

THE STUDY OF CONCEPTUAL MODELS OF FOOD CHOICE OF FOODS, INDIVIDUAL DIFFERENCES AND INFLUENTIAL FACTORS RELATED TO SOCIETY

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Abstract: The present paper analyzes existing models to provide an intact approach by integrating key elements into a larger framework. Food-intrinsic factors (sensory and perceptual characteristics), food-extrinsic factors (information, social environment, physical environment), personal-state factors (biological characteristics and physiological needs, including psychological components) Identification and classification of key determinants of general food choice has been done. In which habits and experiences), cognitive factors (knowledge and skills, attitudes, likes and preferences, anticipated outcomes and personal identity) as well as sociocultural factors (culture, economic variables, political elements) etc. have been analyzed.

Keywords: Food, culture, Economic variables, Physical environment etc.

1.1 The role of consumer food choices in a healthy and sustainable food system

Global food systems face a complex and multifaceted set of challenges with respect to both human and environmental health, from farm to fork. From the perspective of human society, there are still 690 million people who suffer from hunger, while food insecurity is projected to increase due to the current coronavirus disease 2019 (Covid-19) pandemic and the resulting economic shock. Meanwhile, 677.6 million adults, equivalent to 13.1% of the worldwide population, are obese [1], resulting in a double burden of malnutrition. Individual food choices embedded in food consumption patterns evolved according to changes in the natural environment, biological basis, material need, lifestyle and development of technology [2]. In modern society, due to increasing national wealth and urbanization, people consume more processed food along with animal protein. At the same time, consumption of whole foods or minimally processed foods such as whole grains, legumes, and other sources of fiber decreased [3]. Some studies have highlighted that eating patterns and food choices have changed with changes in global food systems and food supplies, resulting in an increase in unhealthy food intake [4]. Alterations of global food supply chains affect the food environment, [5]. In particular, food choices with ultra-processed food have increased significantly [6,7,8] due to easy accessibility, affordable pricing and marketing strategies. The vicious circle between food choice and food choice outcome is created as it is

confirmed that consumption of heavily processed foods is significantly associated with higher BMI and increased likelihood of being obese [6,7,9] happened. On the other hand, overweight and obese individuals tend to prefer and choose more energy-dense foods [10,11,12]. Given that the negative impacts on humans as well as on the planet (for example, pre- and post-operative activities in the food system produce up to 37% of total anthropogenic greenhouse gas emissions [13]) promote healthier and more sustainable food. Giving has increased a lot. Choice and better diet have been a new multidisciplinary research impulse [14,15,16,17,18].

1.2 Stage classification for health behavior

The Stages of Change model developed by Prochaska and colleagues suggests that health-related behavioral change occurs through five distinct stages. These are precontemplation, contemplation, preparation, action and maintenance. The model assumes that if different factors influence the transition to different stages, individuals should respond best to interventions designed to match their stage of change.

The phase model of change, in contrast to the other models discussed, has proven to be more popular for use in changing behavior rather than for explaining current behavior. This is probably because the model provides practical intervention guidance that can be taught to clinicians. In addition, large random samples can be tested with messages corresponding to the individual's stage of readiness for change.

It has been suggested that a stage model may be more appropriate for simple more discrete behaviors such as eating five servings of fruits and vegetables each day, or for complex dietary changes such as drinking low-fat milk (meal-based goal). Low-fat eating (nutrient based goal).

Currently, no theory or model adequately explains and predicts the full range of food-choice behavior. In general, models should be seen as a means of understanding the factors that influence individual decisions and behaviour. Despite the number of models of behavior change, they have been employed in relatively few nutritional interventions; The most popular is the Stage of Change model. However, the best test of this model, whether phase-matched dietary interventions outperform standardized approaches, has not yet been performed.

1.3 Health Belief Model (HBM) and Conservation Motivation Theory

HBM was originally proposed by Rosenstock, modified by Baker and has been used to predict protective health behaviours, such as screening, vaccination uptake and compliance with medical advice. The model

suggests that people considering changing their behavior should feel personally threatened by an illness/disease and then engage in a cost-benefit analysis. This model also suggests that people need some sort of signal to take action to change behavior or make health decisio

1.4 Conceptual Model of Factors Influencing Consumer Food Choice

1.4.1 The three main categories of factors influencing food choices are given as food-related characteristics, individual differences and societal characteristics.

A rich body of literature has focused on exploring the factors influencing individual food choice. Due to the complex nature of food choices, the proposed factors as well as the classification of factors differed from one study to another.

There are three main categories (1) Food-related characteristics: Intrinsic Features such as color and fragrance, and external features such as information and packaging.

(2) Individual differences: biological (eg, appetite, appetite and taste), physical (eg, accessibility, cooking skill and timing), psychological (eg, mood and stress), cognitive (eg, attitude or preference, belief, and knowledge), and social (eg, family and peers) factors. (3) Characteristics related to society: culture, economic variables such as prices and income, and policy.

1.4.2. Role of food environment as factors influencing food choices

In addition to the three main categories, in recent years, the 'food environment' has been defined and recognized as an important factor influencing people's food choices. The food environment is the collective physical, economic, policy and socio-cultural environment, opportunities and circumstances that affect people's food choices and nutritional status. In fact, the 'food environment' includes various factors from the above three main categories, namely the physical and social environment as well as the economic, policy and socio-cultural environment. Some studies attempted to provide a more holistic view by integrating the role of the food environment.

1.4.3. Development of an early conceptual model of food choice as a prototype

It is recognized that food choices are multifaceted, situational, dynamic and complex. Thus, a multidisciplinary approach and a holistic picture are needed to understand not only how different factors

are involved, but also how factors are structured and interact with each other in the decision-making process. To this end, there are broad conceptual models of food choice behavior. Developed to understand the process of making food choices. Models containing factors involved in food choice are classified into three components: life course, effect, and individual system. According to the authors, the course of life includes individual roles and the social, cultural and physical environments to which a person has been and is exposed. An individual's life course produces a set of influences: ideals, personal factors, resources, social structures, and food context. These influences inform and shape people's personal systems, including conscious values, interactions and unconsciously driven strategies that may result in food-related choices.

1.5 Aim of Proposed Framework

Individual food choice is important because it affects our health and our planet at large, with multifactorial determinants inherent in food-related characteristics, individual differences, and society-related characteristics. In addition to early conceptual models of food choice, in recent years, there is abundant literature focusing on expanding and enriching conceptual models of food choice. However, no single perspective, theory, framework or model can provide a complete picture of food choice mechanisms and properly explain it because influencing factors have been classified in different ways. The factors influencing food choice are not clearly leveled across sectors of food itself, individuals and society. Thus, the purpose of the present paper is to (1) systematically review existing conceptual models of food choice; (2) Summarize and reclassify the factors influencing food choice into three main categories: characteristics related to food, individual differences, and characteristics related to society; (3) analyze the direction of the effects between the factors in the conceptual model; and (4) develops and provides a conceptual framework that separates the complex and multifactorial nature of individual food choice.

1.6 Materials and methods

The aim of the present review is to present the factors influencing individual food choice with a proposed conceptual model by including academic publications as well as gray literature. The inclusion of publications is based on the following criteria: (1) studies were to be published in English; (2) studies that were based on healthy adult populations; (3) studies focused on general food choices rather than specific food choices (eg, ethnic food and functional food); (4) studies that were not conducted in a specific

sociocultural context (eg, specific to some community or city); (5) Studies that propose at least one conceptual model of food choice.

1.7 Result

Each conceptual model of food choice was analyzed, categorizing the factors included in the model into the following main factors, according to our proposed framework developed from the model of Aertmann, Beyens and van den Berg [19] Influencing choice: food-intrinsic factors, food-extrinsic factors, personal-state factors, cognitive factors, and socio-cultural factors. All the factors involved in these main factors.

Table 1

Factors influencing individual food choice included in our proposed framework.

Five Main Factors in Three Categories		Sub-Factors Under Five Main Factors
Food-related features	Food-internal factor	Sensory features (flavor, taste, smell, and texture) and perceptual features (color, portion size, nutrition and health value, and quality)
		Information (nutritional labels, health claims, packaging, aesthetics, and ethics of production history, brand, advertisement)
	Food-external factor	Social environment (intrapersonal factor and social norms from family, peers, and media including ethical concern, social context when food choice is made).
		Physical environment (availability and accessibility of food products, food retail environments, time).
		Biological features (genetic factors, personal dietary patterns and metabolism, physical condition such as health).
Personal-state factor		Physiological needs (hunger, appetite, and weight status)
		Psychological components (emotion, motivation, personality)
Individual differences		Habits and experiences
		Knowledge and skills
Cognitive factor		Attitude, liking and preference
		Anticipated consequences
		Personal identity (demographic features such as age, gender, ethnic identity, and education, and personal value and belief)
Society-related features	Sociocultural factor	Culture (norms and values)
		Economic variables (Income, socioeconomic status, and price)
		Political elements (Agricultural and food policy and regulations)

Sources: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7766596/table/foods-09-01898-t001/?report=objectonly>

1.7.1 Conceptual model of factors influencing food choice

In this section, we present the factors involved in conceptual models of common food choices.

1.7.1.1 Food-intrinsic factors: sensory and perceptual features

Food-intrinsic factors are defined as sensory (eg, taste, taste, smell and texture) and perceptual (eg, colour, portion size, nutritional and health value, and quality) properties of food. Twenty-six models have proposed that sensory and perceptual characteristics influence food choice.

1.7.1.2 Food-External Factors: Information, Social Environment, Physical Environment

In our definition, information about the food item (eg, nutritional labels, health claims, packaging, aesthetics, ethics of production history, brands and advertising) is defined as one of the extra-food factors. Twenty-eight models included food-related information as factors influencing food choice. In addition to food-related information, the food environment is thought to be a food-extrinsic factor that largely influences food choice as well. We divided the food environment into two factors, namely the social environment (eg, social norms from family, peers and the media, moral concern as well as the social context when food is chosen) and the physical environment (eg, product availability), accessibility and convenience; In-store attributes such as shelf display, order, placement and timing). Thirty-four models indicated that the social environment contributes to the decision of food choice

1.7.1.3 Personal-State Factors: Biological Characteristics and Physiological Needs, Psychological Components, Habits and Experiences

In our definition, individual states that influence food choice include biological characteristics (eg, genetic factors, individual dietary patterns and physiological conditions such as metabolism, health) and physiological needs (eg, appetite, appetite and weight status), psychological components (eg, emotion, motivation, personality), and personal habits and experiences. Sixteen models include biological characteristics and physiological needs as factors influencing food choice.

1.7.1.4 Cognitive factors: knowledge and skills, attitudes, likes and preferences, anticipated outcomes, and personal identity (demographic characteristics, beliefs and values)

Before the final outcome of the food choice behavior is reached, cognitive factors have an impact on food decision making. Having knowledge (especially nutrition and food-related knowledge) as well as having food management skills can have a huge impact on food choices. For example, nutritional knowledge has been shown to be a partial mediator of socio-demographic variation in food intake, particularly for fruits and vegetables, implying that knowledge is an important factor in explaining variation in food choice.

1.7.1.5 Sociocultural Factors: Culture, Economic Variables, and Political Elements

For the previous factors, the effects are mainly at the individual level. The last category, the socio-cultural factor, focuses on the social level. According to Larsen and Storey [20], the effects of the macroenvironment on individual food choices include (1) income, socioeconomic status, and the price of

food, reported by twenty-nine models, (2) cultural norms and values by seventeen models. (3) Agriculture and Food Policy and Regulations, reported by nine models.

1.7.2 Effects among factors in the conceptual model of food choice

Thirty-two conceptual models of food choice indicated possible directions of influence among factors on the direction of final food choice.

1.7.2.1. Potential effects between factors in a conceptual model of food choice.

For most conceptual models, the directions of influence among the factors influencing food choice are demonstrated on a theoretical basis. Early-established models can be viewed as prototypes that allow continuous research to expand or enrich the model with new data or evidence. To conclude briefly, some models explicitly indicate the direction of influence between factors with experimental data or mathematical modeling. There is a need for empirical data to support and differentiate interactions between factors.

1.7.2.2. Direction of Influence between Factors in the Conceptual Model of Food Choice

In general, the more specific factors the model addressed, supported by experimental data, the clearer indications of the directions of effect could be given. For example, in the model of Gutzer et al. (2015), both sensory (internal) and packaging (external) information trigger emotional responses but the choice was based on sensory information. Both emotional responses and liking contribute to the prediction of food choice. For food with environmentally sustainable properties, individual norms regarding the use of organic food influence attitudes towards the use of organic products in institutional settings, which is partly mediated by the purchase of organic products [21]. Choice of convenience food with environmentally sustainable properties is positively related to consumer food shopping habits, environmental behavior related to food, gender, income, and knowledge [22]. Another study also reported that the likelihood of purchasing a healthy convenience food is influenced by overall choice of food, which is influenced by liking sensory specific product characteristics such as appearance, taste and smell [23].

1.8 Discussion and Finding

The conceptual models we include in the analysis mainly follow a three-tiered framework of food features, individual systems, and environment. However, different models may include a different number of factors within and between these three levels, with different methods of classification. Thus, the present review analyzed existing conceptual models of food choice, summarized the influencing factors influencing food choice, then re-classified the results from the literature and the factors influencing food choice. integrated into the proposed three-tiered framework, namely characteristics related to food, individual differences, and characteristics related to society. The ultimate goal is to provide a clear and simple roadmap to facilitate future development of research in the field of consumer food choice and to maximize contributions from individual studies. Being on the same page, outlines can help researchers communicate ideas, compare research data, and easily replicate existing results. In our framework, the influential factors that determine food choice are food-intrinsic factors (sensory and perceptual characteristics), food-extrinsic factors (information, social environment, physical environment), individual-state factors (biological characteristics, physiological needs, psychological component). , habits and experiences), cognitive factors (knowledge and skills, attitude, likes and preferences, anticipated outcomes and personal identity), and sociocultural factors (culture, economic variables, political elements). The results reflect the fact that (1) the social environment is the most commonly addressed factor influencing food choice; (2) Due to the availability of research evidence, factors such as food information, food environment and economic variables are easy to be manipulated and measured in experimental settings. Thus, the role of these factors in influencing food choice was more carefully and clearly examined and concluded; (3) Compared with other field studies, the complex mechanisms and interactions between food perception (food-intrinsic factor) and bio-physiological (individual-state) still need more investigation and the results can be translated into conceptual models of food choice. should be integrated into. ; (4) While some factors influencing food choice may be universal (eg, life course, large-scale and cross-cultural studies are needed to address factors influencing cultural-specific choices.

1.9 Limitations

First, we focus on a three-level classification of factors influencing food choice, namely food-related characteristics, individual differences, and society-related characteristics. However, recent research also pointed out important roles in determining food choice played by the natural environment such as climate change, natural resources as well as food production and the supply chain. Ideally, these factors should

also be included in the conceptual framework. Second, the present study summarizes the factors influencing food choice as proposed in the conceptual model. The keywords we use for literature search may limit the inclusion of publications examining a single or fewer factors with experimental settings and empirical data. Thus, more meta-analyses are needed to understand how different but distinct factors contribute to food choice. Further examination is recommended with the inclusion of the results of factor analysis from a food-choice questionnaire.

1.10 Conclusion

Finally, the more specific factors the model addressed, supported by experimental data, the clearer indications of the direction of the effect could be given. We appreciate the multifactorial nature of individual food choice and the effort to incorporate as many factors as possible into the model to provide a more intact and holistic approach. However, the trade-off of expanding models must also be recognized. In this case, interdisciplinary research is expected to build a holistic conceptual model of food choice supported by empirical data from studies in different fields. We observed that the proposed factors and their effects in the theory of planned behavior (attitude, norms, and intention) are often investigated with experimental settings and thus empirical data were obtained. Some other factors and influences are also frequently examined such as preference, food or nutritional knowledge, personal value, emotion, income and sensory properties of food. Future studies should explore other factors and their effects on food choices.

1.11 Future research directions

The present review provides an analytical framework to disentangle the complex and multifactorial nature of individual food choice with the aim of moving towards healthier and more sustainable food systems. Recently, the European Commission has placed consumer food choices as one of the key goals to achieve a more healthy and sustainable EU food system.

More importantly, consumers will have the right to a long-lasting, healthy, enjoyable, nutritional and sustainable diet tailored to individual standards. It has been pointed out that research is needed to better understand the factors influencing consumer choice such as food environment, policies, gender, information, education, marketing, incentives and lifestyle. In our opinion, factors that may influence a person's food choice in the future should also be taken into account when examining: (1) multiple areas of research in sensory science, cognitive science, social science, as well as business studies. Subjective

impulses and the need for cooperation; (2) Structural and systematic methods of examining the effects of factors related to food-choice as well as interactions between factors (eg, using the proposed framework as a guiding map); (3) the number of factors included in the framework and the ability to investigate and trade-offs between the effect of a single factor and the effect of a combination of different factors; and (4) enriching and improving the framework with empirical observations or data based on a feedback mechanism.

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