**Healthy Eating Behavior Change with Psychological Features and Insulin Resistance: Buffet and Food Diary App Analysis**

Meelim Kim1, 2, Seihee Park1, Courtney Jihoo Kim3, Hyung Jin Choi1, 2\*

1Department of Biomedical Sciences, Seoul National University College of Medicine, Seoul, Korea

2BK21 Plus Biomedical Science Project Team, Seoul National University College of Medicine, Seoul, Korea

3Department of Neuroscience, Vanderbilt University College of Arts and Science, TN, USA

**Running title:** Healthy Eating Behavior Change

**Corresponding author:**

Hyung Jin Choi

Room #216, Research Building, 103 Daehak-ro, Jongno-gu

Department of Biomedical Sciences, Seoul National University College of Medicine, Seoul, Korea, 03080

BK21 Plus Biomedical Science Project Team, Seoul National University College of Medicine, Seoul, Korea, 03080

E-mail: mailto:hjchoi@snu.ac.kr / Fax: +82-2-745-9528

Appendix A: Supplementary tables

**Table A1.** Serving sizes of food served during the buffet test-meal assessment.

|  |  |  |  |
| --- | --- | --- | --- |
| **Healthy Diet Foods** | **Nutritional InformationCarb / Protein / Fat (%)** | **Calorie density(kcal per 100g/mL)** | **Glycemic Index**  |
| Brown rice | 90 / 7 / 3 | 152 | 50 |
| Whole grain bread | 76 / 10 / 14 | 250 | 51 |
| Boiled egg | 0 / 35 / 65 | 150 | 30 |
| Braised chicken | 34 / 30 / 36 | 90 | 45 |
| Vegetable salad | 69 / 12 / 19 | 83.9 | 22 |
| Nabak kimchi | 100 / 0 / 0 | 18 |  |
| Apple | 100 / 0 / 0 | 52 | 36 |
| Banana | 96 / 4 / 0 | 93 | 46 |
| Low-fat milk | 49 / 29 / 22 | 40 | 26 |
| Soymilk | 0 / 33 / 67 | 50 | 30 |
| Seagram’s sparkling water | 0 / 0 / 0 | 0 | 0 |
| Water | 0 / 0 / 0 | 0 | 0 |
| **Unhealthy Diet Foods** |  |  |  |
| Combination pizza | 52 / 18 / 30 | 392 | 80 |
| French butter croissant | 43 / 9 / 48 | 415 | 70 |
| Grilled spam | 57 / 13 / 30 | 340 |  |
| Chicken tender stick | 33 / 49 / 18 | 288 |  |
| Sneakers chocolate | 52 / 9 / 39 | 483 | 90 |
| Egg tart | 88 / 6 / 7 | 321 |  |
| Orange juice (sweetened) | 44 / 6 / 50 | 160 | 57 |
| Apple juice (sweetened) | 100 / 0 / 0 | 63 |  |
| Pickle | 65 / 9 / 26 | 300 | 63 |
| Seasoned sesame leaves | 59 / 26 / 15 | 116 |  |
| Coca Cola | 100 / 0 / 0 | 80 | 63 |
| Sprite | 100 / 0 / 0 | 110 |  |

**Table A2.** Classifications of the eating behavior indices.

|  |  |  |  |
| --- | --- | --- | --- |
| **Measurement Method** | **Food IntakePhenotype (FI)** | **Food ProportionPhenotype (FP)** | **Food DiversityPhenotype (FD)** |
| **Buffet test-meal (B)**= Laboratory setting= Objective (direct measurements) | **1) Total Intake** (FIB-T)**2) Type of Diet Intake**2a) Healthy Diet Intake (FIB-H)2b) Unhealthy Diet Intake (FIB-UH)**3) Macronutrient intake**3a) Carb (FIB-Carb)3b) Protein (FIB-Pro)3c) Fat (FIB-Fat)**4) Micronutrient Intake**4a) Sugar (FIB-Su)4b) Sodium (FIB-So)4c) Saturated Fat (FIB-Sf) | **1) Type of Diet Proportion**1a) Healthy Diet Proportion (FPB-H)1b) Unhealthy Diet Proportion (FPB-UH)**2) Macronutrient Proportion**2a) Carb Proportion (FPB-Carb)2b) Protein Proportion (FPB-Pro)2c) Fat Proportion (FPB-Fat) | **1) Total Food Diversity Score** (FDB-T)**2) Healthy Diet Diversity Score** (FDB-H)**3) Unhealthy Diet Diversity Score** (FDB-UH) |
| **Diary app (D)**= Real-world setting= Subjective (self-report) | **1) Total Intake** (FID-T)**Macronutrient Intake**1a) Carb (FID-Carb)1b) Protein (FID-Pro)1c) Fat (FID-Fat)**2) Micronutrient Intake**2a) Sodium (FID-So)**3) Total Intake Per Meal**3a) Breakfast (FID-B)3b) Lunch (FID-L)3c) Dinner (FID-D)3d) Snack (FID-S) | **1) Macronutrient Proportion**1a) Carb Proportion (FPD-Carb)1b) Protein Proportion (FPD-Pro)1c) Fat Proportion (FPD-Fat) |  |

**Table A3.** Comparison of main outcomes from buffet test-meal assessment by intervention condition.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Outcome** | ***N*ª** | **Control** | ***N*ªª** | **Digital CBT** | ***p* (2-tailed)** |
| **Food Intake** |  |  |  |  |  |
| FIB-H, kcal, mean (*SD*)FIB-UH, kcal, mean (*SD*) | 2525 | 26.1 (68.9)−35 (54.2) | 4545 | −8 (46.4)−20.2 (150) | 0.031\*0.636 |
| **Food Proportion** |  |  |  |  |  |
| FPB-H, %, mean (*SD*)FPB-UH, %, mean (*SD*) | 2525 | 10.7 (28.1)−10.7 (28.1) | 4545 | 14 (22.7)−14 (22.7) | 0.6010.601 |
| **Food Diversity** |  |  |  |  |  |
| FDB-H, %, mean (*SD*)FDB-UH, %, mean (*SD*) | 2525 | −2.8 (10.8)−7.9 (14.5) | 4545 | 4.6 (11.5)−10.7 (12.4) | 0.011\*0.396 |

**ª**Number of participants in control group, **ªª**Number of participants in Digital CBT group \**p* < .05

**Table A4.** Changes in main outcomes from the first buffet to the second buffet for both groups.

|  |  |  |  |
| --- | --- | --- | --- |
| **Outcome** | **First buffet** | **Second buffet** | ***p* (2-tailed) ª** |
| **dCBT Group** |  |  |  |
| **Food Intake** |  |  |  |
| FIB-H, kcal, mean (*SD*)FIB-UH, kcal, mean (*SD*) | 259.7 (157.5)307.6 (210.4) | 301.4 (187.5)172.3 (168.3) | 0.01\*0.000\*\* |
| **Food Proportion** |  |  |  |
| FPB-H, %, mean (*SD*)FPB-UH, %, mean (*SD*) | 70.9 (19.4)29.1 (19.4) | 84.9 (19.4)15.1 (19.4) | 0.000\*\*0.000\*\* |
| **Food Diversity** |  |  |  |
| FDB-H, %, mean (*SD*)FDB-UH, %, mean (*SD*) | 29.3 (12.4)27 (13.2) | 33.9 (13.9)16.3 (11.4) | 0.01\*0.000\*\* |
| **Control Group** |  |  |  |
| **Food Intake** |  |  |  |
| FIB-H, kcal, mean (*SD*)FIB-UH, kcal, mean (*SD*) | 276.3 (153.6)304.6 (242.8) | 262 (170.5)212 (247.3) | 0.5660.013\* |
| **Food Proportion** |  |  |  |
| FPB-H, %, mean (*SD*)FPB-UH, %, mean (*SD*) | 66.4 (29.6)29.6 (26.8) | 81.2 (24.4)18.8 (24.4) | 0.01\*0.068 |
| **Food Diversity** |  |  |  |
| FDB-H, %, mean (*SD*)FDB-UH, %, mean (*SD*) | 29.7 (13.2)25.3 (13.7) | 26.9 (12.3)17.4 (15.6) | 0.2120.012\* |

\**p* < .05; \*\**p* < .01

**Table A5.** Comparison of main outcomes from the food diaries in app assessment by intervention condition.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Outcome** | ***N*ª** | **Control** | ***N*ªª** | **Digital CBT** | ***p* (2-tailed)** |
| Breakfast, kcal, mean (*SD*) | 25 | −41.6 (47) | 45 | 26.8 (154.6) | 0.035\* |
| Lunch, kcal, mean (*SD*) | 25 | 1.7 (48.4) | 45 | −13 (43.5) | 0.195 |
| Dinner, kcal, mean (*SD*) | 25 | 5.4 (50.9) | 45 | −12.5 (55) | 0.184 |
| Snack, kcal, mean (*SD*) | 25 | −43.87 (47.4) | 45 | −34.1 (73.6) | 0.553 |

**ª**Number of participants in control group, **ªª**Number of participants in Digital CBT group \**p* < .05; \*\**p* < .01

**Table A6.** Changes in main outcomes from the first buffet to the second buffet for both groups.

|  |  |  |  |
| --- | --- | --- | --- |
| **Outcome** | **Week 1** | **Week 8** | ***p* (2-tailed) ª** |
| **dCBT Group** |  |  |  |
| Breakfast, kcal, mean (*SD*) | 210 (139.7) | 215.3 (196.6) | 0.851 |
| Lunch, kcal, mean (*SD*) | 397.5 (126) | 333.7 (152) | 0.008\*\* |
| Dinner, kcal, mean (*SD*) | 450.7 (171.7) | 190.1 (28.3) | 0.005\*\* |
| Snack, kcal, mean (*SD*) | 161.9 (98.1) | 92.2 (99.7) | 0.000\*\* |
| **Control Group** |  |  |  |
| Breakfast, kcal, mean (*SD*) | 185.4 (118.9) | 131.5 (177) | 0.028\* |
| Lunch, kcal, mean (*SD*) | 445.8 (99) | 448.3 (258) | 0.962 |
| Dinner, kcal, mean (*SD*) | 501.6 (200.8) | 502.7 (264.8) | 0.98 |
| Snack, kcal, mean (*SD*) | 229.3 (222.9) | 127.6 (147.4) | 0.006\*\* |

\**p* < .05; \*\**p* < .01