



UNIVERSITI PUTRA MALAYSIA

***EFFECTS OF MENU CHANGE ON NUTRITIONAL STATUS, ENERGY
BALANCE AND FOOD ACCEPTANCE OF RECRUITS AT THE BASIC
TRAINING CENTRE IN PORT DICKSON, MALAYSIA***

NURHAZWANI BINTI ABDULLAH

FSTM 2013 13



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By

NURHAZWANI BINTI ABDULLAH

**Thesis Submitted to the School of Graduate Studies, Universiti Putra
Malaysia, in Fulfilment of the Requirements for the Degree of Master of
Science**

November 2013

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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November 2013

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Impact of basic recruit training (BT) on nutritional status is extensively studied but there are limited possible strategies to minimize the potential losses of nutritional status during BT. The research aimed to determine the effects of BT on nutritional status, energy balance, food acceptance and foodservice satisfaction during BT and subsequent menu changes was implemented after the effects were determined. There were two studies, which study 1 provided baseline assessment and study 2 was a menu changes as the intervention from results of study 1. Study 1 was a case study with 50 recruits series A for 6 months. Nutritional status measured were body weight and composition with TANITA-TBF300A, food intake with 24-hours diet recall and food weighing, physical activity status with questionnaire based on energy cost of activities, energy provided by menu and portion sizes served were calculated with Nutritionist Pro, and assessment of food acceptance and foodservice satisfaction with validated questionnaires. Study 1 showed that body weight and composition were attenuated ($p < 0.05$) and energy intake decreased throughout BT ($p < 0.05$) with fat as the major source of energy. Most of selected nutrients met or exceed the recommended level of nutrients except for calcium and dietary fibre. Energy requirement was high during Phase 2 BT while at Phase 3 BT, recruits showed the highest negative energy balance ($p < 0.05$). Menu showed that the nutrients met the Recommended Level of Intakes (RNIs) for Malaysian but not the military dietary recommendation, PMAT of energy. Standard food portions served improved body weight and composition of the recruit ($p < 0.05$). Sensory attributes was emphasized when choosing meals. Recruits rated poor foodservice satisfaction level. Study 2 was a pretest-posttest design with 75 army recruits series B that participated in the 6-months of menu changes. The effects of menu changes were examined on nutritional status, energy balance, food acceptance and foodservice satisfaction. Study 2 employed same methods as study 1 for the variables measured. Results showed that menu changes did not have significant effects on the body weight, lean body mass and total body water. However, BMI and body fat percents were significantly increased ($p < 0.05$). The recruits consumed higher energy intake (~100 to 900 kcal) ($p < 0.05$) and fulfilled the military dietary recommendation, PMAT for energy intake but did not meet the energy requirement of BT. Carbohydrate met the

range of recommended level (55 to 70%) and fat intake met the range of fat intake (30%). Recruits attained the nutrient requirement for vitamin A, vitamin C, iron, thiamine, riboflavin, niacin, sodium and zinc. Calcium intake was close to the recommendation but dietary fibre was not sufficiently consumed. The negative energy balance was reduced throughout BT. Scores of food acceptance increased and foodservice satisfaction has improved from poor to acceptable ($p < 0.05$) with menu changes. In conclusion, menu changes lessen the negative energy balance among the recruits. Yet, there were no significant changes of body weight and composition except for BMI and body fat. Hence, more research is warranted to establish the long term benefits of this menu approach.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk Ijazah Master Sains

**KESAN PERUBAHAN MENU TERHADAP STATUS PEMAKANAN,
KESEIMBANGAN TENAGA DAN PENERIMAAN MAKANAN OLEH
REKRUT DI PUSAT LATIHAN ASAS TENTERA DARAT DI PORT
DICKSON, MALAYSIA**

Oleh

NURHAZWANI ABDULLAH

November 2013

Pengerusi : Prof. Madya Dr. Boo Huey Chern, PhD
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Impak latihan asas ketenteraan (BT) terhadap status pemakanan telah dikaji meluas tetapi strategi untuk mengurangkan kehilangan status pemakanan semasa BT adalah terhad. Penyelidikan ini bertujuan untuk menentukan kesan BT kepada status pemakanan, keseimbangan tenaga, penerimaan makanan dan tahap kepuasan perkhidmatan makanan semasa BT, dan intervensi yang dijalankan setelah kesan BT ditentukan. Terdapat dua kajian yang mana kajian I adalah untuk memberikan penilaian asas dan kajian II adalah perubahan menu sebagai intervensi kepada keputusan daripada kajian I. Kajian I adalah kajian kes yang melibatkan 50 rekrut siri A selama 6 bulan. Status pemakanan diukur adalah berat dan komposisi badan dengan menggunakan TANITA-TBF300A, pengambilan makanan dengan ingatan 24-jam dan penimbangan makanan, status fizikal aktiviti dengan soal selidik berdasarkan kos tenaga aktiviti, tenaga yang dibekalkan oleh menu dan saiz porsi yang dihidangkan dikira dengan Nutritionist Pro, dan penilaian penerimaan makanan dan tahap kepuasan perkhidmatan makanan dengan soal selidik yang telah validasi. Kajian I menunjukkan berat dan komposisi tubuh menurun ($p < 0.05$) dan pengambilan tenaga berkurang sepanjang BT ($p < 0.05$) dengan lemak sebagai sumber tenaga utama. Kebanyakan nutrien memenuhi atau melebihi saranan nutrien kecuali kalsium dan serat diet. Keperluan tenaga adalah tinggi semasa Fasa 2 BT dan Fasa 3 BT menunjukkan keseimbangan tenaga negatif yang tertinggi ($p < 0.05$). Menu menunjukkan nutrien memenuhi saranan tenaga untuk RNI Malaysia tetapi tidak saranan tenaga untuk tentera, PMAT. Saiz porsi standard yang dihidangkan memperbaiki berat dan komposisi tubuh rekrut ($p < 0.05$). Ciri sensori ditekankan semasa pemilihan makanan. Tahap kepuasan perkhidmatan makanan rekrut adalah rendah. Kajian II adalah ujian pra-pasca dengan 75 rekrut siri B yang mengikuti 6-bulan perubahan menu. Kesan perubahan menu ditentukan dengan status pemakanan, keseimbangan tenaga, penerimaan makanan dan tahap kepuasan perkhidmatan makanan. Kajian II menggunakan kaedah pengukuran seperti kajian I bagi pembolehubah yang diuji. Hasil menunjukkan perubahan menu tidak mengubah berat, jisim tubuh tanpa lemak dan jumlah air dalam badan secara signifikan. Bagaimana pun, IJT dan lemak tubuh meningkat secara

signifikan ($p < 0.05$). Rekrut mengambil tenaga yang lebih tinggi (~100 sehingga 900 kcal) ($p < 0.05$) dan memenuhi saranan diet tentera, PMAT untuk pengambilan tenaga, tetapi tidak memenuhi saranan keperluan tenaga semasa BT. Karbohidrat memenuhi julat saranan (55 sehingga 70%) dan lemak memenuhi saranan (30%). Rekrut mencapai keperluan nutrien untuk vitamin A, vitamin C, zat besi, tiamin, riboflavin, niasin, natrium dan zink. Pengambilan kalsium hampir memenuhi saranan tetapi serat diet tidak diambil dengan cukup. Keseimbangan tenaga negatif berkurang sepanjang BT. Skor penerimaan makanan meningkat dan tahap kepuasan perkhidmatan makanan bertambah baik daripada rendah kepada boleh diterima ($p < 0.05$) dengan perubahan menu. Kesimpulannya, perubahan menu mengurangkan keseimbangan tenaga negatif di kalangan rekrut. Namun, tiada perubahan signifikan terhadap berat dan komposisi tubuh kecuali BMI dan lemak tubuh. Oleh itu, lebih kajian diperlukan untuk mengukuhkan faedah jangka panjang pendekatan menu.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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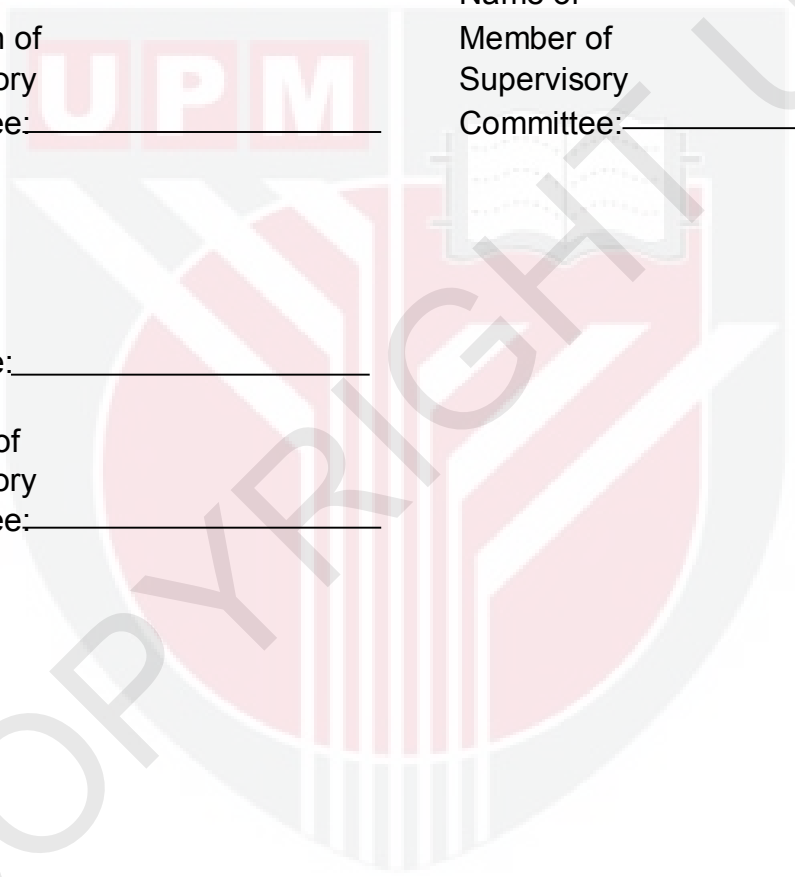
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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

The impact of basic recruit training (BT) on the army recruits' health and lifestyle is getting considerable attention from the Armed Forces superior for a reason that the Armed Forces have to produce fit and healthy army recruits with capabilities to work with the armed services. During BT, a recruit will be trained and adopt the life as the real soldier, before being commissioned as a soldier. Army recruits in the Malaysian Armed Forces aged between 18-24 years, and their admission to BT is the prerequisite to join the Malaysian Armed Forces (Ministry of Defence Malaysia [MINDEF] 2011). BT benefits the recruits as it develops cardiorespiratory performance and muscle strength (Knapik, Darakjy, Hauret, & Canada, 2006; Loughran, Martorell, Miller & Klerman, 2011; Santtila, Keijo, Laura & Heikki, 2008; Shek, Shephard, Brenner & Bateman, 2001). Recruits have to maintain their performance during the arduous military training to pass the BT and before going to the selected regiment or corps because certain unit such as Special Forces require highly fit soldiers (Jesse, Training Cell Warrant Officer I, personal communication, July 18, 2011). BT is a training course that transforms civilians into soldiers. Over the BT of sixth-months period, the recruits learn about basic soldiering skills, army heritage and Seven Army Core Values. From the Seven Army Core Values, training modules were developed to achieve the target set by the core values (*Arahan Latihan Perajurit Muda*, 2011). The Seven Army Core Values are the foundation of the training modules in BT to achieve the training objectives. Table 1 (Appendix A) shows the training modules based on the seven army core values

BT is divided into three training phases; Phase 1, Phase 2 and Phase 3 BT respectively, in which every phase will increase in duration, frequency and intensity of training before taking the final battlefield (Subhi, Training Cell Captain, personal communication, June 10, 2010). Total of training hours for sixth-months of BT is 904 hours of working and another 106 hours of outside working hours.

Phase 1 BT transforms a civilian with military values and develops the physical strength for two-month period. Primary training is mostly held in the camp, and they learn the theoretical parts of the training in the classroom. Training includes exercise training, drills, tactical foot marches, basic marksmanship, and combat and first aid skills. Phase 2 BT constructs the attitude of recruits with enhanced physical ability, mental toughness and self-esteem for two-month period. Phase 2 BT is more advanced and rigorous than the Phase 1 BT and is mostly comprises of field exercise training. This includes weapon drill, individual and team marksmanship, hand granite, orienteering, water confidence, abseiling and rappelling, obstacles course, and

enabling test (writing test stage 1). In Phase 2 BT, advanced exercise training are carried out, for example, war-exercise (endurance physical training- hands activity, feet and waist activity, grouping activity, and obstacles training), porky drill and sports (obstacles course, soccer, sepak takraw, cross-country, kickboxing, softball, netball, tug-and-war, and futsal). Recruits always keep themselves on fatigues during the Phase 2 BT, even on weekends. After becoming familiar with the Phase 2 BT, the recruits put their training to the test at Phase 3 BT. This final training will test the knowledge and skills required before being enlisted as a soldier. The training consists of final field training exercises, sports carnival, drill competition, and premier test (writing test stage 2). For the first few weeks of Phase 3 BT, they will have the most intensive training. They will be physically tested either pass or fail. On the following weeks of Phase 3 BT, the recruits congregate for Rites of Passage, right after the field training exercises. It marks the completion of all BT phases and the final transition from 'recruit' to 'soldier'.

1.2 PROBLEM STATEMENT

There are limited studies or scholarly research that has explored energy intake of the recruits when food is supplied by the contract catering in the Malaysian Armed Forces foodservices and the impact of the food on nutritional status of the recruits, as well as the food acceptance and foodservice satisfaction during basic recruit training. As the contract catering strives to achieve the highest level of services for the recruits, the contract catering would like to evaluate their foodservice performance, and see if the recruits are satisfied with their services. This study addresses whether the food provided by the contract catering would sustain the army recruits during BT training and what are the feedbacks of the foodservice in the Army Basic Training Centre, by examining these research questions: 1. How is the impact of BT on the army recruits' body weight and composition? 2. Are energy and nutrient intake adequate during BT? 3. How are the physical status and energy balance during BT? 4. Are the nutrients from the current menu meet the recommended level of nutrient intakes of (RNIs) and the military recommendation (PMAT) for army recruits during BT? 5. How are the effects of portion sizes served on the nutritional status of army recruits? 6. What is their food acceptance during BT? 7. How is the feedback on the foodservice? 8. What strategies can be done if the army recruits do not achieve good nutritional status, which can adverse the performance during BT?

1.3 STUDY OBJECTIVES

Two studies are conducted and the objectives of these studies are:

Study 1

Main objective 1: To evaluate changes in nutritional status of army recruits throughout basic recruit training (BT)

Specific:

1. To evaluate changes in body weight and composition during basic recruit training (BT)
2. To evaluate changes in energy and nutrient intake during basic recruit training (BT)

Main objective 2: To evaluate changes in physical activity status during basic recruit training (BT)

Specific:

1. To evaluate changes in energy expenditure, energy balance and physical activity level during basic recruit training (BT)
2. To examine the relationship between anthropometric measures and nutrient intake with physical activities.

Main objective 3: To evaluate menus of the contract catering in the Army Basic Training Centre

Specific:

1. To determine the energy and macronutrients composition of menus
2. To compare the nutrient values of the menus to the Recommended Nutrient Intakes (RNIs) of Malaysia and the military recommendation, PMAT
3. To examine the effects of standard food portions with the food portion practices on the nutritional status

Main objective 4: To determine food acceptance of army recruits of the foods by the contract catering in the Army Basic Training Centre

Specific:

1. To examine the relationship between hedonic ratings and the consumption of the foods
2. To understand why they like or reject the foods
3. To evaluate the differences of the sensory characteristics of the foods

Main objective 5: To determine the recruits' foodservice satisfaction with the contract catering in the Army Basic Training Centre

Specific:

1. To determine the scores for individual foodservice statements and foodservice dimensions
2. To examine the relationship between foodservice dimensions with overall satisfaction

Study 2

Main objective 1: To evaluate changes in nutritional status of army recruits who participated in the menu plan intervention

Specific:

1. To evaluate changes in body weight and composition of army recruits during the menu plan intervention
2. To evaluate changes in energy and nutrients intake of army recruits during the menu plan intervention
3. To evaluate changes in energy balance of army recruits during the menu plan intervention

Main objective 2: To determine the feasibility of the menu plan intervention by measuring food acceptance and foodservice satisfaction with the contract catering in the Army Basic Training Centre

Specific:

1. To measure food acceptance after implementation of the menu plan intervention
2. To measure foodservice satisfaction with the contract catering after implementation of the menu plan intervention

1.4 HYPOTHESES

Proposed hypotheses for study 1 and study 2 are:

Study 1

H1. There is a significant change in body weight and composition during basic recruit training (BT)

H2. There is a significant change in energy and nutrient intake during basic recruit training (BT)

H3. There is a significant change in energy balance during basic recruit training (BT)

H4. There is a significant relationship between anthropometric measures and nutrients intake with physical activity

H5. The menus provided by the catering meet the recommended level of nutrient intake for the army recruits

H6. There are significant effects of portion sizes on the nutritional status

H7. There is a significant relationship between hedonic ratings and the consumption of the foods

H8. There is a significant difference of the sensory characteristics of the foods

H9. There is a significant relationship between foodservice dimensions with overall satisfaction

Study 2

H1. Menu has a significant effect on body weight and composition of army recruits

H2. Menu has a significant effect on energy and nutrient intake of army recruits

H3. Menu has a significant effect on energy balance of army recruits

H4. Menu has a significant effect on food acceptance of army recruits

H5. Menu has a significant effect on foodservice satisfaction of army recruits

1.5 SIGNIFICANCE OF THE STUDY

The study is important as it is done with a comprehensive methodology and procedures. The originality of the study provides detailed sensory assessment and foodservice evaluation of food served during basic recruit training in Malaysia and information of nutritional adequacy throughout all phases of basic recruit training and other factors that may influence the food intake during basic recruit training, which are required to the formulation of managerial policies for menu planning in the Malaysian Armed Forces. In addition, the study may help to increase literatures about outsourcing of the Malaysian Armed Forces foodservices to the contract catering. The study also provides qualitative explanation of Malaysian army recruits' food acceptance that may influence the food intake during BT. Results from the study may be used by the contract catering to identify the strengths and weaknesses of the food and services as well as provide the menu planners with other alternative to tackle under consumption of food during BT.

1.6 DEFINITION OF TERMS

Body composition: Proportions of various tissues (fat, muscle, and bone) in human bodies, usually expressed as body fat percentages and percentages of lean body mass (Lee & Nieman, 2005)

Body weight: An important variable in equations predicting caloric expenditure and in indices of body composition (Chumlea, 1988)

Energy intake: Determination of energy from proportions of carbohydrate, protein and fat whether it suffices the dietary recommended level (National Coordinating Committee on Food and Nutrition, 2005)

Energy requirement: The energy requirement of an individual is the level of energy intake from food that will balance energy expenditure when the individual has a body size and composition, and level of physical activity, consistent with long-term good health; and that will allow for the maintenance of economically necessary and socially desirable physical activity. In children and pregnant or lactating women the energy requirement includes the energy needs associated with the deposition of tissues or the secretion of milk at rates consistent with good health (FAO/UNU/WHO, 1985)

Food acceptance: Stimulated response denoting the degree of like or dislike for a particular food due to the food attributes (appearance, taste, aroma, and overall acceptance) (Edwards, Kipps, & Thomson, 1988)

Food portions: The amount of a food chosen to eat at any one time-which may be more or less than a serving (Academy of Nutrition and Dietetics, 2013)

Nutritional status: A measurement of the extent to which an individual's physiologic need for nutrients is being met (Mahan, 2004)

Satisfaction: A measurement of a consumer's feedback of food and services (Capra et al., 2005)

1.7 THESIS ORGANIZATION

This thesis has conducted two studies with chapter 1 contains introductory chapter, explores the study gaps and objectives of the study. Chapter 2 contains a review of literature. Chapter 3 comprises of study 1, which examines the impact of BT on nutritional status, physical activity, food preferences, food acceptance and satisfaction with army recruits series A for 26-weeks of BT. Chapter 4 contains study 2, that test the effects of menu changes in improving the nutritional status of army recruits during basic recruit training (BT) and to assess whether this approach effectively increased food preferences, food acceptance and satisfaction level with the catering, with army recruits series B. Chapter 5 presents the general discussion between study 1 and study 2. Chapter 6 consists of general conclusion, limitations and further research. References cited are listed following chapter 6. Appendices are at the end of the thesis.

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