Facts, Fallacies, and the Future:
What Works/What Doesn’t and the Way Ahead for SOF Nutrition

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No conflicts of interest.

Facts

• Operators understand the link between fueling/hydrating and performance and recovery.
• Operators carry exceedingly heavy loads and do not eat enough when on mission, which may affect performance on target.
• OPTEMPO may exceed optimal time for recovery; must maximize recovery strategies.
• Current ration menus and design do not support promotion of energy intake while on mission.
• Additionally, GI distress may incapacitate team members for days, yet they do not seek medical treatment.
Mission Characteristics

- Average Load Carried (lbs): 72.38±18.97
- Average foot INFIL Distance (kilometers): 2.37±2.49
- Average percent grade of INFIL: 1.96±1.90
- Average speed of movement (meters per second): 1.20
- Average time spent on objective (minutes): 386.43±266.26
- Average foot EXFIL Distance (kilometers): 2.02±1.57
- Average percent grade of INFIL: 1.96±1.90
- Average speed of movement during EXFIL: 4.78±2.49
- Average difficulty of Mission: 3.48±1.15
- Average number of missions completed during deployment: 17.25±8.66

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Facts

Estimated Daily Energy Expenditure vs. Military Dietary Reference Intake

\[ \text{Estimated Daily Energy Expenditure} = (47.97 \times \text{Body Mass (kg)}) + (706.33 \times \text{Physical Activity Factor}) - 467.22 \]

Physical Activity Factor Categories:
- 0: Low (Briefings/Mission Prep)
- 1: Low-Moderate (Common Warrior Tasks)
- 2: Moderate-High (Battle Drills)
- 3: High (Specialized Intense Activity)

Based on perceived mission intensity of 3.5 on a scale of 1-6, a physical activity factor of 1.5 was chosen to estimate daily energy expenditures.

*Predictive equation strongly correlated (r = 0.74) with doubly labeled water measured energy expenditures.

Barringer et al., J Int Soc Sports Nutr, 2018

Load Carried During Foot Movement

49% of respondents were above the recommended approach load.
90% above recommended fighting load.
### Historical Perspective of Load Carriage

#### Load Carried by Unit/Conflict

<table>
<thead>
<tr>
<th>Unit/Conflict</th>
<th>Weight in kgs</th>
</tr>
</thead>
<tbody>
<tr>
<td>French Poilu (WW I)</td>
<td>30</td>
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<tr>
<td>British Infantry on the Somme (WW I)</td>
<td>38</td>
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<tr>
<td>French Foreign Legion (WW I)</td>
<td>29</td>
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<tr>
<td>Wingate's Chindits (WW II)</td>
<td>33</td>
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<tr>
<td>U.S. Forces in North Africa (WW II)</td>
<td>35</td>
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<tr>
<td>U.S. Marines in Korea</td>
<td>34</td>
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<tr>
<td>U.S. in Vietnam</td>
<td>38</td>
</tr>
<tr>
<td>Falklands Campaign</td>
<td>39</td>
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<tr>
<td>U. S. Rifleman Afghanistan</td>
<td>45</td>
</tr>
<tr>
<td>10th SFG Afghanistan (Barringer &amp; Conkright, 2018)</td>
<td>46</td>
</tr>
</tbody>
</table>

### Energy expenditure vs. time of movement

#### Estimated Energy Expenditure for INFIL

- Need for aggressive feeding strategies or lighter loads

### Energy Balance and Performance

#### Effects of Energy Balance and Percent Change in Body Mass on Change in Physical Performance

<table>
<thead>
<tr>
<th>Total energy balance (kcal)</th>
<th>Daily energy balance (kcal/day)</th>
<th>Percent change body mass (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small (ES = –0.2)</td>
<td>302</td>
<td>–0.3</td>
</tr>
<tr>
<td>Moderate (ES = –0.5)</td>
<td>1,212</td>
<td>–3.3</td>
</tr>
<tr>
<td>Large (ES = –0.8)</td>
<td>2,630</td>
<td>–7.7</td>
</tr>
</tbody>
</table>

Defined ES magnitude (small, moderate, large) as determined by Cohen [36].
ES equivalent to percent change in lower-body performance of 0% (zero), –2% (small), –7% (moderate), and –10% (large).
ES effect size

Murphy et al., Sports Medicine, 2018
Load Carriage and Speed

Effects of Load Carriage on Speed and Survivability

Direct Fire Speed Survival Score (DFS$^S$)

Survival Score 0 1 2 3 4 5 6 7 8 9 10

Survival Score 0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

Time(Reaction) = Distance/Velocity Reaction
Time(Shots) = Time(Reaction)/Shooting Cadence + 1
Survival Probability = 1 - (1-Accuracy) timeshooting


Survey Question

Eating is important for my physical performance on a mission

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Mostly Agree</th>
<th>Agree</th>
<th>Mostly Disagree</th>
<th>Definitely Agree</th>
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<td>20</td>
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Survey Question

Eating is important for my mental performance when on a mission

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<tr>
<th>Frequency</th>
<th>Mostly Agree</th>
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<th>Mostly Disagree</th>
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On a scale of 1-6 average importance of nutrition and hydration for mission success: 5.30±0.82
Survey Question

Rations taste bad

I would eat more on a mission if the rations tasted better

Consumption of MREs

Long-term Consumption of Meal, Ready to Eat (MRE)

- Long-term consumption (i.e., >10 days) of MREs has been shown to result in underfeeding
- The combination of high energy expenditure in excess of intake results in weight loss, impaired performance, and increased injury risk

Hirsch et al., Appetite, 2004
USASOC DFAC Nutrition

» ETP requested to create new menu standards in a ARSOF DFAC
» Study conducted by LTC Rene Cole, USARIEM to assess new menu
» Results included increased Diet quality and meal satisfaction, and correlations with higher APFT scores among those with better diet quality
» Resulted in ARSOF Policy 7-18 “Performance-Based Menu Standards and Guidelines”
» 14 DFACs across USASOC implementing


Meal Prep Program

» Currently being piloted in USASOC
» Menu established by SOF RD with focus on the end user’s goal of “gain” “maintain” or “lose” weight
» Contains 1 starch, 1 veg, 1 fruit, 1 entrée, 1 beverage
» Same price as regular DFAC meal
» Meals are pre-cooked and frozen in a microwaveable container with proper heating instructions
» Way ahead- Standardization and policy
Nutrition for Training and Deployment

» BLUF - We MUST ensure caloric needs are met!
» Average measured energy expenditure during SOF training was 4468 (range: 3700 to 6300) calories/day
» Periods of negative energy balance increase risk of peak power loss and strength decrements, potentially compromising SMs’ ability to perform military tasks and subsequently may impact mission success


Caloric Deficit met by COTS Supplemental Nutrition Products

» Currently COTS nutrition products provided to USASOC and JSOC only
» 2019 USSOCOM drafting COTS supplemental nutrition products policy (champion: SOCOM Surgeon)
» “Although these products may be enriched and/or fortified with vitamins and minerals, these products are distinguishable from Dietary Supplements by the presence of a “Nutrition Facts” panel on the product packaging or at the point of purchase.”

SOCOM Policy on Performance Enhancing Substances 16-29
**Performance Nutrition Criteria for COTS Nutrition Products**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Pre-Event</th>
<th>During (1-2 hrs)</th>
<th>During (2-3 hrs)</th>
<th>During (3 hrs)</th>
<th>Post-Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbs</td>
<td>1.4-4.8g/kg</td>
<td>n/a</td>
<td>30-60 g/hr</td>
<td>30-60 g/hr</td>
<td>1 to 1.2 g/kg/hr during the first 4 to 6 hours</td>
</tr>
<tr>
<td>Protein</td>
<td>May consume 20-40g</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>20-40g consumed every 3-4 hrs</td>
</tr>
<tr>
<td>Fat</td>
<td>As tolerated</td>
<td>As tolerated</td>
<td>As tolerated</td>
<td>As tolerated</td>
<td>As part of total daily intake</td>
</tr>
<tr>
<td>Sodium (Na)</td>
<td>Add salt to food/MRE</td>
<td>n/a</td>
<td>400-650 mg/hr</td>
<td>650-1100 mg/hr</td>
<td>Upwards of 9-10 g Na/day during very high activity in 100° F degree heat</td>
</tr>
</tbody>
</table>

**References for Performance Nutrition Criteria**

Thank you

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Precision Nutrition

- Individual response to diet
- Epigenome
- Differential gene expression
- Microbiota
- Metabolic products
- Bioactive compounds
- Individual
- Diet