

國人體重過重及肥胖者休息代謝率之實測值與估計值

之比較研究

Comparison of Measured versus Predicted Resting Metabolic Rate in Taiwanese Adults with Excess Weight

中文摘要

休息代謝率的高低與肥胖的形成有極大相關，正確的測量數值，有助於熱量平衡的控制；本研究以在台灣的體重過重及肥胖者族群為基礎，比較以間接計熱器測定休息代謝率與六種常用預測公式估計值的差異。

本實驗從醫院減重門診篩選了 250 位，年齡範圍從 20—86 歲(平均 40 ± 14.5 歲)，BMI 範圍為 24.1—51.7 公斤/(公尺)² (平均 32 ± 5.6 公斤/(公尺)²) 之過重或肥胖成人，以間接計熱器 (MetaMax 3B, 德國 Cortex 公司製) 測量其空腹 4 小時休息代謝率，所得之值與常用的六種預測公式估計值作比較。體重、身高、體組成、24 小時飲食記錄、日常活動量都列入記錄。數據以 SPSS 13.0 版之配對 t 檢定、Pearson 相關係數、Stepwise 線性回歸作各組比較分析。

在校正年齡及性別後，以間接計熱器測量值與六種預測公式所得之估計值比較有顯著差異，但中等程度相關 ($P < 0.001$)，分別為 Harris—Benedict ($R^2 = 0.63$)，Owen ($R^2 = 0.61$)，Mifflin ($R^2 = 0.63$)，WHO ($R^2 = 0.63$)，Bernstein ($R^2 = 0.62$)，and Liu equation ($R^2 = 0.63$)。另外，實際測量值明顯比預測值低，其中以 Bernstein 差異最小 (176.2 ± 339.8 大卡/天)。適合台灣過重及肥胖族群的各種預測模式依 BMI 24—27，27—35，>35 三個不同組別中，在越高的組別，預測模式的準確度越差。

六種常用預測公式對台灣成人過重及肥胖者的預估似乎有過高的情形，影響台灣過重及肥胖者的休息代謝率的主要相關因子為體重、身高、除脂肪組織(Fat-free mass)、腹圍、年齡、性別等。在過重及肥胖族群中，休息代謝率的預測模式建議為 $RMR = -577.02 + 5.15 \times \text{體重(公斤)} + 426.98 \times \text{身高(公尺)} + 6.87 \times \text{腹圍(公分)} - 2.72 \times \text{年齡(歲)} + 184.28 \times \text{性別(男=1,女=0)}$

英文摘要

Objectives: To compare the values of resting metabolic rate (RMR) derived from six common prediction equations with the measured RMR using an indirect calorimetry in adults with excess weight.

Methods: A total of 250 overweight and obese adults, aged 20-86 (40+14.5) years and BMI 24.1-51.7 (32 + 5.6) kg/m², were recruited from the obesity clinic in a medical center, and their RMR was measured using an indirect calorimetry (MetaMax 3B, Cortex Germany). These measured RMR values were compared with values from six prediction equations (Harris and Benedict, Owen, Mifflin, WHO, Bernstein, and Liu) using a statistical analysis.

Results: A significant but moderate correlation ($P < 0.001$) adjusted for age and gender was found between measured RMR and RMR derived from the Harris-Benedict ($R^2 = 0.63$), Owen ($R^2 = 0.61$), Mifflin ($R^2 = 0.63$), WHO ($R^2 = 0.62$), Bernstein ($R^2 = 0.62$), and Liu's equation ($R^2 = 0.62$). Furthermore, the measured RMR values were significantly lower than RMR values calculated using the six prediction equations. Among these, the Bernstein equation has the smallest difference (176.2 + 339.8 kcal/day). Several predictive models showed progressively poor prediction in the groups with BMI.

Conclusions: The present prediction equations seem to overestimate RMR of the overweight and obese Taiwanese adults. Factors having influence on variations in resting metabolic rate are weight · height · fat-free mass · waist · gender and age. The better suggested predictive model was : $-577.02 + 5.15 \times \text{weight}(\text{kg}) + 426.98 \times \text{height}(\text{m}) + 6.87 \times \text{waist}(\text{cm}) - 2.72 \times \text{age}(\text{years}) + 184.28 \times \text{gender}$ (male=1, female=0)