著者 | 沖田 孝一  高田 真吾 谷浦 有史  森田 慧輝  門口 智泰  佐々木 浩子  横田 卓  綾川 真太郎  筒井 裕之
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EFFECTS OF LOW-CARBOHYDRATE DIET ON PHYSICAL STRENGTH

Koichi Okita¹, Shingo Takada², Tomofumi Taniura³, Noriteru Morita³
Tomoyasu Kadoguchi⁴, Hiroko Sasaki⁵, Takashi Yokota⁵
Shintaro Kinugawa⁴, Hiroyuki Tsutsui⁵

1) Department of Sport Education, Hokusho University
2) Department of Cardiovascular Medicine, Hokkaido University Graduate School of Medicine
3) Hokkaido University of Education, Iwanizawa  4) Department of Education, Hokusho University

I. Background

Recently, low-carbohydrate diets (LCD) for weight control and management of the metabolic syndrome has become increasingly popular¹⁴–²⁰. However, there is a paucity of research about effects of LCD on physical performance¹²–²⁰.

II. Objective

In the present study, we examined the effects of LCD vs low-calorie diets on physical performance in untrained subjects.

III. Methods

We recruited 12 sedentary young subjects (20±2
Changes in obesity measures

![Graphs showing changes in body weight, BMI, and waist in low-carbohydrate and low-calorie groups.]

Fig 2. Significant decreases in body weight, BMI (body mass index) and waist were seen only in low-carbohydrate group.

Changes in glucose tolerance measures

![Graphs showing changes in FBS, HbA1c, and insulin levels in low-carbohydrate and low-calorie groups.]

Fig 3. Significant decrease in HbA1c was seen only in low-carbohydrate group.

Subjects were randomly assigned to LCD (carbohydrate intake <20g) and low-calorie diet group (Fig 1). We measured body composition, various performance aspects (Thigh muscle thickness, leg extension power, exercise tolerance by bicycle ergometer), blood metabolic parameters (fasting glucose, HbA1c, insulin, lipids, ketone bodies), inflammatory markers (C-reactive protein: CRP, white blood cell count: WBC and thiobarbituric acid reactive substance: TBARS) before and after 1 month of each diet therapy.
IV. Results

Body weight, fat and waist significantly decreased (p<0.05) in LCD groups, whereas no significant changes were seen in low-carbohydrate diet group (Fig 2). HbA1c level was significantly decreased (p<0.05) only in LCD groups (Fig 3). CPR, WBC and TBARS did not significantly change in both groups (Fig 4). The other parameters also did not significantly change in both groups. Acetoacetic acid, 3-hydroxybutyric acid, total ketones were remarkably

Changes in inflammatory markers

![Graphs showing changes in CRP, WBC, and TBARS pre and post treatment for LOW-CARBOHYDRATE and LOW-CAORIE diets.](image)

Fig 4. Significant decreases in inflammatory markers were not seen in both groups.

Changes in ketone bodies

![Graphs showing changes in acetoacetic acid, 3-hydroxybutyric acid, and total ketones pre and post treatment for LOW-CARBOHYDRATE diet.](image)

Fig 5. Remarkable increases in ketone bodies were seen in low-carbohydrate group.
Changes in muscle mass and physical strength

![Graphs showing changes in muscle mass and physical strength](image)

Fig 6. Significant decreases in muscle mass, strength and exercise tolerance were not seen in both group.

V. Conclusions

We have demonstrated that LCD for a relatively short-term can decrease body weight and body fat without negative effects on physical strength.

Acknowledgments

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References


第6回アジア栄養療法学会議
(2014年7月21－24日 台北 台湾)における研究発表
糖質制限食が体力面へ与える影響

沖田 孝一① 高田 真吾② 谷渕 有史③ 森田 憲輝④ 門口 智泰⑤
佐々木 洋子⑤ 横田 卓⑦ 鈴川 真太郎③ 筒井 裕之⑤

1）北語大学生涯スポーツ学部スポーツ医学学科 2）北海道大学医学研究科循環器保健科学
3）北海道教育大学教育学部 4）北語大学教育文化学部教育学科

日本語要約

近年、肥満症、メタボリック症候群、糖尿病患者の予防・改善を目的とした低糖質食療法が、米国糖尿病学会で推奨され、我が国では、未然をもって今から普及してきている。しかしながら、一方で低糖質食が体力面などに与える悪影響が懸念されている。本研究では、低糖質食および厳ガリリーが体力指標に与える影響を検討した。12人（男性5人、女性7人、平均年齢20才）の被験者を低糖質食と厳ガリリー制限群に無作為に割り付け、1ヶ月間の介入を施行し、前後において、身体計測、筋力、持久力および血液生化学的検査を行なった。介入後、糖質制限群のみにおいて、体重、体格指数、腹囲およびHbA1cが有意に減少した（p<0.05）。一方、血中ケトン体は、糖質制限群で極めて顕著に増加していた（p<0.05）。膝伸展筋力、最大酸素摂取量および大脳四頭筋厚は、両群で有意の変化および差異を認めなかった。低糖質食では、比較的短期間に有効な減量が得られ、体力面への悪影響は明らかではないことが示された。