Article 1 - Effect of nutritional intervention on body composition and performance in elite athletes (Garthe et al., 2013)

Purpose:

Compare the effects of nutritional interventions on body compositions and athletes performances

Methods:

39 elite athletes were randomly selected in “nutritional counseling group” (NCG) or “ad libitum group” (ALG), time duration was 8-12 weeks, Body composition and performance variables were measured
Results
Discussion and Limitation

Discussion:

The weight gain in NCG was higher than ALG, The weight gain however, it was attributed to increased fat mass rather than muscle mass.

Limitation:

The small sample size, the time procedure was really short, more research should be done
Conclusion

In conclusion, the experienced athletes in strength training may have lower capacity for increasing LMB than inexperienced ones and this is a critical point in designing a diet plan, so each individual need specific amount of energy regarding his/her condition.
Article 2 - Effects of combined creatine plus fenugreek extract vs. creatine plus carbohydrate supplementation on resistance training adaptations (Taylor et al., 2011)

- Purpose:
  Investigate the effects of creatine supplemented with fenugreek extract (supplement gaining popularity for other reasons) as an alternate means of increasing cellular uptake of creatine.

- Methods:
  Participants - 47 resistance trained men
  Control - placebo; creatine (5g) and dextrose (70g)
  Experimental - creatine (3.5g) and fenugreek (900mg)
  Treatment - 4 days/week resistance training for 8 weeks
  Analysis - DEXA, 1RM tests, Wingate Anaerobic Capacity test
Table 2.

Body composition assessments at week 0 (T1) and after week 4 (T2) and week 8 (T3). V means (± SD).

<table>
<thead>
<tr>
<th>Variable</th>
<th>PL</th>
<th>CRD</th>
<th>CRF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight T1 (kg)</td>
<td>88.7 (12.1)</td>
<td>89.7 (12.4)</td>
<td>85.2 (11.2)</td>
</tr>
<tr>
<td>Weight T2 (kg)</td>
<td>88.7 (12.1)</td>
<td>90.6 (10.9)</td>
<td>86.3 (11.5) *</td>
</tr>
<tr>
<td>Weight T3 (kg)</td>
<td>89.2 (11.3)</td>
<td>90.6 (11.3)</td>
<td>86.3 (10.6)</td>
</tr>
<tr>
<td>Fat Mass T1 (kg)</td>
<td>13.3 (5.6)</td>
<td>15.2 (5.6)</td>
<td>12.4 (7.1)</td>
</tr>
<tr>
<td>Fat Mass T2 (kg)</td>
<td>13.5 (6.0)</td>
<td>13.4 (6.0)</td>
<td>14.4 (10.5)</td>
</tr>
<tr>
<td>Fat Mass T3 (kg)</td>
<td>13.0 (5.4)</td>
<td>14.5 (5.3)</td>
<td>11.9 (6.1)</td>
</tr>
<tr>
<td>Lean Mass T1 (kg)</td>
<td>65.7 (8.8)</td>
<td>64.7 (8.8)</td>
<td>64.4 (6.8)</td>
</tr>
<tr>
<td>Lean Mass T2 (kg)</td>
<td>65.9 (8.9)</td>
<td>66.0 (7.9)</td>
<td>66.0 (7.9) *</td>
</tr>
<tr>
<td>Lean Mass T3 (kg)</td>
<td>66.2 (8.3)</td>
<td>66.6 (8.2) *</td>
<td>66.1 (6.9) *</td>
</tr>
<tr>
<td>Body Fat % T1</td>
<td>16.0 (5.7)</td>
<td>18.2 (5.4)</td>
<td>15.2 (6.4)</td>
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</table>
Table 3.

Performance assessments at week 0 (T1) and after week 4 (T2) and week 8 (T3). Values (±SD).

<table>
<thead>
<tr>
<th>Variable</th>
<th>PL</th>
<th>CRD</th>
<th>CRF</th>
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</thead>
<tbody>
<tr>
<td>BP 1RM T1 (kg)</td>
<td>114.6</td>
<td>108.6</td>
<td>121.8</td>
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<tr>
<td>BP 1RM T2 (kg)</td>
<td>117.0</td>
<td>115.1</td>
<td>127.0</td>
</tr>
<tr>
<td>BP 1RM T3 (kg)</td>
<td>118.2</td>
<td>118.0</td>
<td>128.7</td>
</tr>
<tr>
<td>BP 80% reps T1</td>
<td>8.4</td>
<td>7.9</td>
<td>8.1</td>
</tr>
<tr>
<td>BP 80% reps T2</td>
<td>8.7</td>
<td>8.2</td>
<td>7.5</td>
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<tr>
<td>BP 80% reps T3</td>
<td>8.1</td>
<td>7.2</td>
<td>8.1</td>
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<tr>
<td>LP 1RM T1 (kg)</td>
<td>371.8</td>
<td>382.5</td>
<td>372.7</td>
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<tr>
<td>LP 1RM T2 (kg)</td>
<td>417.9</td>
<td>423.8</td>
<td>417.8</td>
</tr>
<tr>
<td>LP 1RM T3 (kg)</td>
<td>446.4</td>
<td>454.0</td>
<td>434.4</td>
</tr>
<tr>
<td>LP 80% reps T1</td>
<td>15.1</td>
<td>11.5</td>
<td>13.5</td>
</tr>
</tbody>
</table>
What does the research say?

● Results:
The treatment showed significant improvement in performance measures (strength and body composition)

● Conclusion/Applications:
Fenugreek extract can be an acceptable substitute to large quantities, sometimes as high as 70g, of simple CHO (dextrose) for increasing cellular uptake of supplements

● Limitations/Implications/Further Research:
What other insulin stimulators are available? other subjects? Females?
Middle Distances
Article 3 - Comparison of Energy Expenditure to Walk or Run a Mile in Adult Normal Weight and Overweight Men and Woman (Loftin et al., 2010)

- **Purpose:**
  Investigated the total energy expenditure of a mile by walking or running in normal or overweight participants

- **Methods:**
  Participants - 50 volunteers from Oxford, Mississippi community
  19 Normal Weight Walkers (11 men, 8 women)
  11 Overweight Walkers (2 men, 9 women)
  20 Marathon Runners (10 men, 10 women)
  Body Comp - DEXA scan, Metabolic Cart measure RER
<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Mean</th>
<th>SE</th>
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</thead>
<tbody>
<tr>
<td>Kilocalories</td>
<td>NWW</td>
<td>93.9a</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>OW</td>
<td>98.4a</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>MR</td>
<td>99.3a</td>
<td>2.4</td>
</tr>
<tr>
<td>Kcal·mile$^{-1}$·kg·BW$^{-1}$</td>
<td>NWW</td>
<td>1.29a</td>
<td>0.02</td>
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<tr>
<td></td>
<td>OW</td>
<td>1.16b</td>
<td>0.05</td>
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<tr>
<td></td>
<td>MR</td>
<td>1.35c</td>
<td>0.04</td>
</tr>
<tr>
<td>Kcal·mile$^{-1}$·kg·FFW$^{-1}$</td>
<td>NWW</td>
<td>1.72a</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>OW</td>
<td>1.89a</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>MR</td>
<td>1.89a</td>
<td>0.04</td>
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<tr>
<td>Preferred walking and</td>
<td>NWW</td>
<td>2.94a</td>
<td>0.08</td>
</tr>
<tr>
<td>marathon pace, mph</td>
<td>OW</td>
<td>2.97a</td>
<td>0.08</td>
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<tr>
<td></td>
<td>MR</td>
<td>6.78b</td>
<td>1.22</td>
</tr>
</tbody>
</table>

*FFW = fat-free weight; MR = marathon runners; NWW = normal weight walkers; OW = overweight walkers.
†Different letters indicate $p < 0.05$.

**Table 2.** Energy Expenditure walking or running a mile in NWW, OW, and MR and physical activity recall.
Table 3. Energy Expenditure walking or running a mile by gender in the NWW and MR

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Gender</th>
<th>Mean</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kcal</td>
<td>NWW</td>
<td>M</td>
<td>103.1</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>81.1</td>
<td>1.9</td>
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<tr>
<td></td>
<td>MR</td>
<td>M</td>
<td>106.9</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>91.7</td>
<td>2.4*</td>
</tr>
<tr>
<td>Kcal·mile⁻¹kg·BW⁻¹</td>
<td>NWW</td>
<td>M</td>
<td>1.28</td>
<td>0.02</td>
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<td></td>
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<td>F</td>
<td>1.31</td>
<td>0.04</td>
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<td></td>
<td>MR</td>
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<td>1.48</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>1.51</td>
<td>0.03</td>
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<tr>
<td>Kcal·mile⁻¹kg·FFW⁻¹</td>
<td>NWW</td>
<td>M</td>
<td>1.64</td>
<td>0.03</td>
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<tr>
<td></td>
<td></td>
<td>F</td>
<td>1.82</td>
<td>0.06</td>
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<tr>
<td></td>
<td>MR</td>
<td>M</td>
<td>1.91</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>1.75</td>
<td>0.04</td>
</tr>
</tbody>
</table>

*F = female; FFW = fat-free weight; M = male; MR = marathon runners; NWW = normal weight walkers; OW = overweight walkers.

*p < 0.05 for gender difference.
Article 4 - Energy availability of female varsity volleyball players. (Woodruff et al., 2013)

• Purpose:
  – Use current advancement of technologies for measuring total energy expenditures and exercise energy expenditures to determine the energy availability of female volleyball athletes for the first time.
  • Energy Availability is the amount of energy available for the body to perform all other functions after subtracting exercise training energy expenditures
• **Study Subjects:**
  10 medium sized participants from Canadian Interuniversity female volleyball team.

• **Method:**
  For seven days all the participants’ energy intakes, total energy expenditures, body compositions, energy availabilities, and exercise energy expenditures were measured every day.
• Equipments used:
  – Energy Intake: Food Processor Nutrient analysis software
  – Body compositions: Bod Pod
  – Total energy expenditure and METs: Bodymedia Sensewear Mini armband
• Energy availability = (EI\text{kcal} – Ex\text{EEkcal})/kg fat-free mass (FFM)
• Result:
  – All ten participants have proper energy balance throughout the week of the study
  – Energy expenditure
    • During a game: 848 kcal
    • During practice: 511 kcal
    • Warm ups before a game: 402 kcal
  – Mean energy availability 42.5 kcal· kg FFM$^{-1}$ · day$^{-1}$

• Limitations:
  – Errors in measuring energy intakes
  – Small sample sizes
• Conclusion:
  – Energy availability is critical to determine athletes’ energy balance
  – It is important to identify any imbalanced energy status that can lead to serious health consequences
  – Energy availability above 30 kcal·kg FFM⁻¹·day⁻¹ may achieve optimal athletic performances when needed
“we will define endurance as resistance to fatigue during a mode of exercise where the primary cause of fatigue is induced by substrate depletion… typically endurance exercise is therefore 30 min or longer…” (Saris et al., 2003)
Most important substrates for the contracting muscle:

1. Muscle glycogen
2. Blood glucose

(Jensen & Richter, 2012)
Muscle glycogen utilized as a function of:

1. Exercise intensity and duration (training)

2. Activity of the enzyme glycogen phosphorylase (genes, training)

3. Concentration of substrates: glycogen & inorganic phosphate (diet)

(Jensen & Richter, 2012)
Muscle glucose uptake is a function of:

- Permeability of the muscle membrane to glucose (*genes, training*)
  - Cell signaling mechanisms including insulin and stress hormones
  - GLUT4 mediated glucose transport and saturation point
- Delivery of glucose (*diet*)
  - Capillary diffusion
  - [Plasma glucose]

*(Jensen & Richter, 2012)*
What does the research say?

Fuel selection and cycling endurance performance with ingestion of $[^{13}\text{C}]$glucose: evidence for a carbohydrate dose response:

Purpose: to investigate the relationship among glucose ingestion, fuel selection, and performance in an endurance exercise

(Smith et al. 2010)
Methods

- Twelve trained, recreational male cyclists or triathletes
- Placebo vs. 15, 30, and 60 g/h glucose
- 2 hour constant load ride followed by 20-km time trial
- Used $[^{13}\text{C}]$glucose and tracer techniques to determine sources of glucose utilized:
  - muscle
  - liver
  - exogenous (i.e., the Gatorade)
Results

Sample size too small for enough statistical confidence (n=12)

Mean time and power to complete 20 km trial after 2 hours of cycling:

Placebo: 36.4 minutes at 210 Watts

15 g/h  35.2 minutes at 225 Watts

30 g/h  35.0 minutes at 227 Watts

60 g/h  34.7 minutes at 232 Watts
Controversies…

• Female Athletic Triad
• Supplementation
  - Creatine
  - Protein
  - John Ivy’s Exercise Drink (Nutrient Timing)
• Diets
  - Ketogenic Diet
  - Paleo
  - Atkins
• Timing Goals
  o Pre Exercise - sparing, glycemic impact/index
  o Concurrent - sparing, hormone balance
  o Post Exercise - nutrient sensitivity, anabolic state
References


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