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Calories Used While at Rest or Sleeping

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Abstract
In Jennings (2022) [1] the author derived the following formula for human weight loss during rest or sleeping.

(dW/dt) = - RMR/D pounds/day

Here, the author will show the exprssions for RMR, calories/day, (resting metabolic rate) and D (3500 calories per pound) to compare values for (dW/dt).
In this article, we will look at various ways to predict RMR and tabulate (dW/dt) between the predictions.

Keywords: Resting Metabolic Rate (RMR), Lean Body Mass (LBM), United States

Introduction

First, we have to go over the derivation of the equation in the ABSTRACT. From Jennings (2022) [1] we quote, "(Jennings, 2012) [4] has the formula for weight loss and calorie intake, where Dk is the conversion factor for weight in kilograms. Co is the normal calorie intake per day, Ce is the actual calories eaten, RMR is the resting metabolic rate, (dW/dt)o is the weight loss per day at the start of the linear weight decline in the fast and F_A is the activity factor. Generally, $1.3 < F_A < 1.9$, but a bit lower for women. Equations (1) and (2) are the starting equations in this study.

$$Co = (RMR)\,(F_A) \tag{1}$$

$$Dk\,(dW/dt)o = -\,(Co - Ce) \tag{2}$$

To convert to American units, we use D instead of Dk. k = 2.20462 lb/kg. D = 3500 calories/pound human weight. Wishnofsky (1958) [4] For resting or sleeping $F_A = 1$ and $C_e = 0$ (calories eaten). Substituting C_o into (2) with $F_A = 1$ while $C_e = 0$ gives.

$$(dW/dt) = -\,RMR/D \text{ pounds/day} \tag{3}$$

We remove the subscript $_0$ for simplicity.

Results 1

To get the predictions for RMR, there are different expressions. We will look at expressions for RMR(men) and compare (dW/dt). A way of estimating RMR is by Cunningham (1980) [5].

$$RMR = 501.6 + 21.6(LBM) \text{ Calories/day} \tag{4}$$

Where LBM for men is the lean body mass using Hume (1966) [6]:

$$LBM(men) = (0.32810)\,\Omega(kg) + (0.33929)\,ht(cm) - 29.5336 \text{ kg} \tag{5}$$

And Ω is the weight of the man in kg with height ht in cm. This is focusing on RMR for men over 16 years of age.

Results 2

In Jennings (2012) [2] we note the Livingston-Kohlstadt (2005) [7] non-linear formula for men, [W_o] kg and [A] years.

$$RMR = a\,(W_o)^P - y\,A \qquad (6)$$

Where a = 293, P = 0.4330 and y = 5.92.

We evaluate (6) with W_o = 70 and A = 30 (Reference Man).

In Jennings (2012b) [3] we have for men.

$$RMR(men) = 13.89\Omega(kg) + 14.36\ ht(cm) - 1811\ calories/day \qquad (7)$$

We take as a Reference Man ICRP (1975) [8] the following for Ω(kg), ht(cm) and age, as follows: Ω(kg) = 70 kg, ht = 177.8 cm and age 30 years.

Discussion

We now put the values for RMR into (3) to compare the weight loss during rest or sleeping. Then there is the Harris-Benedict (1919) [9] formula for men.

$$RMR(men) = 66.5 + 13.75\ \Omega(kg) + 5.003\ ht(cm) - 6.775\ (age(years))\ calories/day \qquad (8)$$

In (4), (6), (7) and (8) we use the values for weight, height and age for Reference Man. Remember D = 3500 Calories/lb.

Formula	RMR calories/day	(dW/dt) = - RMR/D pounds/day
(4)	1663	- 0.475
(6)	1667	- 0.476
(7)	1715	- 0.490
(8)	1715	- 0.490

So, in the (dW/dt) column, the weight loss for a man at rest or sleeping is predicted in a constant way to be a bit less than ½ pound per day.

Conclusion

We compared (dW/dt) using different equations in estimating RMR for a man with height, weight and age of Reference Man. It appears that the predictions for Resting Metabolic Rate agree.

Acknowledgment

When the author was exploring the Catholic Church in 1980, he went to Masses at Our Lady of Refuge Catholic Church in San Diego, California. At one of the Masses, they said we share eternal life with the Blessed Virgin Mary. In 1987, the author became a Catholic by conversion at HOLY SPIRIT Parish, corner of Dwight/College in Berkeley, California.

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