

# Knowledge of personal energy requirements in college students

Aurora Buffington, Richard Tandy, and Laura Kruskall, FACSM

Department of Kinesiology and Nutrition Sciences, School of Allied Health Sciences, University of Nevada, Las Vegas

## Abstract

This study explored whether university students enrolled in health science classes were able to estimate their energy requirements within a range of calories equal to predicted Estimated Energy Requirements (EER)  $\pm$  two standard deviations. The self-administered long version of the International Physical Activity Questionnaire (IPAQ) and a participant survey were given to a convenience sample (N=155) of 63 male and 92 female undergraduate students (19-23 years) with subsequent measurements of height, weight and body fat percentage. The surveys produced participants' self-reported anthropometric data, perceived estimated energy requirements, and status of prior college level nutrition education. Results from the IPAQ yielded metabolic equivalents which were converted to physical activity coefficients for use in the objectively calculated EER equation. Comparisons were made between self-estimated vs. calculated energy requirements, as well as self-reported vs. measured heights and weights. The participants' mean BMI was  $24.3 \pm 4.6$ , with 5.8% classified as unhealthy low (<18.5) and 34.2% classified as either overweight (25-29.9) or obese (>30). The mean physical activity level (PAL) was  $1.8 \pm .5$ , reflecting an active lifestyle, with 30% classified as sedentary. Students estimated their EER at a mean of 2085 calories, significantly underestimating their calculated EER by a mean of 700 calories ( $p < .001$ ), and they estimated their basal energy expenditures (BEE) at a mean of 929 calories, significantly underestimating their calculated BEE by a mean of 644 calories ( $p < .001$ ). Female students were better able to estimate energy requirements as compared to their male counterparts, 41.3% vs. 20.6%,  $\chi^2(1) = 7.236, p = .007$ . These preliminary findings suggest that college students are not aware of the amount of energy in calories required to maintain their personal state of energy balance, and further assessment of this topic could provide a better understanding to assist people in the achievement and maintenance of healthy weight.

## Introduction

The rates of overweight and obesity in the U.S. have risen steadily to the current rate of 66%. Merely attending college is associated with weight gain during the transition from childhood to early adulthood. Studies have shown that adult mortality may be related to BMI in early and mid-adulthood independent of the weight status as an adult. It follows that a healthy weight during young adulthood could have a bearing on health in the later years of life.

One determinant of energy-balance related behavior is the ability or perceived ability of the individual to perform a particular behavior. A starting point for this study was to determine what knowledge people had in regards to their personal energy requirements. A literature search on the topic however, yielded minimal information. This study examined whether college students could estimate the amount of calories needed to maintain their current weight, within a wide calorie margin equal to two standard deviations.



Figure 1. Energy balance equation. In order to maintain body weight, energy in must equal energy out.

## Materials and methods

A convenience sample was taken from undergraduate students enrolled in introductory nutrition or health statistics classes at the University of Nevada, Las Vegas. Participants filled out a Participant Survey and the self-administered long version of the IPAQ. Heights and weights were taken using a medical balance beam scale equipped with a measuring rod, and body fat percentages were assessed using an HBF-306 Omron body fat analyzer.

Data entry was accomplished using an Excel spreadsheet which was formatted to automatically calculate the following:

- Body Mass Index (BMI)
- Basal Energy Expenditure (BEE)
- Metabolic Equivalents per minute per day (MET-min/day)
- Physical Activity Level (PAL) and coefficient
- Estimated Energy Requirements (EER) (Table 1)

The data were analyzed using SPSS, version 15.0.

Table 1. Estimated Energy Requirement (EER) equations

	Normal-weight, overweight, and obese >19 years
Males:	$864 - (9.72 \times \text{age}(y)) \times \text{PA} \times (14.2 \times \text{weight}(kg)) + 503 \times \text{height}(m)$
Females:	$387 - (7.31 \times \text{age}(y)) \times \text{PA} \times (10.9 \times \text{weight}(kg)) + 660.7 \times \text{height}(m)$

## Experimental Design

This was a quantitative descriptive study examining whether significant differences existed between the following variables:

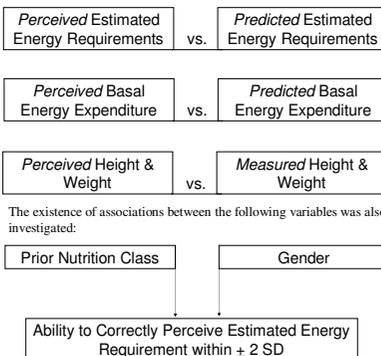


Figure 2. Variables of interest.

## Results

Table 1. Description of the participants.

	Total N=155	Female n=92	Male n=63
Height	$66.4 \pm 3.8$	$64.2 \pm 2.4$	$69.7 \pm 3$
Weight	$153.5 \pm 39$	$134 \pm 23.3$	$181.9 \pm 39.9$
BMI	$24.3 \pm 4.6$	$23 \pm 3.9$	$26.3 \pm 5$
Body Fat %	$20.7 \pm 7.2$	$23.5 \pm 6$	$16.5 \pm 6.9$
PAL	$1.8 \pm .5$	$1.7 \pm .5$	$1.9 \pm .5$
Correct EER	51	38 (41.3%)	13 (20.6%)

Significantly fewer students than expected estimated EER correctly,  $\chi^2(1) = 18.123, p < .001$ :

- Students significantly underestimated EER by a mean 700 kcal,  $t(147) = 10.54, p < .001$
- Students significantly underestimated BEE by a mean 644 kcal,  $t(144) = 10.15, p < .001$

Although perceived heights and weights were statistically different from measured heights and weights, the difference was not clinically significant:

- Students significantly overestimated height by an average 0.4 inches,  $t(154) = 6.68, p < .001$
- Students significantly underestimated weight by an average 2.1 pounds,  $t(153) = 5.39, p < .001$

Significantly fewer males than expected estimated EER correctly,  $\chi^2(1) = 7.236, p < .007$ :

- 41.3% of the females estimated their EER correctly compared to 20.6% of the males

How did we come up with the Physical Activity (PA) coefficient?

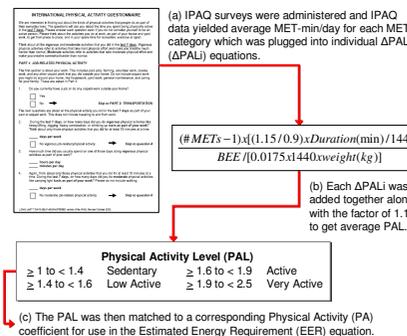


Figure 3. IPAQ Data transformation for use in EER equation.

## Conclusions

The results led the authors to conclude the following:

- College students were unable to estimate their energy requirements within a calorie range equal to  $\pm$  2 standard deviations
- The ability to estimate energy requirements was better in the females as compared to the males
- Having taken a college nutrition class did not make a difference in their ability to estimate energy requirements

Surprisingly, students underestimated their caloric needs, and if their diets reflected their knowledge they would all be in a state of negative energy balance. While a stable body weight provides reassurance that caloric intake is equal to caloric expenditure, weight gain in adults can be subtle and virtually unperceivable. Even a slightly positive state of energy balance as small as 50 calories per day has the potential of adding 5 pounds over the period of one year. This study demonstrated that students do not know how many calories they need to achieve weight maintenance in a typical day.

To our knowledge, this is the first time that IPAQ data was used to classify physical activity levels for use in the EER equation. Additional research could validate the use of IPAQ derived data for use as a physical activity coefficient, and would add another measure of objectivity to the variables used in the EER equation, providing a more objective tool to help patients achieve a healthy weight.

## References

- Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., et al. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise*, 35(8), 1381-1395.
- Food and Nutrition Board, Institute of Medicine of the National Academy of Sciences. (2005). *Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids*. Washington, DC: National Academies Press.
- Gerrior, S., Juan, W., & Basiotis, P. (2006). An easy approach to calculating estimated energy requirements. *Preventing Chronic Disease*, 3(4), 1-4.

## Acknowledgments

We thank John Young and Lawrence Golding for providing technical guidance and measurement equipment, Amy Miracle, Dallas Carnahan, Melinda Seff, Doreen Highfield, JJ Chen, Anna Milner, Virginia Beck and Pamela McKay for allowing their introductory nutrition students to participate in the study, and Leslie Huska for her outstanding administrative support. Printing for this poster was provided by the University of Nevada, Las Vegas Department of Kinesiology and Nutrition Sciences.

## For further information

Please contact [aurorabuffington@aol.com](mailto:aurorabuffington@aol.com). A copy of the thesis *Knowledge of personal energy requirements in college students* can be obtained at [www.uni.edu](http://www.uni.edu). A PDF-version of this poster can be obtained at [www.ePosters.net](http://www.ePosters.net).

