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Resting Metabolic Rate Test

Total energy expenditure: This is the amount of energy (in calories) that a person uses per day. It is the sum of 3 separate energy expenditures:

1. **Resting metabolic rate (RMR)** is the number of calories required by the body to maintain basic function such as heartbeat, breathing, temperature regulation and brain activity. Essentially, the RMR is the number of calories you burn at rest, doing nothing more than sitting in a chair.
2. **Diet-induced thermogenesis** is energy expanded from digesting and absorbing food and liquids.
3. **Activity expenditure** is energy spent on movement.

To get an accurate resting metabolic rate result, you must try to eliminate all other causes of energy expenditure by:

1. Fasting to eliminate diet-induced thermogenesis.
2. Avoid exercise or excessive movement to eliminate activity expenditure.

Indirect calorimetry (a measurement of metabolic rate) relies on the fact that 4.813 calories are burned for every milliliter of oxygen consumed.

How does RMR work? Oxygen uptake requires a precise measurement of the volume of air and of the concentrations of oxygen in the inspired and expired air. The process requires that all of the air a person breathes out be collected and analyzed while they rest quietly. By doing so, the KORR indirect calorimeter device can accurately determine the amount of energy (in calories) you are burning at rest.

What are the benefits of RMR? Knowing how many calories you are burning, will assist you in your weight management program (i.e. lose, gain or maintain current weight). RMR is influenced by your age, gender, ethnicity, body fat, muscle mass, exercise, etc. Two people with the same weight can have very different metabolic rates.

Obesity and RMR: Most overweight people are convinced that they have a slow metabolism. The truth is that statistically, most overweight and obese individuals have average or above average metabolic rates.

Weight loss and RMR: When a person loses weight, their RMR will almost always decrease. The type of weight loss program does matter. Losing weight with a calorie restricted diet (especially if they do not eat high protein food and do not lift weights to build muscle) may result in severe long-term reduction in the RMR. The Biggest Loser TV show demonstrated that the aggressive "eat less, move more" weight loss approach resulted in substantial and lasting reduction in the RMR. Specifically, 6 years after the show ended, many of the contestants regained most of their lost weight, but their average RMR was still 500 calories less per day than expected based on their current body composition and age. This is a primary reason why 90%

of diets fail (the other primary reason is insulin resistance). The person loses weight, but over a third of this is from muscle loss, resulting in a lower RMR, which in turn causes them to regain the weight. For example, a 170 pound woman has an RMR of 1500 calories. She loses 30 pounds, but 12 pounds is muscle. Her RMR is now 1350 calories. After 6 months she gets tired of dieting and exercising and gains the weight back. Unfortunately, because her new RMR is now 1350 calories, her weight gain increases even higher to 175 pounds.

What is more important, your RMR or exercise? Your RMR is much more important as the majority of your daily energy expenditure comes from your **RMR.** An average woman will have an RMR of about 1500 calories, but only burns about 300 calories walking three to four miles per day.

What can I do to maintain my RMR while losing weight? Eating a low-carb high-protein diet, combined with regular resistance training will help maintain your RMR. Additionally, if you can maintain your new weight for 6 months, your RMR will usually rise to its expected level.

What factors influence my RMR?

1. Body fat percentage: If your body fat percentage is high, your RMR might be lower.
2. Weight: A larger body requires more calories. However, during weight loss, your body tries to conserve energy and will lower your RMR.
3. Exercise: Aerobic exercise (jogging, walking) burns calories that day, but does not significantly increase the RMR. In contrast, weight lifting will build muscle, which in turn will raise your RMR. Additionally, muscle only takes up one third of the space of fat for the same weight. A typical person who gains 5 pounds of muscle will barely notice the increase in size of their body, but it will significantly increase their RMR.
4. Diet: Low-calorie weight-loss diets may cause the RMR to drop by over 20%.
5. Age: The metabolic rate declines with age because of loss of skeletal muscle mass and increased percentage of fat tissue.
6. Height: Taller people typically have greater body surface area and more lean mass and thus have a higher RMR.
7. Body temperature: For every increase of 0.5° C in internal temperature of the body, the RMR will increase by about 7%. A person with a high fever may have an RMR elevated by up to 50%.
8. External temperature: Exposure to cold temperature causes an increase in the RMR, as the body tries to create extra heat needed to maintain its internal temperature.
9. Some people are simply born with higher metabolisms, while others have slower metabolisms.
10. Hormones: Multiple hormones can increase or decrease your RMR. Low thyroid will cause a lower RMR and thus weight gain.

What is an average RMR? There is a very wide variability in resting metabolic rate among humans. A 5’4”, 170 pound 40-year-old woman has a predicted RMR of about 1500 calories. A 5’10”, 200 pound 40-year-old man has a predicted RMR of about 1900 calories.

How do I prepare for an RMR test?

1. Avoid eating a meal 4 hours before the test.
2. Avoid exercising on the day of the test.
3. Avoid stimulants such as caffeine prior to the test.
4. Have low physical and mental stress the day of the test.

How is the RMR test procedure performed? You will sit or lie comfortably in a chair. A nose clip will gently squeeze your nostrils together to prevent you from breathing in and out of your nose. A mouthpiece and plastic tubing attached to the RMR machine will measure your oxygen levels. For best results stay relaxed with eyes gently closed and breathe normally. The test will take about 10 to 12 minutes.

How often should I retest? We typically recommend repeating the RMR about 6 months after starting a new fitness and/or nutrition plan.

What results are included with an RMR test (see your specific report)?

1. Measured resting metabolic rate (RMR)/resting energy expenditure (REE): This number (in calories per day) was determined by your 10 to 12-minute test. It is the number of calories you burn every day when at rest.
2. Predicted REE: This is the number of calories you are predicted to burn every day when at rest. It is based on your age, height, weight and sex.
3. Metabolism comparison: By comparing your measured REE versus your predicted REE, you will know if your metabolism is faster or slower than average.
4. Exercise calories: This is how many calories you are predicted to burn from 30 minutes of moderate exercise. It is based on your measured REE.
5. Lifestyle activity: This is how many calories you are predicted to burn from daily activities. It is also based on your measured REE.
6. Total energy expenditure (TEE): This is how many calories you are predicted to burn during an entire day without exercise. It is the sum of your measured REE and lifestyle activity.
7. Total energy output: This is how many calories you are predicted to burn during an entire day with 30 minutes of moderate exercise. It is the sum of your measured REE, lifestyle activity and 30-minute moderate exercise.
8. Weight gain: You are more likely to gain weight if you consume more calories than your total energy output.
9. Maintenance zone: This is how many calories to eat to maintain your current weight.
10. Weight loss zone: This is how many calories to eat to try to lose weight.

Obesity/weight loss/insulin resistance (read Dr. Kuhlman's insulin resistance handout): **We now know that the type of food you eat and when you eat it is more important than the number of calories you eat**. When you suddenly reduce your calories by 30%, your body will sense this and to prevent you from starving to death, it will reduce your metabolic rate by up to 30%. To keep your metabolic rate close to baseline, eat a low sugar, high-protein diet (which will lower your insulin resistance), and perform resistance exercises (that will build muscle).

About 70% of your tendency to gain weight is determined by the genes you inherited from your parents. Additionally, every person has a body weight set point where it wants to weigh. This is mainly determined by your genetics and insulin resistance. You cannot change your genes, but you can lose weight long-term by reducing your insulin resistance. **You can decrease your insulin resistance with two simple strategies:**

1. Decrease high insulin levels by eating a low sugar diet.
2. Periodically get your insulin levels low by not snacking between meals and intermittently fasting (for example, eat a normal supper then no snacking that night and skip breakfast the next morning and then eat a normal lunch).

Summary: We do not recommend a really low-calorie diet for the vast majority of people because it can lower their RMR for years, resulting in regaining all of the weight back. In order to lose weight long-term, it is best to lose fat (especially visceral fat), but not muscle. We have several recommendations for safe and long-term/permanent weight loss:

1. Eat a low sugar, high-protein diet.
2. Perform intermittent fasting/restricted eating a couple days per week.
3. Avoid sugar sweetened drinks: The most important thing most Americans can do to stay healthy is avoid drinking sugary sweetened drinks. Diet soda does not cause a spike in glucose levels, but these drinks do increase insulin levels and cause increased cravings for sugary foods.
4. Lose weight slowly.
5. Lift weights/resistance training a few times per week.
6. Stay physically fit.
7. Sleep at least 7 hours per night.
8. Work on stress management.
9. Have purpose in life.
10. Treat all underlying medical conditions.
11. Consider weight loss medications that also treat insulin resistance and lower visceral fat such as Metformin, Semaglutide, Tirzepatide, etc.
12. Consider hormone replacement therapies that lower insulin resistance and reduce visceral fat such as testosterone, thyroid, estradiol and DHEA.
13. Consider bariatric surgery.