MEAL FREQUENCY AND WEIGHT LOSS—IS THERE SUCH A THING AS STOKING THE METABOLIC FIRE?

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Within the fitness community there has been a prevailing dogma over the past few decades which asserts that eating meals at higher frequencies throughout the day (e.g., 6 – 7 meals instead of the standard 3 – 4 meals per day) will impart additional and beneficial effects on metabolism and fat loss. This is colloquially referred to as "stoking the metabolic fire" and largely stems from epidemiological research dating back to the early 1960s that showed that there was an inverse relationship between meal frequency, bodyweight, and skinfold thickness—in other words, the more frequently a person eats, the leaner they become (8,11). More recently, and diametrically opposite to this viewpoint, another nutrition camp suggests a protocol that calls for the individual to fast for an extended period of time (usually 16 – 18 hr) and then eat their remaining calories within a given window that usually follows an exercise bout and lasts about 6 – 8 hr. This is commonly known as intermittent fasting (IF) and has gained a lot of popularity over the past 10 – 15 years, both from fitness enthusiasts and researchers alike. Within the concept of IF there are multiple different fasting protocols, most of which are aimed at reducing bodyweight. One such popular protocol entails complete fasting for 24 hr, followed by ad libitum (at liberty) feeding the following day—this is termed alternate day fasting (ADF). For the sake of simplicity, this review will regard IF as any dietary protocol that encompasses the lower end of meal frequency (i.e., 1 – 2 meals per day) with prolonged periods of fasting in between. While both methods of dieting—IF and the "stoking of the metabolic fire" diet protocol—promote weight loss, neither have ever defied the one ultimate requisite for a successful weight loss program: "calories in – calories out = weight loss (or gain)."

In other words, both ways of dieting work because they reduce caloric intake relative to expenditure and thereby induce a caloric deficit. If increased or decreased meal frequency were better for weight loss than the traditional 3 – 4 meals per day, then either of the two diets would have to affect one or both factors of weight loss (calories in or calories out). Assuming a sufficient and equal caloric deficit in both conditions, the caloric intake part of the equation can be eliminated and the focus can be turned solely on caloric expenditure. The remainder of this article will look at how meal frequency, either increased or decreased, must affect caloric expenditure in order to affect weight loss to a greater extent than that of moderate meal frequency, and if this is even possible.

CALORIES OUT

There are four factors that affect a person's overall caloric or energy expenditure (EE) throughout the course of a day (24EE). Those factors are basal metabolic rate (BMR), the thermic effect of food (TEF), energy expended due to structured exercise (EEx), and non-exercise activity thermogenesis (NEAT) (13,19). Mathematically it looks like the following:

$$24EE = BMR + TEF + EEx + NEAT$$

If increasing or decreasing meal frequency does lead to an increase in metabolic rate, and therefore, an increase in fat loss, it would have to affect one of the above factors.

MEAL FREQUENCY, EEX, AND NEAT

To date, there is no evidence to suggest that increasing or decreasing meal frequency, independent of caloric reduction and weight loss, has any effects on EEx or NEAT. However, it has been shown that reductions in bodyweight do promote an unconscious reduction in spontaneous activity and therefore a reduction in caloric expenditure (12,14,20). Thus, any diet that reduces bodyweight will likely produce a reduction in EEx and NEAT, unless the person consciously compensates by increasing their training volume. Theoretically, if someone increases their meal frequency, it is conceivable that they may increase their NEAT as a factor of preparing more food over the course of the day. Assuming that approximately 50 – 100 kcals are expended due to cooking, this could amount to a couple hundred extra calories burned over the course of 24 hr (13). However, this is completely speculative and most likely would have negligible effects on the overall caloric deficit from reducing caloric intake and a conscious increase in EEx.

MEAL FREQUENCY AND BMR

Can altering meal frequency affect BMR? The main component in the average person's 24EE, assuming a relatively low EEx and NEAT, is fat-free mass (FFM), which is the primary driving

force behind BMR (5,18). Thus, the majority of a person's 24EE is dictated by their BMR. Given that BMR is largely dependent upon FFM, an alteration in meal frequency would have to indirectly increase BMR through increases in FFM. This, however, is irrelevant given that there is no indication that eating smaller meals at a more frequent rate increases FFM to a greater extent than does eating an isocaloric and isonitrogenous diet with fewer but larger meals.

Recently, some research has explored 24-hr muscle protein synthesis (MPS) rates following a bout of resistance training with varying protein intake frequencies (two, four, and eight per day) of 80 g of whey protein (3,15). However, these studies were acute in design and did not lend good evidence that these protein intake protocols will lead to significant differences in muscle mass over time. Further, it is the moderate frequencies of protein consumption (four per day) that resulted in slightly higher MPS rates, compared to the lower (two per day) or higher (eight per day) frequencies.

With an isocaloric, isonitrogenous, and hypocaloric diet (1,200 kcals per day), one recent study showed that a diet consisting of six meals per day could better attenuate muscle losses than following a diet of two meals per day (1). However, a moderate meal frequency was not used in this study, so it is hard to say whether or not 3 – 4 meals per day could be just as effective as six. Nevertheless, despite this limitation, previous research has consistently shown little differences in overall weight loss with varying meal frequencies (ranging from 1 – 9 meals per day), which suggests that meal frequency does not matter assuming that adequate protein is being ingested (2,6,23,25,26).

Finally, some equivocal research suggests that BMR and TEF increase following exercise (17,21). Most of the research has been done in previously untrained men and women; therefore, extrapolations for highly trained, young individuals are speculative at best. As it stands, meal frequency does not appear to affect BMR to any significant degree.

MEAL FREQUENCY AND TEF

Quite simply, TEF averages to approximately 10% of an individual's total caloric intake (7). Thus, if a given person ingests 2,000 kcals over the course of the day, approximately 200 kcals will be lost as heat through obligatory processes such as absorption, digestion, and storage (18). Interestingly, early research has shown that obese individuals actually have lower values of TEF (e.g., < 10%), possibly increasing their risk for weight gain (7,22).

Will altering meal frequency have any effect on TEF? According to current research, the answer is no (24). In fact, in the acute studies showing non-significant increases in TEF based on meal frequency, it was shown that lower meal frequencies actually yielded the higher values of TEF (4,16). This is completely opposite of what many bodybuilders and fitness enthusiasts believe. Thus, increasing or decreasing meal frequency does not affect TEF to any significant degree compared to moderate meal frequency.

OTHER FACTORS TO CONSIDER WITH MEAL FREQUENCY

From a practical standpoint, increasing meal frequency is a great way to try to increase an athlete's caloric intake or to reduce a dieter's feelings of hunger on a hypocaloric diet. Furthermore, there is research to suggest that the body anticipates mealtimes based on fixed meal patterns (10). This is manifested through an increase in ghrelin signaling in the brain and stimulating feelings of hunger because the person is "expecting" a meal at a certain time (10). Therefore, those who might be considering dropping the number of meals they eat per day may experience an initial increase in hunger due to the contribution of ghrelin on their previous feeding pattern. This will eventually subside after the body adapts to the new routine.

CONCLUSIONS AND REMARKS

As shown, no strong evidence suggests that an increase or decrease in meal frequency leads to an increase in metabolic rate and body fat loss. Indeed, when calories are controlled and meal frequencies are varied (anywhere between 1 – 6 or more meals per day), there appears to be no significant difference in metabolic rate or overall fat loss. Thus, the real question regarding meal frequency is, "which diet protocol most fits with each individual's lifestyle and dietary preferences?" Nevertheless, whether an individual eats 1 – 3 times per day with prolonged fasts in between, or six or more meals spaced 2 – 3 hr apart, the effects on metabolism and fat loss will essentially be the same. BMR is dictated by FFM, and TEF is essentially unaffected by the frequency or timing of meals. Some aspects to consider when it comes to meal frequency are increased feelings of hunger with fewer meals during a hypocaloric diet and the possible increased feelings of hunger with a shift in feeding pattern from higher frequency to lower. Nevertheless, at the end of the day it comes down to personal preference and the individual's fitness and performance goals.

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