3-Day Energy and Macronutrients Balance

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Introduction:

The goal of this task here is to study the energy and macro-nutrients intakes over a recorded 3-days average comparing to the Acceptable Macronutrient Distribution Range (AMDR) set by Health Canada (2006) estimated base on my own anthropometry and physical activity information. The information required for this study are the quantities and types of food with timestamps over a 3-days period. The nutritional information of these foods, which will be provided via Diet & Wellness Plus+ online service. My anthropometric information of height, weight, gender, and average activity level of the three days (estimated at beginning and the end of data collection) will be used for EER and AMDR calculation (Health Canada, 2006).

Methods:

The Estimated Energy Requirement is calculated using the equation:

$$EER = 662 - 9.53 \times age + PA \times (15.91 \times weight + 539.6 \times height)$$

whereas PA is the estimated physical activity level, it should be estimated base on a combination of moderate, vigorous, and daily activity. In this case, a low activity level with a factor of 1.11 was chosen: as daily steps counts were recorded on my smart watch averaging at 10000 steps range between 9000 and 14000, including about 60 minutes of light activity with heart rate lower than 140 bpm, and (or) 5 to 10 minutes fast pace activity with heart rate above 140 bpm, the average daily walking time was about 1 hour. The body weights were recorded on each morning: 84.4 kg, 84.1 and 83.6 kg and with an average of 84 kg. With height of 1.81 m, the EER can be calculated as 2902 kcal.

In order to be more accurately reflect the actual food intake, food of choices should be verified on the Diet & Wellness Plus+ site before the recorded day if possible; however, in case of the

food intake was not available on the website, the ingredients of the food should be clear or retraceable from the web. For instance, the item *Tim Horton chicken bacon wrap* was created base on the nutritional values published on Tim Horton official website. The quantity of each item was weighted using an electric kitchen accurate to 0.1 gram or a measuring cup to about 5mL; all solids were measured as gram and liquid to milliliter to be consistent.

Results:

As shown from the 3-day average report and Appendix B, the total energy of actual intake was about 2279.1 kcal, it is 622.9 kcal less than the EER (2902 kcal) at 79%; the energy balance was on a deficit, which is equal to the energy stored by 0.18 pounds (3500 kcal/pound) or 81 gram of fat. The total energy deficit was about 1868.7 kcal over the three days. The Body Mass Index (BMI) measurements changed from 25.76 to 25.6 due to the change of weight by 0.8 kg. The other anthropometric data was waist circumference, it was measured 80 cm (from belly button) at beginning of the 3-days and measured 78 cm on the last day. The 3-day average actual intake of carbohydrate was 232.2 grams, which is below the AMDR range of 326.5 to 471.6 grams; the

protein intake was 150.1 gram and fat was 88.5 g, both within the AMDR range. Noticeably, the actual fiber intake was only 28.3 grams, where the recommend daily value is 38 grams for male adult (Health Canada, 2006).

Discussion:

Even though the BMI of 25.5 is classified as overweight, my waist circumference of 80 cm is much lower than the standard of 102 cm. The goal for my dietary intake should be maintaining current weight and body composition; possibly reducing 1 or 2 percentages of body fat while keeping exercise and preserving muscular mass. The deficit of energy balance during the three-day reporting period was likely due to the 'extra' awareness of food intakes. While recording every single food intake during the day, I was subconsciously avoiding small bites such as 1 or 2 chips, nuts, grapes (which would make the report a cumbersome list of small items). I also tried to combine eating schedule to fit the *breakfast, snack, lunch, snack and dinner* format; whereas I normally would skip breakfast and lunch (coffee only) to feel more energetic, and eat snacks more frequently along the way before big meals, which is reflected on the dietary record. The lack of carbohydrate intake was partially due to a recent change of working schedule, I would eat one extra serving (120 g) of fruits or carb-rich food such as sweet potato or potato salad before work or workout; this was not manageable during the reporting period. Moreover, I consciously prefer protein rich food over carbohydrates due to personal dietary habit. Currently the carbohydrates intake is about 100 grams short from the lower end of AMDR; this shortage can be made up with three servings fruits and vegetables, or two servings of grains. However, my current carbohydrates intake of 232 grams is still well above the RDA of 130 grams for adult, and energy level during the three days seems to be adequately supported. The protein intake was sufficient according to the report, as 150 gram is sitting at the middle of

AMDR range. The fat intake was also adequate within the range; however, according to Health Canada (Health Canada, 2006) Essential Fatty Acids of Linoleic (n-6) and Linolenic (n-3) are also part of the dietary reference intake for macronutrients, which was significantly short. The actual intake for Linoleic was 54% of DRI and 62% for Linolenic. Essential fatty acids are beneficial for promoting proper nerve functioning, producing hormones, healthy brain, and heart. One way to remediate that is to increase consumption of nuts and fatty fish (Health Canada, 2019), which I consume none during the 3-days period. The dietary fiber intake is the one that show the most discrepancy percentagewise, it was about 28 grams per day, 74% of DRI. Consuming more dietary fiber can go hand in hand with adding more carbohydrate to the diet, skin peels of fruits such as apple, date and grape are excellent source of fiber; moreover, starchy vegetables such as potato, sweet potato, lentils and okra are also great source of non-soluble fiber as well as high quality carbohydrates. The last macronutrient is the water intake, the actual intake is about 98.6% of DRI value. This should be considered adequate on normal setting; however, needs for rehydration is closely related to daily activity level, temperature, which impact human body's ability to keep hydrated. For instance, I was using infrared sauna for 40 minutes on day 2, which could lead to more dehydration; more than DRI of water and electrolytes would be needed in this case.

Final Thoughts:

Base on the 3-day average dietary intake report, there are a few strategies and actionable items that can be considered to improve health and overall well-being. The first strategy is to increase the dietary intake of carbohydrate and fiber, this can be achieved by: a. **Add two possible three servings of fruits and vegetable** during the day. b. **Add one serving of carbohydrate dense**

starchy vegetable to lunch and dinner (major meals) such as mash potatoes (with skin), baked sweet potatoes, mashed beans, lentils, or chickpeas. c. **Introduce more whole grain food** into the diet, such as quinoa salad, oatmeal cereal or whole grain pasta. The second strategy is to **introduce essential fatty acids rich food** source to aid the deficiency of EFA intake. I would add snacks such as roasted almond, pecan, or smoke salmon along the day. The other way is to use fish-oil or EFA supplements. Final strategy is to **replace more processed food with whole food**. This is the hardest task as processed food is much convenient and assessable on a busy schedule. A great way to eat home-made meal is **using meal-preparation**, which would make time more manageable for cooking and increase the chance of eating plant-based protein as they usually required more time to prepare.(wash, chop, cook) There are also many micronutrients related information can be learned from the 3-days report, an important note was that the 3-day average sodium intake was about 2 gram, which was dangerously close the UL of 2300 mg/day. (Health Canada, 2004) Reducing choice of processed food will likely to help with controlling the sodium intake.

An interesting discovery was made during the recording of the 3-days dietary intake, when adding the item 'BCAA energy powder' (pre-workout amino acid supplements of 15 grams per serving) on day 2, the food label clearly states as 'zero Calorie', but how could this be 'zero Calorie' while supporting energy? Upon further research, many amino acids indeed provide energy, the ratio is 4.65 kcal per gram. (May & Hill, 1990) However, Food and drug administration of United States regulations states that 'supplements manufacturer cannot declare the protein content of a product when it only contains individual amino acid.' Moreover, FDA only allows the manufactures to add up their caloric content using the Atwater method, which

only accounts for total calories of protein, carbs and fat; amino acids do not qualify as protein, hence the 'zero Calorie' mystery. (USFDA, 2019) It is interesting to find that there could be hidden energy source besides carbs, fat, protein, and alcohol.

References

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Please See Attached for APPENDIX A and B