

Title: Personalized Lifestyle Intervention and Weight Control ID:
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1. Background

In South Korea, the leading causes of death are cancer and cardiovascular diseases, and obesity is a major risk factor for these chronic conditions. As dietary habits in South Korea have become increasingly Westernized, the prevalence of obesity has risen rapidly. Therefore, discovering effective strategies for obesity prevention and weight loss is a crucial public health priority.

The principle of weight loss is simple—caloric intake must be lower than caloric expenditure—but achieving and maintaining weight loss is considerably more difficult in practice. Fewer than 20% of individuals who lose approximately 10% of their initial body weight maintain that loss for over a year, highlighting the need for sustainable and efficient approaches.

Dietary strategies for weight control are often categorized based on macronutrient composition (carbohydrates, proteins, fats), yet there remains no consensus on which approach is most effective. Evidence remains divided between those emphasizing low-carbohydrate diets and those suggesting that total caloric intake, rather than macronutrient ratio, is more important for weight loss and metabolic improvement.

Additionally, East Asians tend to have less skeletal muscle mass than Westerners despite having a similar or lower BMI, which increases their risk of metabolic diseases. Therefore, developing interventions that effectively improve muscle mass and strength is also essential.

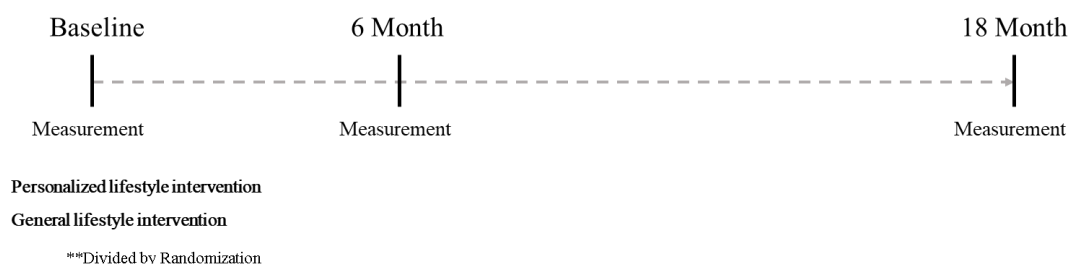
Another key factor for sustainable weight management is emotional regulation. Emotional regulation both influences and is influenced by dietary and exercise habits, making it an important component to consider in weight control research.

A major limitation of many previous studies is the lack of consideration for individual differences. Evidence suggests that macronutrient preference, metabolic capacity, muscle response to exercise, and emotional regulation vary by genetic profile. In the era of precision medicine, it is increasingly important to determine whether genetically tailored diet and lifestyle interventions—those accounting for individual genetic predispositions—can lead to more sustainable weight loss and improved health outcomes compared with non-tailored approaches. The results from this study could provide valuable insight into resolving inconsistencies in the current literature.

2. Objective

- This randomized controlled trial aims to determine whether awareness of personal genetic information related to obesity improves weight management outcomes among overweight and obese individuals.
- Eating habits are typically formed over a long period and are difficult to modify without a strong motivator (e.g., a medical diagnosis). However, given the symbolic and personalized nature of genetic information, awareness of one's genetic profile may serve as a powerful trigger for behavioral change. Therefore, individuals who receive their genetic results accompanied by genotype-tailored recommendations are expected to demonstrate greater improvements in weight and related indicators compared with those who do not. Specifically, the study seeks to identify characteristics of individuals who voluntarily modify their diet or lifestyle after learning about their genetic information and tailored lifestyle recommendations, and to examine subsequent changes in obesity and health indicators. If participants' habits shift toward a genetically tailored lifestyle, such personalized approaches are expected to reduce physiological stress, enhance adherence, and yield sustainable improvements in weight and metabolic outcomes.

3. Design



● Randomized Controlled Trial:

- **Subjects:** 53 overweight or obese young adults.
- **Randomization:** Participants were randomly assigned to two groups (experimental and control) using a computer-generated randomization sequence.
- **Experimental group (27 participants):** Participants received their obesity-related genetic test results (including *FTO*, *MC4R*, and *BDNF*) along with genotype-tailored lifestyle recommendations encouraging healthy behaviors such as reducing fat intake, limiting snacking, and avoiding emotional eating.
- **Control group (26 participants):** Participants received genetic test results limited to non-obesity-related traits (e.g., beauty-related genes). No lifestyle recommendations were provided. Obesity-related genetic results were disclosed only after completion of the final follow-up.
- **Follow-up:** Questionnaire surveys and body composition measurements were conducted at baseline, approximately 5 months after randomization, and at study completion (up to 17 months).

- **Inclusion Criteria:**

1. Korean adults aged 18 and older who are interested in weight management through dietary/exercise therapy.
2. Individuals who can participate consistently in the study for 2 years.

- **Exclusion Criteria:**

1. Individuals currently suffering from illnesses requiring regular treatment in a hospital.
2. Individuals currently taking long-term prescribed medications.
3. Individuals diagnosed with an eating disorder or mental illness (e.g., depression, panic disorder) by a physician.
4. Individuals who have undergone gastric surgery for weight loss.
5. Individuals who have undergone heart surgery or cancer surgery.
6. Individuals suffering from severe anemia.
7. Individuals who are unable to exercise.
8. Pregnant or breastfeeding women, and women planning to become pregnant within 2 years.

4. Outcome assessment Method

- **Single Gene Variant Testing**

- We will evaluate single-nucleotide polymorphisms (SNPs) that may influence weight control. Key examples include genes related to energy metabolism (FTO), muscle strength (INSIG2), mood (BDNF), and taste perception (TAS2R38). Knowledge of such variants may help identify dietary and behavioral strategies that are more compatible with individual metabolic characteristics. For example, for the well-known obesity gene FTO, if a single gene variant such as rs9939609 is present, excess calories may be stored more readily as fat, making a low-calorie or low-fat diet more effective for weight control.

- **Obesity and Body Composition Measurements**

- We will assess various obesity-related parameters as follows:
 - ✓ **Body Weight Change:** The primary outcome, assessed at baseline, approximately 5 months after randomization, and at study completion (up to 17 months).
 - ✓ **Body Composition Change:** Body fat mass, body fat percentage, and skeletal muscle mass were assessed using a bioelectrical impedance analyzer (InBody720, Seoul, Korea). These secondary outcomes were measured at baseline, approximately 5 months after randomization, and at study completion (up to 17 months).