Ergogenic aids in sports -Caffeine-

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Ergogenic aids

'ergon' (gr.) = work + 'genan' produce

Nutritional, pharmacologic, physiologic, or psychological methods to enhance athletic performance

✓ Accepted techniques such as carbohydrate loading
✗ Illegal and unsafe approaches such as use of anabolic-androgenic steroids

Segen’s Medical Dictionary (2012)
Basic facts

Caffeine is the most consumed pharmacologic active substance world-wide

Most fertile plants: tea, coffee, guarana, kola, mate

Oral ingestion till bloodstream: 30 – 45 minutes
Half life: 3 – 4 hours

<table>
<thead>
<tr>
<th>Beverage / Food</th>
<th>Averaged caffeine (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cup coffee (150 ml)</td>
<td>50 – 100</td>
</tr>
<tr>
<td>Energy drinks (250 ml)</td>
<td>Approx. 80</td>
</tr>
<tr>
<td>Cola (330 ml)</td>
<td>32 - 60</td>
</tr>
<tr>
<td>1 cup of tea (150 ml)</td>
<td>20 - 60</td>
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</tbody>
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Grebe, 2011; McArdle, Katch & Katch, 2014
Caffeine’s impact on the brain

- **Pre**
  - Crossing blood-brain barrier

- **Adenosine – antagonism**

- Caffeine blocks adenosine receptors & reduces the inhibitory effect of adenosine

- Central fatigue & perception of effort decrease

- Concentration & alertness increase

Grebe, 2011; Jeukendrup & Gleeson, 2011; McArdle, Katch & Katch, 2014
Caffeine acting on periphery

- Caffeine indirectly stimulates epinephrine release
- **Within adipocyte cells**
- Adenosine – antagonism
  - Both block adenosine receptors which repressed lipolysis
- Central fatigue & perception of effort decrease
- Faciliated fat use as an energy fuel & saving carbohydrate reserves
- **Enhanced** endurance performance

Grebe, 2011; Jeukendrup & Gleeson, 2011; McArdle, Katch & Katch, 2014
Ergogenic effects in sports?

‘Breakthrough-study’ (Costill et al., 1978)

N = 10
VO₂ max = 60 ml/kg/min

Decaffeinated (D) drink

Decaff. (D) + 330mg of caffeine (C)

60 min before 80% VO₂ max ride

→ 19.5% longer time to exhaustion in trial C
Ergogenic effects in sports?

Maximal Swimming performance
(Macintosh & Wright, 1995)

- N = 11
doubleblind

- Caffeine dose: 6 mg per kg body mass
- Placebo

2,5 h before 1500m swim

→ 23s (1,9%) lower swimtime with caffeine

Split times for each 500m
Synopsis

✓ Caffeine seems to enhance athletic performance (i.e. endurance-, high-intensity-, precision sports)
✓ Lots of further studies especially in cognitive science

General advice concerning ergogenic aids:

✦ Huge existence of trend-setting studies but nevertheless source of lively discussions
✦ Detailed examination of study designs, sources and sponsors are suggested (scientists and coaches)
✦ Regularly preventive nutritionist consultancy (athletes)
References


Scientific Committee on Food. (2001). *Report of the Scientific Committee on Food on composition and specification of food intended to meet the expenditure of intense muscular effort, especially for sportsmen.*