FAT LOSS NUTRITION—WHY AND HOW TO MINIMIZE HIGH-REWARD FOODS

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It is well-established in the preponderance of scientific evidence that the relationship of how many calories one consumes per day to the number one expends per day is the single most important factor when it comes to fat loss. Reduced-calorie diets result in clinically meaningful fat loss regardless of which macronutrients they emphasize (2,8). This relationship does not discount that some calories are more nutrient dense than others. It simply demonstrates that one can be both well-nourished and overfed. Food quality and food quantity are important factors that should be considered together; as important as it is to eat high-quality, nutrient-dense foods for general health, one can still gain fat from eating "healthy" if you eat too many calories relative to what one is expending (6).

That said, it is generally recommended to emphasize fruits and vegetables and high-quality meats, eggs, and fish (or protein substitutes, for vegetarians and vegans), while limiting refined foods, simple sugars, hydrogenated oil, and alcohol (12). This fat loss nutrition advice is given because it not only emphasizes nutrient-dense foods but also is generally lower in calories than things like fast food and candy. However, it is well known that the long-term success of a diet depends on adherence (7).

This article will demonstrate that consistently consuming high-reward foods is something that can make consuming fruits, vegetables, and lean proteins less satisfying, and therefore more difficult to stick with. This article provides practical guidelines for limiting high-reward foods and demonstrates why minimizing high-reward foods is a simple and well-supported strategy for long-term adherence to a nutritional approach that emphasizes high-quality, nutrient-dense, lower calorie foods.

PRACTICAL STRATEGIES FOR MINIMIZING HIGH-REWARD FOODS

High-reward foods are foods that have properties that signal high energy density (i.e., the number of calories per gram of food). Food properties that can signal high energy density include texture (signifies fat) and sweetness (indicates carbohydrate). Since food shortage would be a threat to human survival, the human brain has evolved to value these food properties. Foods that contain these properties can stimulate reward centers in the brain, reinforcing the desire and behavior to consume these foods. Modern food technology has concentrated these properties, enhancing the reward values of food and driving people to eat more. The impact of high-reward foods can be so powerful that people can spontaneously overeat by up to 54% above their maintenance calories when they have easy access to such foods (13).

High-reward foods are very calorie dense and often very tasty. They are often high in added fats and/or sugar. Reward properties may also be enhanced through the use of salt or monosodium glutamate (MSG). Examples of high-reward foods include:

- Desserts (cakes, cookies, ice cream, candy, etc.)
- Fried foods (fries, chicken nuggets, fried chicken, etc.)
- Restaurant entrees and appetizers
- Fast food
- Pizza
- Prepackaged snack foods (chips, crackers, etc.)
- Additions to enhance taste (condiments, sauces, dressings, toppings, butter, salt, etc.)

Because high-reward foods are so easy to overeat, they can present a barrier to dietary adherence. Thus, limiting high-reward foods is an important component of any successful dietary strategy. Since high-reward foods are so prevalent, the best way to minimize intake is to control the personal food environment. This can include reducing the visibility of high-reward foods, and also creating effort barriers to obtaining them (10). Examples include:

- Keep high-reward foods in locked cabinets.
- Keep high-reward foods buried behind or underneath healthier options.
- Only keep foods in the house that need to be prepared or cooked (not premade or prepackaged).
- Keep high-reward foods out of the house.
- Limit or avoid foods that are a "problem" (i.e., an individual has difficulty controlling the amount consumed).
- Limit or avoid liquid calories (e.g., sodas, juices, and alcoholic drinks).
- Prepare a list when grocery shopping and exclude high-reward foods from the list. Stick with items on the list, and do not shop hungry.
- When grocery shopping, focus on the perimeter of the store where there are more whole foods (e.g., dairy, meats, and fruits and vegetables). An exception would be the bakery.
- Preplan meals for the week.
- Prepare meals ahead of time (like on a weekend) and freeze or refrigerate for later.
- Avoid snacking. Keep with designated meal times.
- Limit or avoid adding extra fat to food (like butter or dressing).

- Limit or avoid adding extra sweeteners to food (even non-caloric sweeteners).
- Limit or avoid heavily processed, prepackaged foods.

It is important to note that food reward exists on a continuum ranging from low to high, and high-reward foods can vary in terms of calorie content, serving size, etc. There is an aspect of individuality when applying the above tips, as different people have different sensitivities to food reward, and a certain food that is rewarding to one person may not be to another. So, one must experiment with applying the above general guidelines to find what best fits them individually when it comes to practical steps to help reduce the food reward value of the diet in the long term.

HIGH-REWARD FOODS ARE A SUPERNORMAL STIMULI

High-reward foods are what is called a supernormal stimuli, sometimes called a supernormal releaser. Supernormal stimuli, which is a term from ethology (the study of animal behavior) coined by Tinbergen in 1948, which refers to a behavioral phenomenon whereby animals respond more intensely to exaggerated versions of stimuli over the normal stimuli for which they evolved (1,18,20).

Research on supernormal stimuli has been done since the 1950s on a diverse range of animals including insects (14), fish (16), birds and mammals (5) and demonstrated to elicit nurturing, mating, and fighting behaviors (15). The following are some research examples:

- Young herring gulls (Larus argentatus argentatus) obtain food from their parents by pecking at the parents' bill until it regurgitates. The young gull directs their peck at a red spot at the tip of the lower mandible of their parents' beaks, which provides them the red stimuli to where the food is. Researchers made artificial model beaks and showed that both the spot and the bill shape contribute to the strength of the young gull's response. Models not only had much longer and thinner versions than the natural bill, but researchers manipulated the amount of red on various artificial beaks (19). They found more red created more interest from the hatchlings, as beaks with 10 times the amount of red found in natural adult beaks led to an increase in interest and attention on the part of hatchlings.
- Other similar research has found mother birds preferred to try feeding a fake baby bird beak held on a stick if the dummy beak was wider and redder than a real chick's (4).
- It is also been found that most bird species preferred fake plaster eggs with more exaggerated markings than their own, more saturated versions of their color, and a larger size than their own. For example, small songbirds which laid light blue grey-dappled eggs preferred to sit on a bright blue-black polka-dotted dummy so large they slid off repeatedly and kept climbing back on. Another example is ground nesting birds, such as oyster catchers (Haematropus ostralegus), when given the choice between its own egg and a volleyball, ignored the egg and chose to try to roll the volleyball into the nest (3,4,20,21).
- Male silver-washed fritillary butterflies (Argynnis paphia) are stimulated to court females by the flickering movement of their wings. Their natural frequency of wing flicker is in the region of 8 – 10 Hz. However, research found these male butterflies are more sexually aroused by a butterfly-sized rotating cylinder with horizontal brown stripes than it is by a real, live female of its own kind. The males courted more vigorously to flickering stimuli with much higher frequencies (up to 140 Hz) which are greatly in excess of anything encountered in the animal's natural environment. It is unlikely that in the wild these male butterflies would ever experience the high flicker rates used by researchers (14).
- The buprestid beetle, or Australian jewel beetle (Julodimorpha bakewelli) has a body that is big and long, and a brown color. The males are hardwired to like certain features of the female. They like females to be large, brown, and shiny. These beetles attempt to copulate with a type of discarded brown beer bottles called "stubbies" that are bigger, browner, and shinier than any female beetle. A discarded wine bottle of a different color brown held no attraction. Not to mention, the male beetles continued their copulation attempts with the brown beer bottles even while being attacked (and sometimes killed) by a number of ants (11).
- In 1951, Tinbergen discovered the red underbelly of the territorial male stickleback fish provoked the aggressive response to strongly defend their territory from other male sticklebacks (21). By making vaguely fish-like carved wooden floats and painting them with a deeper red underside than another male stickleback, Tinbergen found the stickleback would attack the fake wooden float more vigorously than invading male sticklebacks if the float's underside was redder (4,21).

It is important to note the term supernormal stimuli does not just describe an artificially created stimulus. It also describes naturally occurring morphological features that are at the end of a normal distribution (15). For example, in 1985, Bielert and Anderson found that female baboons with exaggerated perineal swellings (in layman's terms a larger than normal swelling of the bottom associated with the sexually receptive period of their oestrous cycle) aroused greater sexual interest in males (5).

TWO WAYS SUPERNORMAL STIMULI CAN INTERFERE WITH FAT LOSS NUTRITION

Animals and humans are hardwired to respond to certain stimuli that has a survival value in evolutionary terms. Just like animals respond more strongly, and often preferentially, to the exaggerated stimuli, humans can be similarly exploited by exaggerated version of foods their ancestors would find back when humans lived in the wild.

There are two ways high-reward foods act as supernormal stimuli and can therefore hijack basic biologically driven responses that can potentially cause maladaptive eating behaviors that hinder fat loss and lead to weight gain:

1. Consistent and continued consumption of high-reward foods (the supernormal stimulus) can render whole foods (a normal stimulus) less appealing or unappealing. For example, high-reward foods provide a large dosage of sugar, fat, and flavor far more intensely than whole foods.
2. The influence of supernormal stimuli has changed what people think is a "large" portion size for a single meal. Research in 2006 replicated a study that was done in 1984, in which participants were asked to serve themselves the amount they considered to be a typical portion of each meal item on a buffet table (9). The 2006 study found that peoples' perceptions of what they consider to be normal portion sizes have changed in the past 20 years. The researchers said that what they called "portion distortion" may be the cause (17). In other words, exaggerated portion sizes can serve as a supernormal stimulus that distorts one's perception of large portion sizes as appropriate amounts to eat at a single eating occasion.

With the two above points in mind, not only can high-reward foods cause one to be less satisfied by whole foods, and therefore make adherence to a diet that emphasizes whole foods more difficult, but also be more likely to eat larger portion size meals. Since high-reward foods can appeal to human instincts more than the whole foods, the supernormal stimuli can also be a driving force in over-eating.

Given that high-reward foods provide a supernormal stimuli that can exploit how our brains work in a way that can lead to changes in our perception of whole foods, it makes sense to recommend minimizing exposure to high-reward foods (supernormal stimulus) as a general recommendation for fat loss nutrition and promote long-term healthy eating behaviors. This general diet guideline recognizes how the various features of a stimulus can elicit a particular behavior and the importance of creating and developing adaptive behaviors are conducive for fat loss and long-term health. In that, the less one is exposed to an exaggerated (supernormal) version of a stimulus (in this case, high-reward foods and larger portion meals), the more likely one is to build a stronger attraction and satisfaction with consuming whole foods.

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