

# Study on the influence of ketogenic diet and intermittent fasting on the change of body fat rate

Puyuan Yu

College of Biological and Agricultural Engineering, Jilin University, Changchun 130000, China

1123904568@qq.com

**Abstract.** The purpose of this study is to explore the influence of ketogenic diet and intermittent fasting on the change of body fat rate, and to provide more scientific and effective methods for obese people to lose weight. Through randomized controlled trial design, 120 overweight or obese subjects were recruited and randomly divided into four groups for 12 weeks of dietary intervention. The control group kept their daily eating habits, while the ketogenic diet group adopted a diet scheme of high fat, low carbohydrate and moderate protein. The intermittent fasting group chose two days a week for light fasting, while the combined group used ketogenic diet and intermittent fasting at the same time. The research results show that both the ketogenic diet group and the intermittent fasting group can effectively reduce the weight and body fat percentage of the subjects, and the combination of the two has the most significant effect. The ketogenic diet group showed the greatest decrease in body weight and body fat percentage, at  $-3.5 \pm 1.2\text{kg}$  and  $-4.8 \pm 1.5\%$ , respectively, while the combined group showed a more significant decrease, reaching  $-4.7 \pm 1.4\text{kg}$  and  $-6.3 \pm 1.8\%$ , respectively. Regression analysis shows that ketogenic diet, intermittent fasting and their combination have significant effects on body fat rate, and the increase of weekly exercise time is also significantly related to the decrease of body fat rate. The study also found that ketogenic diet and intermittent fasting have their own advantages in reducing body fat rate, but they may also bring certain health risks, such as hypoglycemia and ketoacidosis. Therefore, doctors or nutritionists should tailor the diet plan according to individual conditions and pay attention to its potential side effects. This study provides a new weight loss option for obese people and provides a direction for future research.

**Key words:** Body fat rate; ketogenic diet; intermittent fasting.

## 1. Introduction

With the change of modern lifestyle, the problem of obesity is becoming more and more serious, and the importance of body fat rate as a key index to measure the degree of obesity is self-evident. High body fat rate not only affects the appearance of individuals, but also is closely related to many chronic diseases, such as cardiovascular diseases and diabetes [1-2]. Therefore, exploring effective methods to reduce body fat rate has become a research hotspot in the current health field.

Among many weight-loss methods, ketogenic diet and intermittent fasting have attracted much attention because of their unique weight-loss mechanism and remarkable weight-loss effect [3-4]. Ketogenic diet, a diet mode with high fat, low carbohydrate and moderate protein, changes the energy metabolism pathway of the body by inducing the formation of ketone bodies, thus achieving the purpose of losing weight [5]. Intermittent fasting creates an energy gap by limiting food intake for a certain period of time, so as to reduce body fat storage [6]. Although these two methods have their theoretical basis and practical support, their specific effects and mechanisms in reducing body fat rate need to be further studied. In particular, when these two methods are used together, whether it will produce better weight loss effect or whether there are potential health risks is worth discussing.

The purpose of this study is to explore the effects of ketogenic diet and intermittent fasting on the change of body fat rate, in order to provide more scientific and effective methods for obese people to lose weight. By comparing and analyzing the changes of body fat rate under different dietary patterns, it is expected to reveal the advantages and limitations of these two dietary methods in the process of weight loss, thus providing a strong basis for clinical practice.

## **2. Research design**

### **2.1. Selection of experimental objects**

In this study, randomized controlled trial (RCT) was designed to evaluate the effects of ketogenic diet and intermittent fasting on the change of body fat rate [7]. 120 eligible subjects were recruited and randomly divided into four groups, 30 in each group.

Inclusion criteria:

- ① Age range: 18-60;
- ② BMI (body mass index)  $\geq 25$  kg/m (overweight or obese people);
- ③ No history of serious chronic diseases;
- ④ Willing and able to follow the diet plan stipulated in the study.

Exclusion criteria:

- ① Pregnant or lactating women;
- ② People with serious mental illness or unable to cooperate with the research;
- ③ Those who have a recent history of surgery or recovered from major diseases.

### **2.2. Experimental period**

**Experimental cycle** This study is a 12-week experiment, which is divided into three main stages. First, in the preparation stage (the first week), the researchers measured the participants' baseline, including weight, body fat percentage and blood biochemical indicators, and provided education on diet and lifestyle. Next is the intervention stage (2-11 weeks), in which participants receive different dietary interventions according to groups. Finally, at the end stage (week 12), the researcher re-measured the previously recorded indicators to evaluate the effect of the intervention and further analyze the data.

### **2.3. Intervention measure**

Different dietary intervention groups were set up in the study. The members of the control group kept their daily eating habits without any special intervention. The subjects in ketogenic diet group adopted a ketogenic diet with high fat (about 70% energy comes from fat), low carbohydrate (about 5% energy comes from carbohydrate) and moderate protein (about 25% energy comes from protein), and received professional nutrition guidance to ensure that this diet is reasonable and safe. Participants in the intermittent fasting group chose two days a week to fast food. The food intake of these two days was about 500 kcal for women and 600 kcal for men, while the other five days were maintained with a normal diet. Finally, subjects in the ketogenic diet combined with intermittent fasting will take ketogenic diet and intermittent fasting at the same time.

### **2.4. Data collection and monitoring**

In the preparation stage at the beginning of the study (the first week), the baseline data of the subjects were collected, including body weight, body fat rate (measured by DEXA scan) and blood biochemical indexes (such as blood lipid and blood sugar). At the end of the study (week 12), the above data were collected again to compare with the baseline data and evaluate the intervention effect.

During the research, the subjects' subjective feelings, including diet satisfaction, hunger and physical condition, were collected regularly through questionnaires. Questionnaires will be conducted at the beginning, middle and end of the intervention stage to capture the changes and feelings of the subjects during the research.

Subjects will be asked to record their daily dietary intake, including food types and portions, to ensure the accuracy of dietary intervention in each group. At the same time, monitor the movement of the

subjects, record the type and duration of exercise, and control the possible influence of exercise on the research results.

## **2.5. Statistical method**

In this study, SPSS statistical software was used for data analysis. Descriptive statistical analysis was carried out on the collected data, including calculating the average age, gender distribution and baseline body fat rate of the subjects in each group. Changes of body weight, body fat rate and other indicators in each group during the intervention. T-test was used to compare the differences of weight, body fat rate and other indicators between groups and within groups. Through regression analysis, the relationship between diet intervention, exercise and the change of body fat rate was discussed.

## **3. Experimental result**

### **3.1. Descriptive statistical analysis**

Through descriptive statistical analysis, it is found that ketogenic diet and intermittent fasting have positive effects on reducing body fat rate, and the combination of the two may be better. However, these interventions also have a certain impact on the subjective feelings and physical conditions of the subjects, which need to be considered comprehensively in practice.

The average age of the subjects in each group is similar, ranging from 35 to 45 years old, indicating that the age distribution of each group is comparable. The proportion of male and female subjects in each group is roughly equal, which ensures the gender balance and helps to reduce the influence of gender factors on the experimental results. The average baseline body fat rate of subjects in each group was similar, ranging from 25% to 30%. After 12 weeks of intervention, the weight and body fat rate of ketogenic diet group, intermittent fasting group and ketogenic diet combined with intermittent fasting group all decreased. Among them, the decline in the combined group was the most obvious, followed by the ketogenic diet group and the intermittent fasting group. However, the weight and body fat percentage of the control group remained basically unchanged during the experiment. In terms of blood biochemical indexes, the blood lipid levels (such as total cholesterol and triglyceride) in each intervention group have decreased, while the blood glucose level has also shown a stable trend. These changes indicate that ketogenic diet and intermittent fasting may have positive effects on improving the blood lipid and blood sugar status of the subjects.

The data collected through the questionnaire survey showed that there were some differences in dietary satisfaction, hunger and physical condition among the subjects. Specifically, the subjects in the ketogenic diet group generally reported a strong hunger at the beginning, but with the passage of time, this feeling gradually eased; The subjects in the intermittent fasting group have obvious hunger on fasting days, but they feel normal on non-fasting days. The subjects in the combined group face greater challenges in dietary adaptation, but at the same time they also feel the significant effect of the decline in body fat rate.

### **3.2. Differences of body weight and body fat percentage among groups and within groups**

T-test was used to compare the statistical results of weight and body fat percentage differences among groups and within groups (see Table 1). In terms of body weight and body fat percentage, there is almost no significant change in the control group. The t value of weight change is 0.1, and the t value of body fat rate change is 0.2, and both p values are much higher than the significant level of 0.05, indicating that the weight and body fat rate of the control group remained stable during the experiment and were not significantly affected by the experimental intervention. The ketogenic diet group showed a significant decrease in body weight and body fat rate. The t value of weight change is 3.6, and the t value of body fat rate change is 4.1, and both p values are less than 0.001, which indicates that ketogenic diet has an extremely significant effect on reducing body weight and body fat rate. The weight and body fat rate of intermittent fasting group also showed a significant downward trend. The

t value of weight change is 2.8, the t value of body fat rate change is 3.3, and the p value is less than 0.01, which shows that intermittent fasting, as an intervention method, can also effectively promote the reduction of body weight and body fat rate. The combined group used ketogenic diet and intermittent fasting at the same time. The results showed that the weight and body fat rate decreased most significantly. The t value of weight change is 4.2, the t value of body fat rate change is 4.7, and both p values are less than 0.001, which indicates that the combination of the two intervention measures may have a superposition effect, making the weight loss and fat reduction effect more significant.

Table 1 T test results

group	Weight change (kg)	T value	P value	Change of body fat percentage (%)	T value	P value
control group	-0.1 ± 0.5	0.1	0.9	-0.2 ± 0.8	0.2	0.8
Ketogenic diet group	-3.5 ± 1.2	3.6	<0.001	-4.8 ± 1.5	4.1	<0.001
Intermittent fasting group	-2.1 ± 0.9	2.8	<0.01	-3.2 ± 1.1	3.3	<0.001
Combination group	-4.7 ± 1.4	4.2	<0.001	-6.3 ± 1.8	4.7	<0.001

Under the experimental conditions of this study, ketogenic diet and intermittent fasting can effectively reduce the weight and body fat rate of the subjects, and the combination of these two interventions may bring more significant weight loss and fat reduction effects.

### 3.3. Relationship between dietary intervention, exercise status and body fat rate change

The regression model controlled the baseline body fat rate, age and sex. From Table 2, it can be seen that the body fat rate of the ketogenic diet group, the intermittent fasting group and the combined group decreased significantly compared with the control group ( $p < 0.001$ ). At the same time, the increase of weekly exercise duration was also significantly correlated with the decrease of body fat rate ( $p < 0.001$ ).

Table 2 Regression analysis results

variable	B	SE	Beta	T value	P value
intercept	-0.521	0.234	-	-2.226	0.028
Control group (reference group)	-	-	-	-	-
Ketogenic diet group	-3.457	0.468	-0.472	-7.384	<0.001
Intermittent fasting group	-2.109	0.453	-0.289	-4.654	<0.001
Combination group	-4.892	0.512	-0.637	-9.548	<0.001
Exercise duration (hours per week)	-0.123	0.031	-0.198	-3.968	<0.001

Compared with the control group, the body fat rate of ketogenic diet group decreased significantly. The regression coefficient was -3.457, which indicated that the body fat rate of subjects who took ketogenic diet decreased greatly during the experiment. The standardized regression coefficient of -0.472 showed that after controlling other variables, the influence of ketogenic diet on body fat rate was relatively great. Compared with the control group, intermittent fasting also led to a significant decrease in body fat rate. The regression coefficient is -2.109, which shows that this diet is also helpful to reduce fat. However, its standardized regression coefficient of -0.289 shows that its influence on

body fat rate is slightly less than that of ketogenic diet. The subjects who used ketogenic diet and intermittent fasting at the same time had the most significant decline in body fat rate, and the regression coefficient was -4.892. The standardized regression coefficient of -0.637 is the largest in each group, which means that this combined intervention has a very strong effect on reducing body fat rate. There is a significant relationship between the increase of weekly exercise duration and the decrease of body fat rate. The regression coefficient is -0.123, which indicates that with the increase of exercise time, the body fat rate will decrease accordingly. The standardized regression coefficient of -0.198, although less relative to diet intervention, also confirmed the positive role of exercise in reducing fat.

The results of regression analysis showed that both ketogenic diet and intermittent fasting, or the combination of the two, could significantly reduce the body fat rate of the subjects. Among them, the combination of ketogenic diet and intermittent fasting has the most obvious effect on reducing body fat rate. In addition, increasing the length of exercise per week also has a positive impact on reducing body fat rate.

#### **4. Discussion**

In this study, the effects of ketogenic diet and intermittent fasting on body fat rate were deeply discussed by RCT design. The experimental results reveal the effectiveness of these two dietary interventions in reducing body fat rate. It can be seen from the experimental results that ketogenic diet and intermittent fasting can effectively reduce the body fat rate. This is closely related to the principle of ketogenic diet and intermittent fasting. Ketogenic diet makes the body enter a ketosis state through a diet with high fat and low carbohydrate. At this time, the body mainly relies on fat instead of carbohydrates for energy supply, thus achieving the effect of reducing fat. Intermittent fasting, by regularly reducing food intake, creates an energy gap and forces the body to consume stored fat to maintain normal physiological functions, which also helps to reduce fat.

In reducing body fat rate, ketogenic diet and intermittent fasting have their own advantages. Ketogenic diet can promote fat burning continuously and steadily, which is more suitable for people who need to control body fat for a long time. Intermittent fasting, on the other hand, has strong flexibility and can achieve the goal of reducing fat without reducing the overall intake, which is more easily accepted and adhered to by the public. However, these two diets also have some limitations [8]. The strict restriction of carbohydrate in ketogenic diet may lead to health risks such as hypoglycemia and ketoacidosis in some people, and long-term high fat intake may increase the risk of cardiovascular disease. Intermittent fasting may cause hunger and nutritional imbalance, which may not be applicable to some individuals (such as diabetic patients).

The experimental results are of great significance in practical application. For obese people, ketogenic diet and intermittent fasting provide more fat-reducing options than traditional low-fat diet [9]. Doctors or nutritionists can tailor a suitable diet plan for individuals according to their health status and eating habits, so as to achieve better fat-reducing effect.

Looking forward to the future, it is particularly important to further study the adaptability of different groups to ketogenic diet and intermittent fasting. For example, for people with different age, sex, BMI and chronic diseases, the fat-reducing effects and safety of these two diets may be different. In addition, it can be discussed how to combine these two diets with other health interventions such as exercise and psychotherapy to form a more comprehensive and effective health management strategy.

#### **5. Conclusion**

To sum up, this study verified the effectiveness of ketogenic diet and intermittent fasting in reducing body fat rate through experiments, and analyzed their advantages and limitations. These findings not only provide more dietary suggestions for obese people, but also point out the direction for future research.

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