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Food Preferences, Psychology and Physiology of

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Abstract

Human food choice is influenced by biological, psychological, and cultural factors. Because humans are food generalists, and because the food environment in the first world is so different from the ancestral human environment, innate predispositions play a minimal role. Humans principally learn to eat and like certain foods, and avoid others, with traditions being the main influence. Preferences can be based on the instrumental consequences of eating (e.g., nutritive or toxic properties of foods) or on liking for the taste. Mere exposure, pairing of foods with positive or negative consequences, or a variety of social influences foster liking or disliking. In the extreme, these and other forces turn an innate dislike, as for chili pepper, into a strong liking. Surprisingly, family influences on food preferences are very modest. Food functions in many ways, for example, as a social or moral entity; food preferences are therefore influenced by things such as the nature or origin of a food, and moral/religious attitudes, such as concerns about killing animals. In the developed world, with a surplus amount of foods, a wide variety of foods, and the conquest of most infectious diseases, concerns about food have focused more on obesity and the long-term consequences of diet. As a result, the pleasures of eating, especially in the United States, have become tempered by a fear of fat and food. The situation and person are both major determinants of choice, including the social setting, the time of day (e.g., breakfast vs dinner), eating at home or away from home, and the stage of life, from infancy to old age.

Introduction

Food and food choice constitute a major part of waking human activity, and, in the developing world, the major expense. Furthermore, food choice may be the single most important selective force in animal evolution, as suggested by the fact that many animal groups are named for their food habits (e.g., carnivores, insectivores). In human evolution, adaptations to obtaining large animal foods played a significant role in the evolution of the human brain and human social organization. Early advances in food procurement, agriculture and domestication, set the stage for major advances in technology, and the development of urban centers. Food has served as a foundation for the cultural evolution of nonfood systems, such as religion, ritual, and social exchange, through the cultural evolutionary process of preadaptation. Through many elaborations and the development of distinctive cuisines, food has become an important component of group identity, and a major source of pleasure, which sometimes can be classified as aesthetic. Thus, an understanding of human relationships to food promises to both enlighten a major area of human concern, and to enlighten other areas. The elaboration of eating into a refined and civilized activity in Western culture is beautifully described in Leon Kass' (1994) book, *The Hungry Soul*.

The Basic Relationship between Humans and Their Food

For any person, the world can be divided into the self and everything else. Eating involves taking matter from outside the self and putting it inside the self. This is a very intimate act. It is not surprising that people feel strongly about what they eat. The costs in terms of toxins, microorganisms, or imbalanced nutrients are high, but the benefits are even higher: survival is at stake.

Humans (and rats and cockroaches) are food generalists. They eat a wide range of foods; virtually anything that can fit into the mouth is potential food. Generalists have few innate determinants of food choice, simply because it is not easy to predict the nutritive and toxic properties of a potential food on sensory grounds. There are only a few documented innate biases in human (and rat) food choice. First, there are innate predispositions to like or dislike certain tastes. There is an innate preference for sweet tastes, which, in nature, are predictive of calorie sources. The long history of sweetness in human culture, from fruit preferences to cultivation of fruits, to extraction of sugar from fruits, to colonization of the Americas partly to get a source of sugar, to the development of sugar substitutes, is all driven by the innate liking for sweet tastes (sugar). There is an innate tendency to dislike bitter tastes, and there are probably innate predispositions to reject very strong tastes including oral irritation (as from peppers) and to like fatty textures. Second, there is a suspicion about trying new foods called neophobia (on account of potential toxicity), but also a conflicting interest in them (on account of their potential as a new nutrient source). This has been described as the generalist's (omnivore's) dilemma. Third, there is a special learning mechanism, which allows learning about the consequences of ingestion, even when these may occur hours after ingestion. Fourth, there are a few specific internal states, which seem to signal the need for specific nutrients. Examples are thirst promoting procurement of water and hunger, promoting procurement of sources of energy. There may be a specific internal signal associated with sodium deficiency.

Humans are mammals, and hence have a unique first food, milk. Humans and other mammalian generalists make a transition from this single food to a very wide range of foods. This transition is made under the guidance of parents and other caretakers, and usually consists of a scheduled and graduated introduction of new foods, accompanied by mental maturation of the child and increased ability to chew food. For all mammal species except a subset of modern humans, full digestion and utilization of milk is limited to infancy. The development of dairying afforded the opportunity for humans to exploit milk and its products as adult foods.

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Determinants of Human Food Choice

For humans, food choice is accounted for by some combination of biological, psychological, and cultural factors. The role of biological factors is limited for two reasons. One, as discussed above, is the human generalist orientation to food. Second, the modern developed culture world presents a food world to its members, which is vastly different from the ancestral world in which the biological predispositions evolved. A shortage of food has been replaced by a surplus of food. A modest range of natural, local foods has been replaced by an enormous range of foods, representing most of the world's cuisines at a neighborhood supermarket. 'Super foods' like chocolate with an extraordinary appeal to our innate liking for sweet and fatty tastes have been invented and widely distributed. Food choice, for some in the developed world, represents concerns about child labor, species at risk, and the appropriation of much of the food system by large corporations. Many of these themes are well expressed in Michael Pollan's (2006) book, *The Omnivore's Dilemma*. A major risk of food poisoning from toxins and microorganisms has been sharply reduced; the longer lifetime that has resulted from this and other medical advances establishes a new and more subtle link between dietary patterns over decades and degenerative diseases. Direct experience of food and the consequences of ingestion have been largely replaced by exposure through the media, schools, and other social contacts. Massive amounts of information (some accurate) relating dietary pattern to wellness and disease is widely disseminated. And finally, the linkage between energy expenditure and finding food (or finding anything else) has been almost eliminated. Thus, while the ancestral food environment focused on shortage and short-term consequences of eating, the modern environment stresses overabundance and long-term consequences. However, we must remember that more than 80% of people on Earth are not in the developed world. For them, getting enough food, both calories and nutrients, remains a major concern. Most of their food choices are dictated by strong culinary traditions and economic constraints. These people are not yet inundated by an abundance of different foods, although colas and candies and fast foods have already entered their lives. As globalization continues, and agriculture and distribution systems improve, more and more of the world will face the inversions of our ancestral environment. Culture is the most powerful determinant of human food choice. More can be learned about an individual's food attitudes and preferences from his or her cultural identity than from any other single piece of information. Food choice is highly constrained by availability and cost, and both of these are largely determined by culture, as well as local climate. Exposure to a food is a necessary, and sometimes sufficient, condition to produce a liking for a food, so that cost and availability indirectly but powerfully influence the development of food preferences.

Cost and availability aside, human preferences and food attitudes can be framed by a psychological (as opposed to nutritional) taxonomy of foods. There may be three types of reasons for rejecting or accepting a food: *sensory affective*, that is, feelings (pleasure or displeasure) based on the sensory experience (largely taste and smell); *anticipated consequences*, what the expected consequences are of eating a food; and *ideational*, what is known about a food (e.g., where it comes from, what the nature of it is).

Food rejections can be understood in terms of the selection and interplay of these reasons. One category of rejections is called *distaste*. These are entities rejected because of negative sensory affective properties, such as lima beans, broccoli, beer, or chili pepper, for those who find these foods distasteful. A second category is *danger*. These are things rejected primarily because they are believed to be harmful, because of acute or long-term consequences. The emotion of fear is often associated with their consumption. A third category of rejected things – the largest category – is called *inappropriate*. These are things that the culture labels as inedible, such as pencils, grass, paper, or cloth. They might taste good, and might be harmless, but they are rejected for ideational reasons. The fourth category is *disgust*. Disgusting food rejection is also based on ideational, culturally transmitted information, but unlike inappropriates, there is a strong belief that disgusts taste bad and are harmful. Unlike the affectively neutral response to inappropriates, the response to disgusts is strongly negative and emotional. Disgust is the most powerful reaction people have toward food. Disgusting entities are so powerful that if they touch an otherwise acceptable food, they render it undesirable, disgusting, and inedible (the principle of contamination or contagion).

On the positive side, there are four comparable categories. Good taste (acceptance principally because of sensory properties), beneficial (acceptance largely because of consequences), appropriate (acceptance because it is culturally designated as food, or food for a particular occasion), and transvalued (food enchanced because of its prior history). The transvalued category is much weaker and smaller than the disgust category, in most cultures. In Hindu India, food that has been 'shared' with the Gods (via donation to the priests in the temple, and then returned, in part), called 'prasad,' is an example of transvaluation.

The Acquisition of Food Preferences

For newborn infants, the only functioning categories are good taste (e.g., sweet) and distaste (e.g., bitter). Generally, infants will place in their mouth anything that might fit in, including feces and potentially toxic foods. Gradually, they acquire more distastes and good tastes, and learn about dangerous and beneficial foods. Disgust appears later. The full adult categorization is in place by roughly 5–8 years of age.

Most is known about the distinction between distaste and danger. When ingestion of a food is followed by nausea, it tends to become disliked, that is a distaste. However, if ingestion of a food is followed by most other negative symptoms (e.g., lower gut pain, skin rash, respiratory distress), the food typically becomes a danger. With respect to affect and emotion, it is notable that dislikes (distastes) and dangers have very different properties, although the outcome (rejection) is the same. The nausea-based acquired distaste (often called a conditioned taste aversion), unlike dangers, is not based on a legitimate sense of danger. Even if a person knows that the nausea/upper gastrointestinal illness was not produced by the food, the aversion remains.

The acquisition of good tastes is more complex and less understood. Mere exposure to a food, in itself, often seems sufficient to produce an acquired like. In addition, the association of a food with an already positive event (an already liked food mixed with it, positive regard by a respected person, a pleasant environment, nutritive postingestional consequences), by a process called evaluative conditioning, can lead to acquired likes (or acquired dislikes, if the paired events are negative, as in conditioned taste aversions). Indications of liking by a significant other (peer, older child, teacher, parent) may cause acquisition of liking. The process at work here is not understood. Efforts by adults to promote liking by emphasizing the beneficial consequences (better health, a specific reward for eating) seem to block the acquisition of liking for the food. When a child observes respected others enjoying a food, this promotes liking; when she is rewarded for consuming it, this seems to block the acquisition of liking.

The acquisition of knowledge of appropriate and inappropriate foods seems to be largely cognitive and affect free. The affect-laden acquisition of disgust contrasts with this, and may originate with the process of toilet training, which produces the universal disgust, feces. Some communication of affect (facial and other) is almost certainly involved, but there are also important cognitive aspects; it is the nature of the foods and their history that is central to this category.

Individuals in specific cultures develop likings (the good taste category) for some foods that are innately unpalatable (e.g., bitter, very strong tasting, irritating). Innately unpalatable foods are typically among the favorite foods: chili pepper, black pepper, ginger and other irritant spices, coffee, bitter chocolate, tobacco, alcohol, burnt foods, and highly salted foods. Such reversals of innate aversions are common in humans, and absent or rare in animals. We do not know how these preference reversals occur. In part, it may be through the same processes that produce normal likes: mere exposure, evaluative conditioning, and social approval. But there may also be special mechanisms that are involved in preference reversals. One possible mechanism places liking for innately unpalatable foods in the same category as thrill-seeking activities such as roller coaster riding. That is, humans get pleasure out of situations in which innate aversions or fears are stimulated, but in which they realize that there is no real danger. Roller coasters are safe, and so is chili pepper. This may be the case of pleasure derived from 'mind-over-matter.'

Family Influences and the Family Paradox

There are strong arguments for high parent–child resemblance in food habits. There is the common genetic heritage (including genetically based bitter sensitivity), mother's milk transmits some of the flavors of the mother's diet, parents control access (and hence exposure) to foods, and the principal affective signals about foods in early life come from the parents. Yet parent–child correlations in liking for foods are very low, in the range of 0–0.3, in comparison to parent–child correlations in values (such as attitudes to abortion). These low parent–child correlations appear whether the children studied are 4 year olds or college students. This family paradox cannot presently be explained. Of course, our first food, milk, was not available as a food postweaning in our ancestral environment, so from an evolutionary perspective, we should not develop strong lifelong attachments to our first food. Although all experiences with food, from the womb, onward have some influence on adult preferences, there is no reason to privilege the first 6 years of life. There is reason to believe that peer influence is very important, throughout the school years, although this influence has received relatively little attention.

Preferences and Values: Moralization and Vegetarianism

Selecting and consuming a food has social and moral implications, as well as physiological and sensory consequences. The source of a food (e.g., who prepared it, animal or vegetable origin) can powerfully influence acceptance. Particular food or food product boycotts in recent decades testify to this fact. Hindu Indian concerns about food fall largely within the moral domain. In the United States, there is a long history linking particular foods with the good life or immorality. Through the process of moralization, choice of a particular food may move from the domain of preferences to the domain of values. This has clearly happened with cigarette smoking in the United States. For some vegetarians, eating of animals is an immoral act. When ingestion of a food (including alcohol) becomes moralized, censure of consumers becomes licensed and governments and institutions may take limiting or prohibiting actions.

The Nature and Context of Food Choice

Food choices are sometime made on cognitive/rational grounds, whereas at other times the choice is made more rapidly and intuitively. First exposures to a food (at the point of purchase or ingestion) are more likely to engage rational concerns, whereas subsequent choices of the same food tend to be made in a more automatic, habitual manner. Repeated consumption of the same food on different occasions is likely to lead to increased preference, perhaps because of mere exposure, but repeated consumption over a short period of time can lead to boredom and reduced pleasure (called sensory-specific satiety). Food choices are often made well in advance of actual consumption, as in ordering in restaurants or purchase in a food market. Under the latter conditions, important determinants include branding and salience of the location of foods in the food display. The individual context is also important, including the time of day (breakfast vs dinner foods), the time of year and special annual celebrations like the American Thanksgiving, and stage of life, from infancy to old age.

Across the life course, one goes from intake determined largely by others in infancy to more and more agency in food choice with age, until older ages when the power of choice may become more circumscribed. Important areas of recent concern include social class and gender as determinants of food choice, and cultural differences in concern about genetically modified foods. Finally, the social context of eating affects both the amount eaten and food choice. Social comparison and social

norms have substantial effects. There are intense and often very pleasant social interactions, sometimes called commensality, that take place during meals. In short, understanding a single food choice engages a wide range of influences.

Food, Fear, and Pleasure: Cultural Perspectives

In the nonhuman animal world, and among traditional humans, food is basically a source of pleasure. Even in the developed world, cost and availability aside, the principal factor influencing food choice is taste, that is to say, pleasure, although convenience, health, and processing history of a food are also important determinants. However, with the major changes in the human environment in the developed world, obesity and the consequences of long-term exposure to particular diets have become more salient. As a result, the earlier simple pleasure of eating has become, for many people, an ambivalence, or even an outright fear. This is most well developed in American women, who often fear food as much as they savor it. In some, there is now embarrassment and guilt about consuming high-fat foods, great concern about thinness, and great concern about the healthfulness of every bite of food. This is not a necessary consequence of the modern environment, since in France, the pleasures of eating still dominate.

See also: Emotion, Neural Basis of; Hunger and Eating, Neural Basis of; Olfactory System.

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