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# **The Use Of Military Food Rations In The Reconnaissance Military Field Exercise**

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## Studies before (in Finnish Defence Forces)

- Studies before have improved that soldiers operate under energy deficit in military reconnaissance exercise
- Energy deficit decrease body mass, fat mass and fat free mass
- Energy intake in reconnaissance exercise
  - 2900 kcal / d (Kyröläinen etc. 2004)
  - $2200 \pm 326$  kcal / d (Salonen 2008)
  - $2600 \pm 400$  kcal / d (Tanskanen etc. 2012)
- Energy expenditure in reconnaissance exercise is
  - 4600 kcal / d (Salonen 2008)
  - 4900 - 5500 kcal / d (Tanskanen etc. 2012)



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- In reconnaissance field exercise soldiers (=scouts) consume 57 – 64 % of available energy
- even if they are suffering from energy deficit





## Research questions

1. How much energy soldiers ingest and consume in reconnaissance field exercise?  
What kind of physical changes appears in four day reconnaissance field exercise?
2. What are the main reasons for inadequate food intake in military field exercise? Why conscripts abandon military food rations?
3. What things correlate with efficient and inefficient food intake?





## Food rations

- Food rations were made up of several standard components including breakfast, lunch, dinner, snacks, beverages and accessory items.

**Leijona Catering**



**Drytech**



**Amica, Blå Band**







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## Participants

- 114 conscripts in Reserve Officer School volunteered to participate the study



	Mean $\pm$ SD
Age (year)	19.5 $\pm$ 0.6
Length (cm)	180 $\pm$ 6
Weight (kg)	76.2 $\pm$ 8.6
BMI (kg/m <sup>2</sup> )	23.5 $\pm$ 2.3
Fat mass (kg)	9.6 $\pm$ 3.9
Percent fat mass (%)	12.5 $\pm$ 4.1
Fat free mass (kg)	66.5 $\pm$ 6.9
VO <sub>2</sub> max (ml/kg/min)	49.1 $\pm$ 4.9









## Methods

Energy and water intake was measured with food and water diaries

Customer satisfaction was measured with questionnaires

**MAANANTAI MENU A**

	VAIKUMARIPUOLIO	KAMPASTA	TACOFITA	TROOP-HEDELMÄT-AISELLI	KINKKUPASTEJA	NÄKKILEIPÄ (6 PALJAN)	PÄHKINÄ-HEDELMÄSEKOITUS	PROTEINIPASTUOKA	PROTEINIPATUKKA	ENERGIAIDONMAUHE	ENERGIAIDONMAUHE	KAKAO	KAKAO	SOKEI 4 KPL	KUUVAKERMA 4 KPL
KULUTUS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TILANNE JOSSA KÄYIT TUOTTEEN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SYYT SYÖMÄTTÄ JÄTTÄMISEEN 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SYYT SYÖMÄTTÄ JÄTTÄMISEEN 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SYYT SYÖMÄTTÄ JÄTTÄMISEEN 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

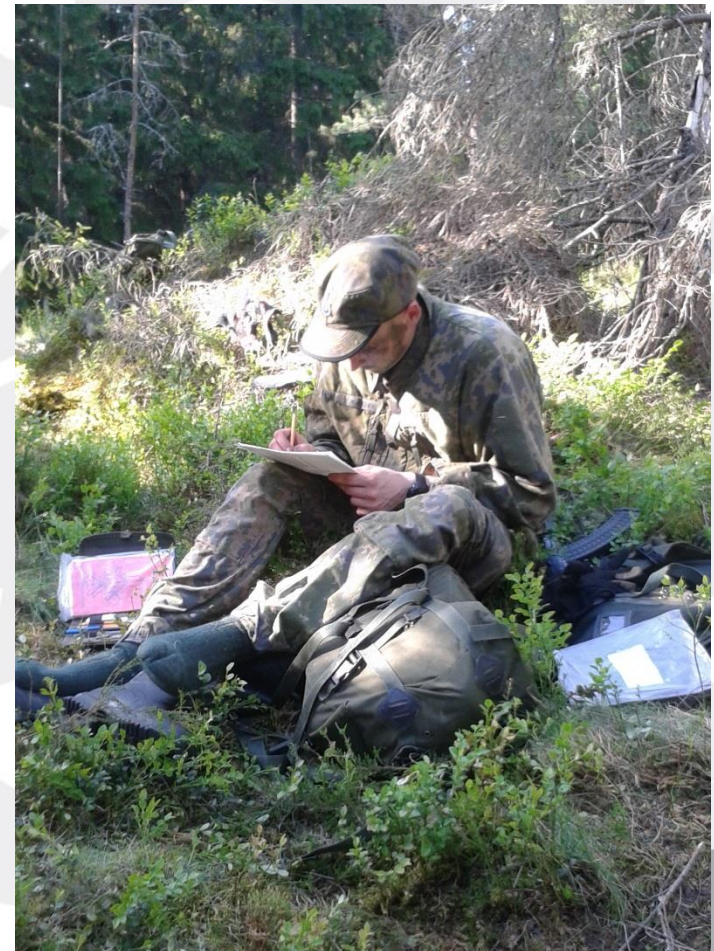
**KULUTUS**  
1 = EN SYÖNYT  
2 = 1/2  
3 = SOIN PUOLET  
4 = 1/4  
5 = SOIN KOKO TUOTTEEN

**TILANNE JOSSA KÄYIT TUOTTEEN**  
1 = TAUKO / RUOKATAUKO  
2 = SIIRTYMINEN  
3 = VARTIO-, PARTIOINTI- TAI TÄHYSTYSTENTÄVÄ  
4 = JOKIN MUU

**SYYT SYÖMÄTTÄ JÄTTÄMISEEN (1-3)**  
1 = EI OLE NÄUKÄ / JANO  
2 = TUOTE EI OLE RIITTÄVÄN HOUKUTTELEVA  
3 = MAKU EI MIELISTÄ  
4 = EN VIITSI / JAKSA SYÖDÄ TAI VALMISTAA  
5 = VALMISTUS / SYÖMINEN VEISI LIIKAA AIKAA  
6 = VALMISTUS VEISI LIIKAA VETÄ

**7 = EN OSAA VALMISTAA**  
8 = ANNOS ON LIIAN SUURI  
9 = PIDÄN TUOTETTA EPATERVEELLISENÄ  
10 = OLEN ALLERGISEN / YLMERKKIA TUOTTEELLE  
11 = TUOTE ON VALUUNOITUNUT  
12 = EN VIITSI, MENEN MIELIKUMMIN NUKKUMAAN  
13 = EN OSAA SANOA / MUU SYY  
14 = EN KÄYTÄ  
15 = EI MAISTU

	VAIKUMARIPUOLIO	KAMPASTA	TACOFITA	TROOP-HEDELMÄT-AISELLI	KINKKUPASTEJA	NÄKKILEIPÄ (6 PALJAN)	PÄHKINÄ-HEDELMÄSEKOITUS	PROTEINIPASTUOKA	ENERGIAIDONMAUHE	KAKAO	MAKU
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(1 ERITTÄIN PÄHÄ - 6 ERITTÄIN HYVÄ)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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(1 ERITTÄIN HANKALA/TYÖLÄS KÄYTTÄÄ - 6 ERITTÄIN HELPPO/KÄTEVÄ KÄYTTÄÄ)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VALMISTAMISEN HELPPOUS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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(1 ERITTÄIN HIDAS - 6 ERITTÄIN NOPEA)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TUOTTEEN TERVEELLISYYS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(1 ERITTÄIN EPÄTERVEELLINEN - 6 ERITTÄIN TERVEELLINEN)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TUOTTEEN SOVELTUVUUS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MUONAPAKKAUKSEEN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(1 TUOTE EI SOVELLU - 6 SOVELTUU HYVIN)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

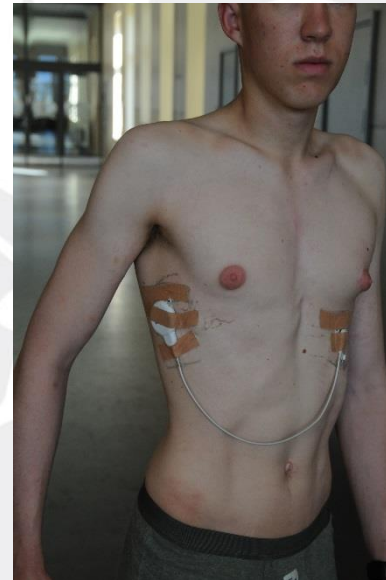




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Changes in body mass and body composition was measured with the bio impedance method

Heart rate was measured with a Firstbeat Bodygard portable heart rate monitor



All statistical analyses were performed with PASW Statistics software (Version 22.0.0; SPSS Inc., Chigago, IL)







## Results

- Participants consumed  $80 \pm 17$  % from the offered energy.

	Mean $\pm$ SD
Energy intake (kcal / d)	3298 $\pm$ 781
Energy expenditure (kcal / d)	4807 $\pm$ 1139
Heart rate (beat / min) (24 h measurement)	89 $\pm$ 11
Water intake (l / d)	5.7 $\pm$ 1.8
Weight of equipment (kg)	49.8 $\pm$ 5.0
Sleep (min / d)	187 $\pm$ 125





### Changes in body mass and body composition during 4-days reconnaissance exercise

	Before	After	Change	Change (%)	p
Body mass (kg)	76.1 ± 8.7	74.6 ± 8.5	1.5 ± 1.0	2.0	<0.001
Fat free mass (kg)	66.3 ± 7.0	66.0 ± 7.1	0.4 ± 1.2	0.6	<0.001
Fat mass (kg)	9.7 ± 3.9	8.6 ± 3.6	1.2 ± 0.8	12.4	<0.001
Body fat (%)	12.6 ± 4.2	11.3 ± 4.1	1.3 ± 1.0	10.3	<0.001





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The amount of  
abandoned rations



How common the  
reason was



Ration	%	Reasons to abandon the ration	%
Breakfast	27	1. Taste was unpleasant 2. Don't feel hungry	32 20
Lunch & dinner	14	1. Don't feel hungry 2. Taste was unpleasant	23 13
Snack	21	1. Taste was unpleasant 2. "I don't know"	27 22
Beverage	43	1. Had no interest to prepare and drink them 2. "Some other reason"	29 18





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- Body mass, fat free mass, BMI, energy expenditure or weight of equipment (kg or %) didn't correlate between energy intake.
- There was weak but significant correlation between energy intake and
  - amount of offered energy ( $r=0.33$ ,  $p<0.001$ )
  - water intake ( $r=0.17$ ,  $p<0.001$ ),
  - satisfaction with the rations ( $r=0.201$ ,  $p<0.001$ ) and
  - taste of the main meals ( $r=0.16$ ,  $p<0.001$ )
- Drytech's food rations proved to be the best according to taste and energy intake.







## Discussion

- Rations are nowadays lighter, tastier and easier to use than few years ago.
- Reconnaissance military field exercise caused energy deficit which was reflected as
  - decreased body weight,
  - fat mass and
  - fat free mass.
- The most common reason for not eating the food rations was the bad taste.



- The eating habits of conscripts divided them into two groups:
  1. Some of the participants consumed energy efficiently and ate almost all energy they were offered
  2. Others ate little during the whole military field exercise.
- Those participants who consumed energy efficiently
  - ingested more energy
  - consumed more water and
  - were more satisfied with rations.





### Conclusions

- Rations offered in Finnish Defence Forces have developed in right direction.
- Energy requirements, military tasks and environmental conditions should take in account when developing new rations.
- It is useful to highlight the importance of eating and consequences of inadequate diet.
- More studies are encouraged to investigate how much energy soldiers should ingest to maintain his or her action competence and combat readiness.





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