



ELSEVIER

ORIGINAL ARTICLE



# Validation of prediction equations for resting energy expenditure in Singaporean Chinese men

Tammy Song<sup>a,\*</sup>, Kavita Venkataraman<sup>b</sup>, Peter Gluckman<sup>c</sup>,  
Chong Yap Seng<sup>b</sup>, Khoo Chin Meng<sup>a</sup>, Eric Yin Hao Khoo<sup>a</sup>,  
Melvin Khee Shing Leow<sup>c</sup>, Lee Yung Seng<sup>c</sup>, Tai E. Shyong<sup>a</sup>

<sup>a</sup> Department of Medicine, National University of Singapore, Singapore

<sup>b</sup> Department of Obstetrics and Gynaecology, National University of Singapore, Singapore

<sup>c</sup> Singapore Institute for Clinical Sciences, Singapore

Received 8 October 2012; received in revised form 17 May 2013; accepted 19 May 2013

## KEYWORDS

Prediction equation;  
Resting energy  
expenditure;  
Validity;  
Ethnicity;  
Chinese

**Summary** Accurate prediction of resting energy expenditure (REE) is important in establishing adequate dietary intake goals for effective weight management. Previous studies have shown that the validity of an energy prediction equation may depend on the ethnicity of the population. Validation studies are lacking in the Singaporean Chinese population. A total of 96 healthy Singaporean Chinese males of age 21–40 years and body mass index (BMI) 18.5–30.0 kg/m<sup>2</sup> participated in this study. REE was measured by indirect calorimetry and compared with REE predicted using existing equations. Validity was evaluated on the basis of mean bias and percentage of subjects predicted within  $\pm 10\%$  of REE measured. In addition, Bland and Altman analyses were performed. No significant difference was observed between the mean levels of measured and predicted REE derived from the Owen equation. The Food and Agriculture Organization/World Health Organization/United Nations University (FAO/WHO/UNU), Harris–Benedict and Mifflin equations significantly overestimated the mean measured REE by 7.5%, 6.0% and 2.4% respectively. Percentage of valid predictions for FAO/WHO/UNU, Harris–Benedict, Mifflin and Owen equations were 60%, 67%, 75% and 73% respectively. Bland and Altman analyses demonstrated poor agreement for all equations. The Owen equation provided a valid estimation of REE in Singaporean Chinese men at a group level. However, the individual errors of the

\* Corresponding author at: Centre for Translational Medicine, MD 6, National University of Singapore #10-01, 14 Medical Drive, 117599, Singapore. Tel.: +65 94895982.

E-mail address: [tammy.song@nus.edu.sg](mailto:tammy.song@nus.edu.sg) (T. Song).

equations were unacceptable high and may have limited utility in making clinical decisions on nutritional requirements.

© 2013 Asian Oceanian Association for the Study of Obesity. Published by Elsevier Ltd. All rights reserved.

## Introduction

The accurate determination of total energy expenditure (TEE) is important for establishing dietary intake goals in weight management of both normal weight and obese individuals and nutritional management of hospitalised patients to avoid the adverse effects of overfeeding and underfeeding [1,2]. It is also used in estimating the energy requirements of a population [1].

Since the routine use of indirect calorimetry (the criterion standard for measuring REE) is not feasible in daily clinical practice, predictive equations are often used to estimate REE [3]. The validity of any predictive equation is crucial as REE is often used as the predictor of TEE as it accounts for 60–70% of TEE for people leading a sedentary lifestyle [4]. Any bias in REE assessment would be amplified when it is multiplied by the factor that is used to estimate the TEE of a population or individuals. The Food and Agriculture Organization/World Health Organization/United Nations University (FAO/WHO/UNU) 1985 predictive equation developed using data from Schofield and colleagues have been adopted as a basic reference for the development of energy requirements in Singapore [5–7]. However, it is unclear whether this equation can be applied successfully to the Singaporean population.

The FAO/WHO/UNU equations, developed using predominantly European subjects, seemed to be less accurate in predicting REE in Asian populations [8–13]. In a study by Ismail et al., FAO/WHO/UNU equations overestimated the REE of adult Malays, Chinese, Indians and Dayaks living in Malaysia by 13% in male and 9% in female subjects [11]. Recently, Tseng et al. reported that the measured REE was significantly lower than REE calculated by the equation by  $271 \pm 311$  kcal/day in Chinese subjects living in Taiwan [13].

Researchers have also queried the continued applicability of the FAO/WHO/UNU equations in our modern population, with changes in body size and composition, physical activity level and diet [14,15]. Several studies have shown that these predictive equations overestimated REE in Caucasian as well as in Asian populations [16–18]. Muller et al. reported that the WHO equations overestimated REE from the measured values by up to 14.3% in males and 7.5% in females in Germany [16]. According to Piers et al., measured REE of

Australian men and women were significantly lower than the predicted REE using FAO/WHO/UNU equations by  $406 \pm 513$  kJ/day and  $124 \pm 348$  kJ/day respectively [17].

No validation studies on prediction equations for REE have been conducted in Singapore. Therefore, it is crucial to identify the most accurate equation appropriate for predicting energy needs in this population. The objective of this study was to evaluate the validity of FAO/WHO/UNU [19] equation and other commonly used prediction equations, Harris–Benedict, Owen et al. and Mifflin et al. from the literature in a sample of healthy Singaporean Chinese men [20–22]

## Materials and methods

### Subjects

A total of 96 healthy Singaporean Chinese men participated in this cross-sectional study. The subjects were selected from a larger study of 260 subjects designed to evaluate the effect of genomic variation, ethnicity and developmental factors on disease risk in Singaporean men with obesity. Only adults aged 21–40 yrs and body mass index (BMI)  $18.5–30.0$  kg/m<sup>2</sup>, with sedentary lifestyle (defined as exercise less than once a week of not more than 30 min duration) were included. We have used the adjusted BMI definitions for the Asian population according to WHO expert consultation in 2002, where  $18.5–22.9$  kg/m<sup>2</sup> represents low risk,  $23.0–27.4$  kg/m<sup>2</sup> represents moderate risk and  $\geq 27.5$  kg/m<sup>2</sup> represents high risk [23]. Exclusion criteria included hypertension, diabetes mellitus, dyslipidemia, altered thyroid function, chronic kidney, liver disease and the usage of medications known to influence REE, for example sibutramine. Subjects with significant recent changes in body weight of more than 5% over the past 6 months or who were actively attempting to lose weight through dieting, bariatric surgery or anti obesity drugs were excluded in view of the need to recruit participants with stable weight of a given narrow distribution of BMI. The subjects were recruited by advertisement. The study was approved by the Domain Specific Review Board of the National Healthcare Group and written informed consent was obtained from each subject.

Download English Version:

<https://daneshyari.com/en/article/3003644>

Download Persian Version:

<https://daneshyari.com/article/3003644>

[Daneshyari.com](https://daneshyari.com)