



National Academy of Sports Medicine

Metabolic Profiling

By

Fabio Comana MS, MA, PES, CES, NASM-CPT

Introduction

Recent research on exercise and weight loss has resulted in a shift towards innovative ideas that incorporate more movement and activity throughout the day, outside of planned exercise (1,2). This strategy known as non-exercise activity thermogenesis (NEAT) is a phenomenon that represents one's basic activities of daily living and includes fidgeting, standing, and moving around. This strategy uses a behavioral approach of making individuals more mindful of their overall activity levels throughout the day, regardless of what they do for exercise, as exercise alone is often insufficient to promote effective weight loss, especially with new exercisers. With this strategy, we do not require detailed (and often unreliable) 3-day activity logs, but simply ask individuals to list their typical daily schedules from recall (e.g., Monday-Friday workday, average weekend). This is completed using a basic activity log (Table 1). With this information, health and fitness professionals now have two implementable strategies:

1. Use this information to help individuals identify when they are excessively sedentary and should consider more physical activity (Table 1). This provides health and fitness professionals with chances to challenge clients to be more active via NEAT. Encourage simple, yet manageable tasks that build self-efficacy to strengthen a lasting commitment for change.
2. Another option is to develop a point system for activity. For example, allocate negative points for lying, reclining or seated activities, excluding sleep (i.e. -1 point) and award positive points for standing and higher-intensity activities (i.e. 1 point for standing, 2 points for light-intensity activities such as walking, 3 points for moderate-intensity activities such as light-jogging). Total the individual points attained within a day and identify areas in need of change and strategies to improve the overall score (Table 2).

These strategies shift focus towards more manageable, positive and enjoyable behaviors that can contribute significantly to sustained weight loss versus prescribing restricted caloric-based goals. Instead of focusing strictly on calorie restriction, efforts are focused on helping individuals adopt healthier lifestyles and burn more calories without a real need to actually count calories.

Table 1 Sample Metabolic Profile to Increase Awareness

Time of Day	Activity	Suggested Activities
00:00 – 06:30 am	Sleep	
06:30 – 07:30 am	Prepare for Work	5-min walk while coffee brews
07:30 – 08:30 am	Commute (drive)	
08:30 – 12:00 pm	Seated – computer	Standing work station; use a different floor for bathroom breaks
12:00 – 01:00 pm	Lunch - seated	Walk to a location to eat lunch with co-worker
01:00 – 05:00 pm	Seated – computer	Walking /standing work meetings; walk to co-worker office to deliver memos
05:00 – 06:00 pm	Commute (drive)	
06:00 – 07:00 pm	Gym	Shorter, intense bouts of exercise (e.g., 8-min cardio, 8-min resistance, 8-min cardio)
07:00 – 07:30 pm	Commute (drive)	
07:30 – 08:30 pm	Bathing, cooking	
08:30 – 11:30 pm	Dinner, TV, reading	Stand during commercials
11:30 – 12:00 am	Prepare for bed	

Theory to Practice

Using an activity log sheet similar to the one presented in Table 1, complete the following tasks:

1. Create an activity log that is representative of your typical day (feel free to make several if your daily schedule differs significantly).
2. Using the point system provided in Table 2 (or creating your own points system), allocate points to your entire day. Total the points for a daily total.
3. Identify areas of inactivity then create challenges whereby you can improve your total by a minimum of 2 points, aiming to complete these challenges every day next week. Keep things simple by limiting your challenges to three activities and no more. The idea is to simplify the process, facilitating adoption and improving the chances of formulating good habits.

Table 2 Sample Metabolic Profile with Points		
Activity & Intensity Equivalent		Points
Reclining / Sitting		(-1) Exclude sleep
Standing		(+1)
Walking - 2.5 mph		(+2)
Jogging - 5 mph / 8 km/h (12 minute mile pace)		(+3)
Running - 8 mph /12.8 km/h (7½ minute mile pace)		(+4)
Running - 10 mph / 16 km/h (6 minute mile pace)		(+5)
Time of Day	Activity	Points
00:00 – 06:30 am	Sleep	0 points
06:30 – 07:30 am	Prepare for Work	+ 1.0 x 1 hour = + 1.0 point
07:30 – 08:30 am	Commute (drive)	- 1.0 x 1 hour = - 1.0 point
08:30 – 12:00 pm	Seated – computer	- 1.0 x 3½ hours = - 3.5 points
12:00 – 01:00 pm	Lunch – seated	- 1.0 x 1 hour = - 1.0 point
01:00 – 05:00 pm	Seated – computer	- 1.0 x 4 hours = - 4.0 point
05:00 – 06:00 pm	Commute (drive)	- 1.0 x 1 hour = - 1.0 point
06:00 – 07:00 pm	Gym	+ 3.0 x 1 hour = + 3.0 points
07:00 – 07:30 pm	Commute (drive)	- 1.0 x 1 hour = - 1.0 point
07:30 – 08:30 pm	Bathing, cooking	+ 1.0 x 1 hour = + 1.0 point
08:30 – 11:30 pm	Dinner, TV, reading	- 1.0 x 2½ hours = - 2.5 points
11:30 – 12:00 am	Prepare for bed	+ 1.0 x ½ hour = + ½ point
		Total: - 8.5 points

Metabolic Profiling Example

Kathy opts to complete a metabolic profile and believes she is fairly active throughout the day. However, after tallying her points, she is shocked to discover how sedentary she actually is and decides her plan needs more than just dietary and exercise strategies. She realizes she needs to find ways to get out of her chair throughout the day and move about more if she wants to lose weight. Her perspective on losing weight has undergone a transformation from this narrow concept focused upon diet and exercise exclusively to a more global approach to being more mindful of all she does throughout the day.

Kilocalorie Defined

Energy is described as the capacity to do work and is measured in units called calories, abbreviated kcal (or kilojoules in Europe). As we use pounds and kilograms interchangeably, one kcal is equivalent to 4.184 kilojoules. For example, a candy bar with 220 kcal would contain approximately 920 kilojoules.

A calorie is defined as the quantity of heat required to raise the temperature of 1 Kg of water by 1° Celsius (C) from 14.5° C to 15.5° C. Unless you are familiar with the metric system, this may make little sense, so let's quantify this definition in more understandable terms. First, the metric system is based off water where 1 Kg of water equals 1 liter of water (33.8 ounces). A temperature range of 14.5° C to 15.5° C is equivalent to 58° Fahrenheit (F) to 60° F. As a practical example, imagine a chemistry experiment where you have 1L of water in a container placed above a heat source (e.g., flame). Imagine too, that this container does not absorb any heat, but transfers all heat from the source directly to the water. Place a thermometer in the water at 58° F and turn on your heat source. If you could capture all that heat (from the source) that would be needed to raise the temperature of that water to 60° F, this would represent 1 calorie. Given the hypothetical container we are using, this may take approximately 10 to 15 seconds.

Although health and fitness professionals use the term calories frequently, do we ever consider whether clients fully understand the implication of what this unit of measurement actually means? We can certainly quantify 100 kcal as a slice of bread, but when it comes to energy expenditure, is the value of 100 kcal possible to translate? Perhaps we need to consider using more effective language that holds greater relevance. For example, weight gain and time are both very important in our lives, so give thought to expressing a kcal surplus or deficit as weight gain (e.g., 100 kcal x 365 days = 36,500 kcal = 10½ pounds in one year) or as time (e.g., 100 kcal = 25 minutes of walking for the average U.S. woman weighing 164.7 pounds and walking at 3 mph - approximately 4 kcal / minute) (3, 4).

Practical Understandings of Hunger vs. Appetite

Hunger and appetite often confuse professionals working with individuals trying to lose weight. Table 3 provides a simple overview of each to help differentiate key differences between the two. Presenting this information should help individuals control appetite, yet not ignore hunger, which can significantly impair any weight loss strategy.

Table 3 Differentiating Hunger from Appetite	
Hunger	Appetite
Biological response here the body needs to replenish energy reserves <ul style="list-style-type: none"> • Instinctively protects the body from starvation. 	A desire or interest to eat a specific food, usually sweet, salty, or fatty. <ul style="list-style-type: none"> • Triggered by either internal or external cues (environment, mood, sensory experiences, physical aspects of food, etc.).
Sensation associated with a gradual onset	Sensation associated with a rapid onset
Triggers are generally considered to exist below the neck line. <ul style="list-style-type: none"> • Low blood sugar. • Empty (growling stomach). • Hormone fluctuations (cortisol, glucagon, ghrelin, insulin). • Need for fuel for thermogenesis due to lowered body temperature. 	Triggers are generally considered to exist above the neck <ul style="list-style-type: none"> • Thoughts & emotions / moods. • Biological (hormones, neurotransmitters), social, cultural, environmental, sensory,
Generally appears several hours without food	Not time dependent
Typically diminishes after eating	May persist after eating
Generally satisfied by any food that offers energy (calories) – leads to satisfaction	Usually only satisfied by specific foods and may provoke emotions and thoughts afterwards (e.g., pleasure, guilt, shame)

Another effective method of helping individuals take control of their eating behaviors is through the use of the hunger scale presented in Table 4. Individuals should learn to time their meals and snacks in order to remain within the four-to-six range throughout the day as much as possible. Prolonged bouts of fasting often result in binge or ravenous eating and a surplus of calories.

Table 4 The Hunger Scale	
Hunger Score	Description
1	Starving, weak, dizzy, headache, lack of concentration
2	Irritable, cranky, very hungry, low energy, lots of stomach growling
3	Strong urge to eat, stomach growls a little
4	Feeling a little hungry – thinking about food
5	Body feels fueled (starting to feel satisfied), neither hungry nor full
6	Fully satisfied - little full, but pleasantly full
7	A little uncomfortable, but could still eat additional items
8	Feeling stuffed
9	Feel very bloated - very uncomfortable, stomach hurts
10	Feel sick from overeating

Critical Thinking Questions:

- Now that you have a clearer understanding of the quantitative tools traditionally used to assess caloric expenditure and their shortcomings, how will this change your philosophical approach to helping individuals lose weight? Will you shift your focus to a more qualitative approach, directed more towards increasing awareness to mindless activities?
- The purpose of this challenge is to help increase your own awareness to some of your eating behaviors. To complete this task, print out the hunger scale provided in Table 4.
 - Maintaining a log, gauge your hunger throughout the day (at timely intervals – e.g., every 2-3 hours), when you eat and at the cessation of eating.
 - At the time of eating, identify whether your decision to eat is more a function of hunger or appetite. Track the time lapse between thinking about food and actually eating food, the type of food consumed, and attempt to identify any triggers to your desire / need to eat – include any potential thoughts or emotions that may have had an influence.
 - Repeat this activity for three days, and then review the data to identify any specific eating behaviors, trends or patterns. Attempt to understand reasons behind them as this information can prove vital to controlling eating behaviors.

References

1. Hamilton, M.T., Healy, G.N., Dunstan, D.W., Zderic, T.W., & Owen, N.O. (2008). Too little exercise and too much sitting: Inactivity physiology and the need for new recommendations on sedentary behavior. *Current Cardiovascular Risk Reports*, 2, 292-298.
2. Levine, J. (2009). *Move a Little, Lose a Lot*. New York, Three Rivers Press.
3. NHANES, 2008. *Trends in intake of energy and macronutrients in Adults from 1999-2000 through 2007-2008*. NCHS Data Brief. Number 49, November 2010. <http://www.cdc.gov/nchs/data/databriefs/db49.htm>; retrieved 09/01/12.
4. Ainsworth, et al. 2011. 2011 compendium of physical activities: a second update of codes and MET values. *Medicine and Science in Sports and Exercise*, 43(3):1575-1581.