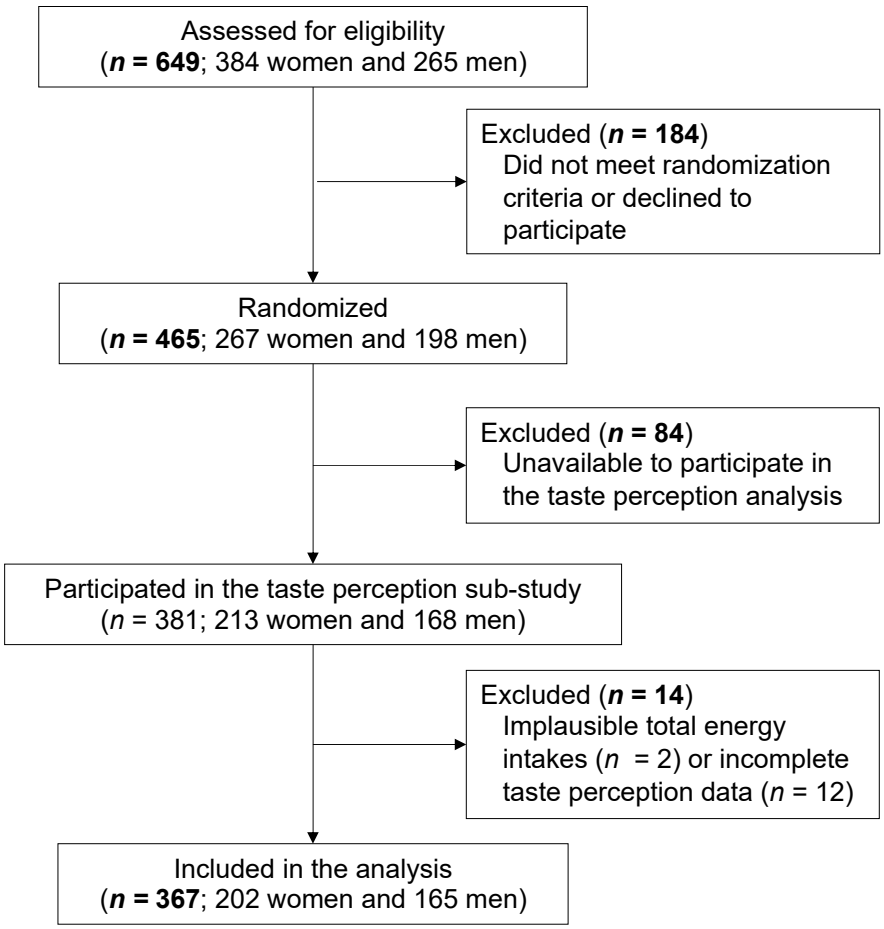
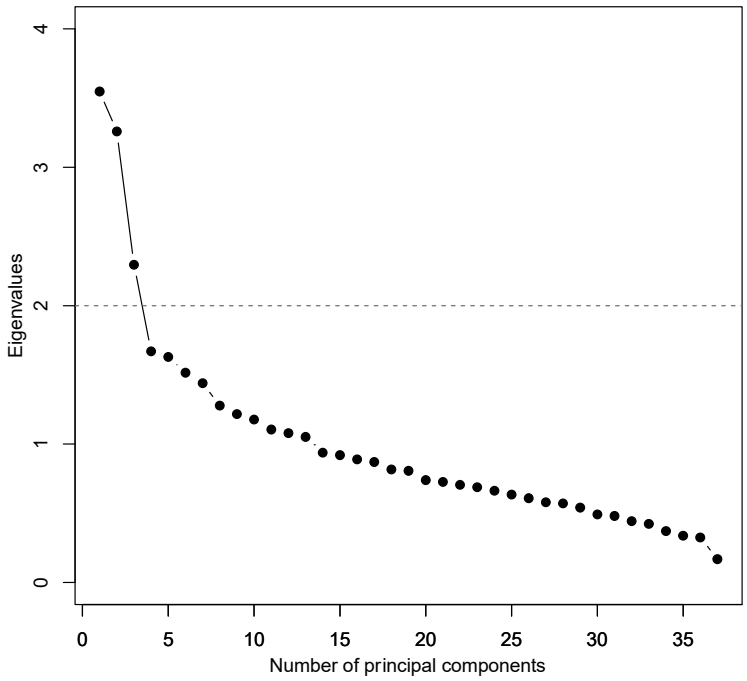



**Supplementary Figure S1.** Flowchart of PREDIMED-Plus Valencia participants.




**Supplementary Figure S2.** Scree plot of the eigenvalues used to determine the number of principal components to retain. Ultimately, three principal components were retained based on their eigenvalues >2.

**Supplementary Table S1.** Food groups and food items for dietary pattern analysis.

| Food groups | Food items |
|---|---|
| Fresh fish | White fish; blue fish |
| Shellfish | Canned natural fish; fish in oil; salted fish |
| Canned & salted fish | Oysters, clams, mussels; squid, octopus, cuttlefish; prawns, crayfish |
| Poultry | Chicken with/without skin |
| Red meat | Beef, pork; lamb; rabbit; liver; hamburgers |
| Processed meat | Serrano ham; cooked ham; sausages; pates; bacon |
| Eggs | |
| Low & no-fat dairy | Nonfat yogurt; low-fat milk; skim milk |
| Full-fat dairy | Full-fat yogurt; whole milk; sweet cream; cheese, cheese curds; spreads; condensed milk |
| Cruciferous vegetables | Cabbage, cauliflower, broccoli |
| Leafy green vegetables | Chard, spinach; lettuce, endive |
| Red & orange vegetables | Tomatoes; carrots, pumpkin |
| Other vegetables | Peppers; asparagus; green beans; onions; mushrooms; zucchini, eggplant; cucumber; gazpacho |
| Citrus fruits | Oranges, tangerines, and grapefruits |
| Non-citrus fruits | Strawberries; watermelon; melons; kiwi; bananas; apples, pears; cherries, plums; peaches, apricots, nectarines; grapes; dried fruits; fruit cups (in syrup) |
| Potatoes | Roasted and cooked potatoes; homemade fried potatoes; commercial fried potatoes |
| Legumes | Lentils; dried beans; chickpeas; peas and beans |
| Nuts | Almonds; pistachios; walnuts; other nuts |
| Whole grains | Whole grain bread; whole grain pasta; whole grain fiber biscuits; brown rice; muesli, oats |
| Refined grains | White bread; white rice; white spaghetti or macaroni; breakfast cereals |
| EVOO | |
| Refined olive oil | Refined olive oil; pomace olive oil |
| Vegetable oil | Corn oil; sunflower oil; soy oil; mixture of vegetable oils; margarines |
| Chocolate & dairy desserts | Chocolate biscuits; cocoa powder; chocolates and bonbons; custard, pudding; ice cream |
| Biscuits, pastries & Cakes | Biscuits; homemade pastries; commercial pastries; donuts; cupcakes; muffins; cake; turron; shortbread, marzipan; pastries |
| Olives | Olives |
| Tomato sauces & mustard | Fried tomato sauce (sofrito) and ketchup; mustard |
| Jelly, sugar & honey | |
| Butter & mayo | Butter; mayonnaise |
| Salty snacks | Other snacks besides fried potatoes (e.g., chips, pretzels) |
| Croquettes | Croquettes, fritters, and dumplings |
| Soups & cream packets | |
| Pizza | |
| Coffee | Decaf coffee; caffeinated coffee |
| Tea | |
| SSBs | Sodas with sugar; bottled fruit juice; non-alcoholic wine (e.g., musts) |
| Natural fruit juices | Orange juice; natural fruit juice |
| Wine | Rosé; sweet wine; young red wine; aged red wine; white wine; champagne |
| Beer | |
| Spirits | Liqueurs, anise; whiskey, gin, vodka |

EVOO, extra virgin olive oil; SSBs, sugar-sweetened beverages

**Supplementary Table S2.** Rotated factor loadings for all food groups from Principal Component Analysis[1]

| Veg/Fruit/WG | | Non-EVOO/Sweet/RG | | Alch/Salt/AnimFat | |
|---|---|---|---|---|---|
| Other veg | 0.66* | Refined olive oil | 0.73* | Wine | 0.55* |
| Leafy green veg | 0.63* | Vegetable oil | 0.47* | Olives | 0.54* |
| Red & orange veg | 0.62* | Biscuits, pastries & cakes | 0.44* | Beer | 0.52* |
| Non-citrus fruit | 0.61* | Refined grains | 0.40* | Spirits | 0.50* |
| Whole grains | 0.45* | Croquettes | 0.30* | Eggs | 0.40* |
| Canned/salted fish | 0.43* | Butter & mayo | 0.27* | Shellfish | 0.36* |
| Cruciferous veg | 0.32* | Chocolate & dairy desserts | 0.27* | Canned/salted fish | 0.33* |
| Low-fat dairy | 0.30* | SSBs | 0.25* | Red meat | 0.27* |
| Tea | 0.27* | Canned/salted fish | 0.22* | Processed meat | 0.25* |
| Poultry | 0.24* | Tomato sauces & mustard | 0.19 | Butter & mayo | 0.22* |
| Fresh fish | 0.22* | Olives | 0.15 | Other veg | 0.19 |
| Shellfish | 0.18 | Soup & cream packets | 0.11 | Pizza | 0.17 |
| Refined olive oil | 0.18 | Poultry | 0.10 | Potatoes | 0.16 |
| Natural fruit juices | 0.18 | Low-fat dairy | 0.10 | Tomato sauces & mustard | 0.16 |
| Potatoes | 0.15 | Non-citrus fruit | 0.09 | Poultry | 0.14 |
| Nuts | 0.14 | Pizza | 0.09 | Red & orange veg | 0.13 |
| Chocolate & dairy desserts | 0.11 | Potatoes | 0.08 | Fresh fish | 0.13 |
| Citrus fruits | 0.09 | Coffee | 0.05 | Chocolate & dairy desserts | 0.12 |
| Eggs | 0.07 | Eggs | 0.04 | Croquettes | 0.12 |
| Pizza | 0.06 | Red meat | 0.02 | Coffee | 0.12 |
| SSBs | 0.04 | Full-fat dairy | 0.01 | Refined grains | 0.06 |
| EVOO | 0.03 | Shellfish | 0.00 | Full-fat dairy | 0.05 |
| Red meat | 0.02 | Other veg | -0.02 | SSBs | 0.05 |
| Legumes | 0.02 | Citrus fruits | -0.03 | Salty snacks | 0.05 |
| Coffee | 0.00 | Beer | -0.03 | Leafy green veg | 0.04 |
| Olives | -0.01 | Cruciferous veg | -0.06 | EVOO | 0.04 |
| Jelly, sugar & honey | -0.04 | Red & orange veg | -0.06 | Jelly, sugar & honey | 0.02 |
| Processed meat | -0.05 | Salty snacks | -0.06 | Refined olive oil | 0.01 |
| Vegetable oil | -0.05 | Tea | -0.07 | Natural fruit juices | 0.00 |
| Biscuits, pastries & cakes | -0.09 | Leafy green veg | -0.09 | Biscuits, pastries & cakes | -0.02 |
| Tomato sauces & mustard | -0.13 | Spirits | -0.12 | Tea | -0.02 |
| Butter & mayo | -0.13 | Processed meat | -0.14 | Soup & cream packets | -0.07 |
| Wine | -0.13 | Jelly, sugar & honey | -0.17 | Cruciferous veg | -0.09 |
| Soup & cream packets | -0.14 | Natural fruit juices | -0.19 | Legumes | -0.15 |
| Salty snacks | -0.13 | Wine | -0.29* | Vegetable oil | -0.15 |
| Full-fat dairy | -0.20 | Whole grains | -0.31* | Citrus fruits | -0.16 |
| Spirits | -0.25* | Legumes | -0.33* | Nuts | -0.18 |
| Beer | -0.25* | Fresh fish | -0.33* | Non-citrus fruit | -0.20 |
| Croquettes | -0.30* | Nuts | -0.37* | Whole grains | -0.23* |
| Refined grains | -0.47* | EVOO | -0.73* | Low-fat dairy | -0.25* |

[1]Values are rotated factor loadings from PCA, arranged in descending order from higher factor loading (highest consumption) to lowest factor loading (lowest consumption). Food groups with a factor loading >|0.20| were considered to contribute significantly to a respective dietary pattern and were marked with an asterisks (*). Alch/Salt/AnimFat, Alcohol, Salty Foods, and Animal Fats dietary pattern; EVOO, extra virgin olive oil; Non-EVOO/Sweet/RG, Non-EVOO, Sweets, and Refined Grains dietary pattern; SSBs, sugar-sweetened beverages; Veg/Fruit/WG, Vegetables, Fruits, and Whole Grains dietary pattern.

**Supplementary Table S3.** ORs and corresponding 95% CIs of moderate or high relative to low adherence to the Veg/Fruit/WG dietary pattern among participants with each taste perception profile.

| | Reference taste perception profiles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low All | | High Bitter | | High Umami | | Low Bitter and Umami | | High All But Bitter | | High All But Umami | | $p^3$ |
| | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | |
| Low All | | | | | | | | | | | | | |
| Moderate | 1.00 | – | | | | | | | | | | | |
| High | 1.00 | – | | | | | | | | | | | |
| High Bitter | | | | | | | | | | | | | |
| Moderate | 0.87 (0.66, 1.15) | 0.327 | 1.00 | – | | | | | | | | | |
| High | 1.37 (0.99, 1.90) | 0.056 | 1.00 | – | | | | | | | | | |
| High Umami | | | | | | | | | | | | | |
| Moderate | 1.13 (0.85, 1.51) | 0.327 | 1.30 (0.97, 1.73) | 0.075 | 1.00 | – | | | | | | | |
| High | 1.27 (0.93, 1.71) | 0.128 | 0.92 (0.68, 1.25) | 0.602 | 1.00 | – | | | | | | | |
| Low Bitter & Umami | | | | | | | | | | | | | |
| Moderate | 1.93 (1.44, 2.57) | 0.402 | 2.21 (1.66, 2.95) | <0.001 | 1.70 (1.28, 2.27) | <0.001 | 1.00 | – | | | | | |
| High | 1.16 (0.91, 1.49) | 0.229 | 0.85 (0.66, 1.09) | 0.196 | 0.92 (0.72, 1.18) | 0.514 | 1.00 | – | | | | | |
| High All But Bitter | | | | | | | | | | | | | |
| Moderate | 1.17 (0.86, 1.59) | <0.001 | 1.34 (0.99, 1.82) | 0.061 | 1.03 (0.76, 1.40) | 0.836 | 0.61 (0.45, 0.83) | 0.002 | 1.00 | – | | | |
| High | 1.13 (0.82, 1.54) | 0.460 | 0.82 (0.60, 1.12) | 0.212 | 0.89 (0.65, 1.22) | 0.463 | 0.97 (0.70, 1.33) | 0.830 | 1.00 | – | | | |
| High All But Umami | | | | | | | | | | | | | |
| Moderate | 1.60 (1.18, 2.18) | 0.320 | 1.84 (1.34, 2.53) | <0.001 | 1.42 (1.03, 1.94) | 0.031 | 0.83 (0.60, 1.14) | 0.255 | 1.37 (1.00, 1.88) | 0.470 | 1.00 | – | |
| High | 1.99 (1.45, 2.74) | <0.001 | 1.45 (1.05, 2.00) | 0.023 | 1.57 (1.14, 2.17) | 0.006 | 1.71 (1.23, 2.37) | 0.001 | 1.77 (1.28, 2.44) | <0.001 | 1.00 | – | |
| Global *p*-value[3] | | | | | | | | | | | | | 0.631 |

[1]Values are ORs (95% CI) estimated via multinomial logistic regression, with adjustment for age, sex, physical activity, smoking status, use of antihypertensive and cholesterol lowering medication, type 2 diabetes, and BMI. Veg/Fruit/WG, Vegetables, Fruits, and Whole Grains dietary pattern.

[2]*p*-values from Chi Square tests for differences from the reference taste perception profile (calculated by column).

[3]*p*-value from log likelihood ratio test of joint significance in fully adjusted multinomial logistic regression models. Only 1 *p*-value is provided, as it is identical for all models regardless of the reference profile.

**Supplementary Table S4.** ORs and corresponding 95% CIs of moderate or high relative to low adherence to the Non-EVOO/Sweet/RG dietary pattern among participants with each taste perception profile.

| | Reference taste perception profiles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low All | | High Bitter | | High Umami | | Low Bitter and Umami | | High All But Bitter | | High All But Umami | | $p^3$ |
| | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | |
| Low All | | | | | | | | | | | | | |
| Moderate | 1.00 | – | | | | | | | | | | | |
| High | 1.00 | – | | | | | | | | | | | |
| High Bitter | | | | | | | | | | | | | |
| Moderate | 0.91 (0.67, 1.22) | 0.521 | 1.00 | – | | | | | | | | | |
| High | 1.24 (0.90, 1.71) | 0.182 | 1.00 | – | | | | | | | | | |
| High Umami | | | | | | | | | | | | | |
| Moderate | 2.31 (1.72, 3.10) | <0.001 | 2.54 (1.90, 3.39) | <0.001 | 1.00 | – | | | | | | | |
| High | 1.70 (1.30, 2.22) | <0.001 | 1.37 (1.05, 1.78) | 0.019 | 1.00 | – | | | | | | | |
| Low Bitter & Umami | | | | | | | | | | | | | |
| Moderate | 1.77 (1.34, 2.34) | <0.001 | 1.95 (1.48, 2.58) | <0.001 | 0.77 (0.58, 1.02) | 0.066 | 1.00 | – | | | | | |
| High | 1.75 (1.34, 2.27) | <0.001 | 1.41 (1.08, 1.82) | 0.010 | 1.03 (0.79, 1.34) | 0.844 | 1.00 | – | | | | | |
| High All But Bitter | | | | | | | | | | | | | |
| Moderate | 1.09 (0.80, 1.46) | 0.590 | 1.20 (0.88, 1.62) | 0.246 | 0.47 (0.35, 0.63) | <0.001 | 0.61 (0.45, 0.83) | 0.002 | 1.00 | – | | | |
| High | 1.81 (1.29, 2.53) | <0.001 | 1.45 (1.04, 2.03) | 0.028 | 1.06 (0.75, 1.49) | 0.729 | 1.03 (0.74, 1.45) | 0.844 | 1.00 | – | | | |
| High All But Umami | | | | | | | | | | | | | |
| Moderate | 2.31 (1.62, 3.29) | <0.001 | 2.54 (1.78, 3.63) | <0.001 | 1.00 (0.70, 1.43) | 0.998 | 1.30 (0.91, 1.86) | 0.149 | 2.12 (1.49, 3.03) | <0.001 | 1.00 | – | |
| High | 1.52 (1.14, 2.02) | 0.005 | 1.22 (0.91, 1.63) | 0.178 | 0.89 (0.66, 1.20) | 0.450 | 0.87 (0.65, 1.17) | 0.349 | 0.84 (0.63, 1.12) | 0.238 | 1.00 | – | |
| Global *p*-value[3] | | | | | | | | | | | | | 0.372 |

[1]Values are ORs (95% CI) estimated via multinomial logistic regression, with adjustment for age, sex, physical activity, smoking status, use of antihypertensive and cholesterol lowering medication, type 2 diabetes, and BMI. EVOO, Extra virgin olive oil; Non-EVOO/Sweet/RG, Non-EVOO, Sweets, and Refined Grains dietary pattern.

[2]*p*-values from Chi Square tests for differences from the reference taste perception profile (calculated by column).

[3]*p*-value from log likelihood ratio test of joint significance in fully adjusted multinomial logistic regression models. Only 1 *p*-value is provided, as it is identical for all models regardless of the reference profile.

**Supplementary Table S5.** ORs and corresponding 95% CIs of moderate or high relative to low adherence to the Alch/Salt/AnimFat dietary pattern among participants with each taste perception profile.

| | Reference taste perception profiles | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low All | | High Bitter | | High Umami | | Low Bitter & Umami | | High All But Bitter | | High All But Umami | | $p^3$ |
| | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | OR (95% CI) | $p^2$ | |
| Low All | | | | | | | | | | | | | |
| Moderate | 1.00 | – | | | | | | | | | | | |
| High | 1.00 | – | | | | | | | | | | | |
| High Bitter | | | | | | | | | | | | | |
| Moderate | 0.43 (0.33, 0.57) | <0.001 | 1.00 | – | | | | | | | | | |
| High | 1.18 (0.83, 1.68) | 0.360 | 1.00 | – | | | | | | | | | |
| High Umami | | | | | | | | | | | | | |
| Moderate | 1.23 (0.90, 1.66) | 0.189 | 2.84 (2.11, 3.81) | <0.001 | 1.00 | – | | | | | | | |
| High | 1.17 (0.90, 1.52) | 0.242 | 0.99 (0.77, 1.28) | 0.953 | 1.00 | – | | | | | | | |
| Low Bitter & Umami | | | | | | | | | | | | | |
| Moderate | 0.73 (0.53, 1.01) | 0.057 | 1.69 (1.23, 2.31) | 0.001 | 0.60 (0.43, 0.82) | 0.001 | 1.00 | – | | | | | |
| High | 0.71 (0.56, 0.92) | 0.009 | 0.61 (0.48, 0.77) | <0.001 | 0.61 (0.48, 0.78) | <0.001 | 1.00 | – | | | | | |
| High All But Bitter | | | | | | | | | | | | | |
| Moderate | 0.68 (0.49, 0.95) | 0.024 | 1.57 (1.12, 2.21) | 0.009 | 0.55 (0.40, 0.77) | <0.001 | 0.93 (0.67, 1.30) | 0.681 | 1.00 | – | | | |
| High | 1.29 (0.95, 1.76) | 0.099 | 1.10 (0.81, 1.49) | 0.545 | 1.11 (0.82, 1.49) | 0.506 | 1.81 (1.33, 2.47) | <0.001 | 1.00 | – | | | |
| High All But Umami | | | | | | | | | | | | | |
| Moderate | 0.55 (0.40, 0.75) | <0.001 | 1.27 (0.94, 1.70) | 0.117 | 0.45 (0.32, 0.62) | <0.001 | 0.75 (0.55, 1.02) | 0.069 | 0.80 (0.59, 1.10) | 0.176 | 1.00 | – | |
| High | 0.95 (0.70, 1.29) | 0.731 | 0.80 (0.60, 1.07) | 0.135 | 0.81 (0.59, 1.11) | 0.191 | 1.33 (0.98, 1.80) | 0.067 | 0.73 (0.54, 0.99) | 0.045 | 1.00 | – | |
| Global *p*-value[3] | | | | | | | | | | | | | 0.350 |

[1]Values are ORs (95% CI) estimated via multinomial logistic regression, with adjustment for age, sex, physical activity, smoking status, use of antihypertensive and cholesterol lowering medication, type 2 diabetes, and BMI. Alch/Salt/AnimFat, Alcohol, Salty Foods, and Animal Fats dietary pattern.

[2]*p*-values from Chi Square tests for differences from the reference taste perception profile (calculated by column).

[3]*p*-value from log likelihood ratio test of joint significance in fully adjusted multinomial logistic regression models. Only 1 *p*-value is provided, as it is identical for all models regardless of the reference profile.