



UNIVERSITÀ DEGLI STUDI DI PADOVA
Department of Land, Environment, Agriculture and
Forestry

Second Cycle Degree (MSc)
in Food and Health

Nourishing the Soul: Exploring the Link
Between Food Choices and Emotions

Supervisor
Prof. Roberta Sellaro

Submitted by
Ágatha Gomes Antunes
Student n. 2040387

ACADEMIC YEAR 2023/2024

Table of Content

Introduction	1
Chapter 1. Impact of food on human being's life	3
1.1 A sociodemographic vision	5
1.2 Accessibility to food: definition and implications	7
1.3 The convenience, price, and availability's question	8
1.4 Food and environmental health.....	10
1.5 The sustainability side of food choices.....	12
Chapter 2. Impact of food on mental health	15
2.1 Dietary patterns and mental health	16
2.2 Gut-Brain connection and mental health: relating physical and psychological aspects.....	20
2.3 Eating disorders	22
Chapter 3. Food choices and the role of emotions	25
3.1 Food as a belief and knowledge.....	27
3.2 The decision-making process.....	27
3.3 Emotions and psychological factors in food choices.....	34
Chapter 4. Food marketing and mood manipulation.....	37
4.1 Food and positive feelings	40
Chapter 5. Toward a conclusion	45
Interventions and dietary strategies	45
Research limitations and future prospects	46
Conclusions	49
References.....	51

Introduction

It is fundamental to recognize food and nutrition as essential for the overall well-being and existence of human beings. Although other factors, such as the environment and lifestyle, also have an influence, a balanced diet is a key modifiable element (Lanham-New et al., 2019). It contributes significantly to health promotion, disease prevention and treatment, and even improving life expectancy (Lanham-New et al., 2019). A balanced diet supports maintaining optimal weight, organs function, fortifying the immune system and regulating energy levels (Gibney et al., 2009; Lanham-New et al., 2019). However, our food choices are influenced by many factors beyond physical health (Gibney et al., 2009): environmental sustainability (Johnston et al., 2014), cultural identity, mental well-being (Lakhan et al., 2008), and emotional experiences (Rozin, 2007) are a few examples. In this context, emotions stand out as one of the most important factors in determining our food choices (Troisi, de Masi, & Sarno 2021). For instance, emotions can influence how we perceive food and the amount of it we consume (Cardi & Treasure, 2015). In recent years, researchers from various disciplines have explored these topics in depth, uncovering valuable insights and bringing light on the complex relationship between food and our well-being. In the following sections, an overview of the main factors that make the relationship between our diet and our well-being will be provided, giving a higher focus on the influence of emotion.

Chapter 1. Impact of food on human beings' life

«Nutrients are the nourishing substances in food that are essential for the growth, development and maintenance of body functions. Essential meaning that if a nutrient is not present, aspects of function and therefore human health decline. When nutrient intake does not regularly meet the nutrient needs dictated by the cell activity, the metabolic processes slow down or even stop.» (Wardlaw & Insel, 1996)

The human being of the present day is so accustomed to seeing food on the table that sometimes forgets its real importance. A plate of pasta with sauce, a loaf of bread freshly picked up from the bakery, some meat to be cut up and served to guests; all of this takes on secondary significance in an age in which, by now, the problem of hunger in developed countries has been far surpassed (Corvo & Fassino). Yet, never more so than in this time, food represents one of the main aspects for the survival and well-being of the human species since it is not only understood as a source of assimilable energy, but as a pivotal element for the development, growth and overall health of both body and mind. It is no coincidence that when we say that proper nutrition enables one to maintain a healthy lifestyle, we are referring to how much the choice of what one wants to eat (and how one wants to eat it) affects positively, but also negatively, the body's overall activity and well-being.

Food is an extraordinarily complex mixture of chemicals that interact with the body in yet partly unknown ways, but also a source of pleasure: the food is an occasion of multisensory enjoyment, in fact: it savors with taste, envelops us with scents, it gladdens the sight with food design and its colors, it gives the sensation of materiality to the touch, it tells a story all to listen to (Corvo & Fassino, 2015).

The foods ingested, each of which is charged with playing an irreplaceable role in keeping the body healthy, are in fact essential for the performance of multiple vital functions, from cell repair to immune system support to even the production of energy needed to support the practice of everyday activities (Warslaw & Insel, 1996). Proper nutrition enables human beings to be active, think clearly, work efficiently and live life to the fullest. Nevertheless, the link between food and health is complex, influenced by what one decides to consume and how it affects the health status of the body. Some nutrients provide immediate energy, others facilitate muscle and tissue rebuilding, and still others help strengthen memory. In any case, not all foods consumed offer the same benefits; many of those that are highly processed or rich in sugars, saturated fats and chemical additives contribute more to the onset of health problems of varying degrees (Gallo et al., 2020). In fact, overconsumption of these foods can lead to serious conditions such as obesity, type 2 diabetes, cardiovascular disease, and other chronic conditions that impair an individual's quality of life (Gallo et al., 2020).

Although not exclusively so, a common mistake is to regard the concept of food and the concept of *nutrition* as synonymous. While the former is what human beings consume in the act of eating, the latter is the process by which the body uses such food to “put itself in gear,” or rather, to activate itself and carry out normal functions (Geissler & Power, 2023). The moment the intake of essential nutrients is insufficient, serious imbalances can occur, which can in turn become diseases, infections or remain stable in the form of general weakness. In contrast, well-balanced and adequate nutrition keeps the immune system strong, increases energy “to burn,” and improves overall health (Geissler & Power, 2023).

The now well-known concept of a healthy diet is not static but continues to evolve over time based on scientific discoveries and the needs of modern society (Mondragon Portocarrero & Miranda Lopez, 2024). Today, healthy diet is not only about meeting an individual's nutritional needs, but also aims to promote overall health and reduce environmental impact through what experts like to call “nutrition education.” Because on the one hand, human beings have always been accustomed to eating what they hunted (prehistoric age), feeding themselves with what they could (in critical times) and swallowing anything to fill their stomachs, it proves essential to educate them to read food, to know it nutritionally as well, and not to just listen to emotions or, at worst, to expect it as a reward/gratification (Rezaieg, 2022).

In an age in which food is readily available and at our fingertips, in which fast food and pre-packaged food are all the rage and the act of eating becomes a mechanism rather than a pleasure, it is incumbent on us to open our eyes and attempt to offer a solution by broadening our gaze toward that which nourishes the soul and enables human beings to live and thrive in health.

1.1 A sociodemographic vision

Sociodemographic factors such as age, income, and education influence food choices, as demonstrated by studies such as Bellisle's (2020) or the Pohjanheimo's et al. (2022) LoCard survey. In their study they reported several factors that may have an impact on individuals' priorities for diverse food preferences, including health, sensory appeal, and ethical concerns. For example, how age significantly affects food preferences, with younger individuals generally paying more attention to sensory aspects such as taste and visual presentation, despite health concerns; while adults tend to focus more on

health-related factors (Pohjanheimo et al., 2022). These differences related to age in food priorities reflect changes in health status and lifestyle, since young consumers are more influenced by immediate gratification and older adults more concerned with staying healthy (Wongprawmas et al., 2021).

In addition, sensory preferences, such as taste, appearance, freshness, texture, color, and smell (Imtiyaz et al., 2021), can also vary with age, thus shaping food choices even more along the life course (Wongprawmas et al., 2021). Indeed, in a study by Imtiyaz et al. (2021), it was found that the most important factor behind food selection among young adults is the sensory component, especially taste. The study also showed that people tend to consume a greater amount of food when they perceive it to have a pleasant taste. On the other hand, the focus on health and nutrition is particularly evident among older adults, who generally prioritize whole foods such as fruits, vegetables and lean proteins (Wongprawmas et al., 2021) and foods rich in vitamins, minerals and other nutrients that are essential for managing health conditions, preventing chronic diseases and increasing longevity (Pohjanheimo et al., 2022).

On the other hand, although younger individuals may be more inclined to choose food based on sensory appeal, such as taste and appearance, health-conscious choices are also influenced by knowledge of nutritional information. However, the degree to which nutrition influences food choices can vary according to education and income levels, which affect both knowledge and access to healthier food options (Bellisle, 2020). For example, individuals with a higher level of education are more likely to understand the importance of nutrition and make food choices that reflect this awareness, selecting options that are lower in sugar and fat and higher in fiber and essential nutrients (Khan & Pandey, 2023). On the other hand, people with limited

access to nutritional information or resources may prioritize taste or cost over health, demonstrating how the role of nutrition in food choice is mediated by broader social and economic factors.

1.2 Accessibility to food: definition and implications

Accessibility to food refers to the ability of individuals to obtain sufficient, nutritious, and affordable food in a convenient and timely manner. This concept encompasses several dimensions, including the physical presence of food outlets, economic affordability, and the convenience of accessing these resources. Physical accessibility involves the availability and proximity of grocery stores, supermarkets, and other food retailers within a community, which directly influences how easily residents can purchase fresh and healthy food items (Morland, Wing, & Diez Roux, 2002).

Economic accessibility relates to the affordability of food, where income levels and food prices determine whether individuals can consistently purchase nutritious foods. Higher food costs can limit access to healthier options, leading consumers to opt for cheaper, often less nutritious alternatives (Drewnowski & Specter, 2004). Additionally, the convenience of accessing food, including factors such as store hours, transportation options, and the time required to prepare meals, plays a significant role in food accessibility (Beaulac, Kristjansson, & Cummins, 2009). For example, individuals with limited transportation may find it challenging to reach supermarkets that offer a wide variety of healthy foods, thereby restricting their dietary choices (Powell et al., 2007).

Furthermore, social and informational aspects contribute to food accessibility. Social accessibility involves cultural acceptability and the presence of familiar food

options within a community, which can affect individuals' willingness to purchase and consume certain foods (Wongprawmas et al., 2021). Informational accessibility includes the availability of information regarding healthy food options, nutrition education, and guidance on meal preparation, empowering individuals to make informed food choices (Khan & Pandey, 2023). These multiple facets of food accessibility interact to shape dietary behaviors and overall nutritional status, highlighting the importance of addressing accessibility issues to promote healthier eating behaviors across diverse populations (Pohjanheimo et al., 2022).

1.3 The convenience, price, and availability's question

Convenience, price and availability are also vital factors influencing food choices. Kaur et al. (2018) demonstrated that Indian consumers placed a high priority on convenience and availability when selecting food, often opting for quick and easy-to-access options. Similarly, Watson et al. (2017) found that low-income consumers in the United States were more likely to prioritize affordable and convenient food options, often due to financial constraints and time pressures. Hiza et al. (2018) further explored the role of food availability and accessibility, revealing that individuals with access to healthy food options, such as fruits and vegetables, consumed these more frequently than fast foods and sugary drinks. This highlights the importance of increasing access to healthy foods as a means of encouraging healthier dietary patterns.

On the relationship between consumption of primary goods and price, In Italy, Istat reports the following:

«In October 2024, inflation rebounded to +0.9 percent, albeit against a backdrop of economic stability. Sectoral trends, however, appear differentiated. In the food sector, price

trend dynamics are accelerating (+2.4 percent from +1.1 percent in September), with effects manifested on the “shopping cart” (+2.0 percent from +1.0 percent). In contrast, Energy Goods prices accentuate the year-on-year decline (-9.0% from -8.7%). Among services, the trend growth in Recreational and Cultural Services prices softens (+3.6 percent from +4.0 percent) while those of Transportation show a slight acceleration (+3.0 percent from +2.4 percent). In October, the inflation assumption for 2024 stands at 1.0 percent » (ISTAT, 2024)

These official data show that in October 2024, the inflation rate in Italy reached an increase of 0.9 percent, although the overall economic picture remained rather stable. In any case, price changes showed significant differences between sectors: primary goods, energy goods and services. In the food sector, prices accelerated with an increase of 2.4 percent and directly impacted the “shopping cart” of the average citizen, whose increase amounted to 2.0 percent, or more than double considering the previous month. These percentages indicate that Italians saw a more pronounced increase in costs for basic necessities, as opposed to energy goods and six recreational and cultural services, which encountered a major deceleration.

Nowadays, economic dynamics shape individual's food choices at different levels, from financial availability to broader contexts, shaping food habits through prices, accessibility and agricultural policies. Price is, in fact, a major factor: highly processed foods high in sugar or fat tend to be cheaper and more accessible than fruits, vegetables, and quality proteins, and fast food products are one example (Chan & Antonelli, 2020). In this sense, individual or family income directly affects the ability to purchase healthy and nutritious foods, and people with limited economic resources are more likely to purchase less expensive but calorically dense foods. What is more, in many geographical

areas access to fresh foods is made difficult by unfavorable economic conditions and government subsidies given to agriculture (Chan & Antonelli, 2020). The global market, for its part, makes available an infinite amount of food from anywhere in the world, but often the economic and environmental costs are very high indeed.

1.4 Food and environmental health

Another important aspect to consider is the impact of diet on environmental health. Our food choices can have significant consequences for the environment, contributing to issues such as deforestation, greenhouse gases emissions and water pollution (Kalkbrenner et al., 2018). For example, sustainable food choices, such as reducing meat consumption and supporting local and organic farming, can be useful for environmental conservation (Poor and Nemecek, 2023). In this sense, and from a purely emotional point of view, Kalkbrenner et al. (2018) discovered that feelings of guilt and empathy could influence the willingness to make more sustainable food choices. Individuals who experienced guilt related to meat consumption were more likely to opt for plant-based foods, while those who felt empathy for animals showed similar tendencies. More specifically, guilt emerges when a person feels responsible for doing something wrong, such as choosing foods perceived as harmful: knowing that meat production generates high levels of greenhouse gas emissions, requires huge amounts of water and contributes to deforestation, can make them feel guilty as contributors to these issues (Monterrosa et al., 2020). Intensive farming practices shown in the media often arouse shame and suffering related to the inauspicious fate to which animals' lives are linked. These practices are also closely linked to environmental consequences such as deforestation, which is frequently driven by the demand for agricultural land,

especially for livestock and palm oil plantations (FAO, 2020). For instance, large areas of the Amazon rainforest are cleared annually to create pasture for cattle, leading to significant loss of biodiversity and ecosystems disruption (FAO, 2020). Furthermore, deforestation not only destroys habitats but also releases large amounts of carbon dioxide stored in trees, contributing to global warming (Greenpeace, 2021).

Greenhouse gases emissions from food production are another critical environmental issue. Livestock farming, particularly cattle, is a major source of methane, a potent greenhouse gas. (FAO. 2021). According to the United Nations, the livestock sector accounts for approximately 14.5% of global anthropogenic greenhouse gas emissions (FAO, 2022), which can suggest that adopting a plant-based diet could reduce food-related greenhouse gas emissions by up to 70% (Poor and Nemecek, 2018).

Water pollution is also a significant issue linked to food production. Runoff from agricultural processes, containing fertilizers and pesticides, very often leads to the contamination of water bodies, generating problems such as eutrophication and dead zones in oceans and lakes (WWF, 2020). Alternatives for mitigating these effects include supporting local and organic farming, as these practices tend to use fewer synthetic chemicals and promote soil health, reducing the probability of harmful runoff (IFOAM, 2019). In addition, buying locally produced food reduces the carbon footprint associated with transportation and supports local economies (IFOAM, 2019). Moreover, by making sustainable food choices, individuals can contribute to the conservation of natural resources and the reduction of environmental degradation.

1.5 The sustainability side of food choices

In recent times, a central theme in debates about environmental sustainability has been food, or rather, the food choices that individuals make to feed themselves and stay healthy. Most of the time, these choices depend on a combination of interrelated factors, ranging from the cultural and social to the biological and psychological.

Treating the issue from a cultural perspective, the traditions and contexts in which individuals find themselves profoundly and significantly shape what they consider acceptable or desirable to consume. For example, in some cultures, meat consumption is a must while in others, vegetarian or vegan diets are predominant. This cultural “teaching” about what is good to consume in each community comes from what that community passes down from generation to generation, influencing the habits and customs of everyone in it. Eating with friends or family can indeed determine what and how much is consumed, just as social norms do (Almerico, 2014).

In a negative sense, unfortunately, social pressure to adhere to more sustainable behaviors can increase guilt to extreme levels when there is a failure to meet such standards (Monterrosa et al., 2020). If guilt acts negatively on the individual's inner feeling, the sense of empathy acts in the opposite way by inducing the individual to voluntarily reduce meat consumption or choose products with sustainability certification. Thinking about the future, the individual may feel empathy toward those who may be affected by climate change and thus choose a different behavior toward food consumption (Monterrosa et al., 2020). This suggests that emotions can serve as powerful motivators, not only for health-related decisions but also for choices related to ethical and environmental concerns.

From a biological-scientific perspective, taste, smell and innate preferences in human beings determine the degree to which they are attracted to the taste of what they are about to consume. Similarly, the sense of hunger and satiety, as well as hormonal signals (such as those produced by ghrelin and leptin) also guide daily food selection (Murcott, 2005). But since the individual is made up not only of bones and tissues, but of a soul and a feeling of its own, emotions also strongly influence the choice of one food over another: stress, anxiety or sadness may lead to a preference for foods rich in sugar and fat and therefore more “comfortable” and rewarding; conversely, joy and mindfulness may encourage healthier choices in terms of both health and environmental impact (Notarnicola et al., 2014). Growing awareness of the effects of greenhouse gases and intensive livestock farming are prompting many people to rethink their eating habits to go green for the planet.

The link between food and emotions is as complex and deep-rooted as that between food and the environment. Food is not only a means of nourishing the body; it is also a symbol of cultural identity and a means of making social connections, an emotional aspect this can sometimes conflict with more sustainable food choices. Many traditional dishes that evoke childhood memories or happy times are often full of ingredients with a high environmental impact. The difficulty of giving up these foods, despite awareness of their effects on the planet, underscores how emotions can affect everyday food choices leading people to opt for less healthy or more convenient foods, often at the expense of sustainability (Notarnicola et al., 2014).

Chapter 2. Impact of food on mental health

According to the World Health Organization (WHO), mental health is defined as a state of well-being in which the individual can realize their own abilities, handle the normal stresses of life, be productive at work, and be able to contribute to their community (WHO, 2018).

An individual's mental health has biopsychosocial characteristics, as it is the result of the interaction of biological, psychological and social factors (Engel, 1977). This means that the individual's well-being extends beyond psychological and emotional aspects and also includes essential factors such as physical health, social support, and adequate living conditions (WHO, 2018; WHO, 2014).

Studies have conclusively shown that our diet has a profound impact on our general well-being, specifically in relation to mental health. For example, a study by Lassale and colleagues (2019) showed that diets rich in processed foods and sugar were associated with a higher risk of developing depression. At the same time, diets rich in fruit, vegetables and fish, such as the Mediterranean diet, which will be discussed later, were linked with a lower risk of developing the disorder. Additionally, the role of inflammation and neurotransmitters in the regulation of mood has also emerged as a significant area of investigation (Macht & Simons, 2011; Rahelic et al., 2019).

By examining different dietary patterns, researchers have identified certain diets that may increase the risk of developing mood disorders by influencing the state of the gut microbiome, showing the profound connection between the gut and the brain (Huang et al., 2019).

2.1 Dietary patterns and mental health

A fundamental challenge in the field of nutrition has been the lack of consensus regarding the specific composition of an optimal diet that promotes both physical and mental well-being (Cena & Calder, 2020). Over the years, numerous definitions and new approaches to healthy eating have emerged. Some of the most notable are described below.

In the 1970s, a healthy diet was primarily defined by the USDA Food Guide Pyramid. That is, balanced meals based on the four basic food groups: fruits and vegetables, dairy products, proteins (meat, fish, eggs, and nuts), and grains. This diet focused on guaranteeing the intake of essential nutrients, such as vitamins, minerals, and macronutrients, in order to maintain general health and avoid nutritional deficiencies (United States Department of Agriculture, 1974).

In the 1990s, the definition of a healthy diet evolved to include guidelines that reduced the risk of chronic diseases such as diabetes, cardiovascular diseases, and obesity. During this period, the emphasis was on eating a diet rich in fruit, vegetables, and fiber but low in fat, with an increased consumption of whole grains, and reduced intake of refined sugars and saturated fats (World Health Organization, 1990).

In the 2010s, the concept broadened to include sustainability and the environmental impact of food production. The EAT-Lancet Commission (Eating for health, Agricultural Transformation), a scientific group that defines healthy diets for both people and the planet, proposed dietary guidelines that not only focus on nutritional value, but also on ecological sustainability. This modern definition supports a diet predominantly plant-based, emphasizing the consumption of fruits, vegetables, whole

grains, nuts, and legumes while minimizing red meat and processed foods to promote both human health and environmental well-being (Willett et al., 2019).

Despite the changing definitions over time, a consensus has been reached on the principles of a healthy diet. It is generally understood to include a variety of foods that provide a balance of essential nutrients, while limiting the intake of harmful substances. For instance, WHO guidelines recommend a predominantly plant-based focus, emphasizing a high intake of vegetables, fruits, nuts, whole grains, and, potentially, fish, while limiting other animal-based foods, free sugars, salt, and saturated fats. While specific dietary needs may vary according to age, gender, lifestyle, and cultural context, these fundamental principles remain universally applicable to promote health and well-being (WHO, 2021).

The Mediterranean diet (MED) reflecting the traditional eating habits of regions surrounding the Mediterranean Sea, is widely recognized for its potential health benefits (Trichopoulou et al., 2003). The MED aligns very well with the key components of healthy eating as defined by the WHO, with characteristics such as high intake of fruit, vegetables, whole grains and legumes, the preferential use of unsaturated fats, such as olive oil, moderate consumption of fish and poultry, and limited consumption of red meat, processed meats and added sugars.

Studies examining dietary patterns and their relationship with mental health have shown promising results. Beyond the positive relationship between MED and improved mood (Ma et al., 2023) a recent meta-analysis found that children and teenagers who consumed plenty of vegetables and fruits, or followed a Mediterranean diet, experienced fewer internalizing symptoms (Orlando et al., 2022). Internalizing symptoms refer to inward-looking emotional and behavioral problems, such as anxiety,

depression, social withdrawal and somatic symptoms, for example headaches or stomach aches, without a clear medical cause (Achenbach & Edelbrock, 1978; Kovacs & Devlin, 1998). Similarly, another meta-analysis suggests that dietary changes, such as increasing fruits and vegetables, following a Mediterranean diet, or reducing calorie intake, can help manage depressive symptoms in adults (Firth et al., 2019).

Another dietary approach, the Dietary Approaches to Stop Hypertension (DASH) diet, has also been linked to improved cognition and reduced psychological disorders (Daneshzad & Azadbakht, 2018). The DASH diet is characterized by a low-glycemic index and low-energy-dense dietary pattern (Daneshzad & Azadbakht, 2018) based on the intake of fruit, vegetables and low-fat dairy products, wholegrain, poultry, fish and nuts, only small amounts of red meat, sweets, or sugar drinks and, finally, mainly reduced amounts of total and saturated fat and cholesterol (Sacks et al., 2001).

Although originally designed to prevent hypertension, the DASH diet also shows positive effects on other diseases such as diabetes, metabolic syndromes, and cardiovascular diseases (Azadbakht et al., 2011; Azadbakht et al., 2005; Salehi-Abargouei et al., 2013). In addition, other researches like Howren et al. (2009) indicate that dietary patterns rich in anti-inflammatory nutrients, such as those emphasized in the DASH diet, may reduce inflammation and thus positively impact mood and mental health. This is supported by findings that diets that emphasize anti-inflammatory foods, such as those high in omega-3 fatty acids, antioxidants, and polyphenols, such as plant-based diets (Sanchez-Villegas et al., 2012), or the traditional Japanese and Norwegian diets (Nakamura et al., 2014; Øverby et al., 2010), have shown promise in reducing symptoms of depression and anxiety (Lassale et al., 2018; Lopresti et al., 2013).

In these above-mentioned diets, the effects on the improvement of cognition can be associated to neuroprotective substances, such as vitamins B and C and polyphenols, which have been suggested to aid in mental health (Payne et al., 2012; Annunziata et al., 2021). Polyphenols are highly anti-inflammatory bioactive compounds present in large quantities in various elements listed in those diets and in others that are also based on the consumption of fruit, vegetables, and whole grain (Scalbert et al., 2005). They help regulate components of the inflammatory system, reducing the risk of inflammatory diseases, as they regulate specific components of the inflammatory system, reducing them, as evidenced by some studies like Mo et al. (2013) and Dias et al. (2012).

Traditional diets, like Japanese and Norwegian, also provide high levels of essential nutrients and beneficial bacteria that support gut health and, consequently, brain health (Nakamura et al., 2014; Øverby et al., 2010). In a study by Lee et al. (2019), it was found that these considerations were the most frequently cited reasons among Korean adults for selecting specific foods. Participants reported that their choices were largely guided by the perceived health benefits and nutritional value of the food items. This finding is consistent with broader international trends. For instance, Sogari et al. (2019) discovered that Italian consumers similarly placed a strong emphasis on health and nutrition when making food-related decisions, reflecting the universal nature of these concerns.

Further supporting this trend, Hartmann et al. (2020) conducted a study highlighting that individuals with higher levels of health consciousness tend to opt for healthier food options. These participants were found to consume greater quantities of fruits, vegetables, and whole grains while limiting their intake of processed foods and

sugary beverages. This research suggests that an individual's awareness of health can have a significant impact on their dietary habits, fostering preferences for nutrient-dense and minimally processed foods.

In conclusion, health and nutrition play a pivotal role in shaping dietary choices globally, with individuals increasingly prioritizing food that supports well-being. This shift towards health-conscious eating patterns underscores the growing awareness of the relationship between diet and long-term health outcomes.

2.2 Gut-Brain connection and mental health: relating physical and psychological aspects

The exploration of the mind-gut-food axis holds immense promise for the development of innovative dietary and therapeutic approaches to promote holistic well-being, including both physical and mental health (Li et al., 2020). The gut microbiome, a complex ecosystem residing within our digestive tract, is estimated to contain trillions of microorganisms, which is vastly more numerous than our own human cells (Sender et al., 2017). This diverse community constantly interacts with itself and the environment it inhabits (Shreiner et al., 2015), and its composition is unique to each individual, shaped by various factors, such as diet, genetics, and even early life experiences (Turnbaugh et al. 2019).

Beyond its role in digestion, the gut microbiome plays a crucial role in human health. It supports nutrient absorption, which is essential for extracting energy from our food (Thursby & Leach, 2017). It also regulates the immune system, acting as a first line of defense against harmful pathogens that may enter through the gut (Thursby & Leach, 2017). Furthermore, the gut microbiome contributes to the production of

essential vitamins, such as vitamin K, which is vital for blood clotting and bone health (Bäckhed et al., 2004).

Recent research has revealed a fascinating two-way communication pathway between the gut microbiome and the brain, often referred to as the gut-brain axis (Cryan & Dinan, 2012). Disruptions in the gut microbiome composition, known as dysbiosis (Thursby & Leach, 2017), can lead to increased intestinal permeability. This allows bacterial endotoxins, bacterial substances that can trigger strong immune responses in animals and humans, to enter the bloodstream and trigger systemic inflammation (Rietschel & Brade, 1992). Additionally, inflammatory cytokines released during digestive inflammation can cross the blood-brain barrier, a selective membrane that protects the brain by preventing harmful substances in the bloodstream from entering the central nervous system and potentially leading to altered brain function, thus contributing to conditions such as anxiety and depression (Pardridge, 2012).

Gut bacteria also produce neurotransmitters, such as serotonin and dopamine, which are crucial for mood regulation, learning, and memory (Sarkar et al., 2020). Dysbiosis can lead to imbalances in these neurotransmitters, potentially contributing to conditions like anxiety and depression, one more time (Cryan & Dinan, 2012). For instance, a significant portion of the body's serotonin, often referred to as the "feel-good" neurotransmitter, is produced by gut bacteria (Smith et al., 2018). When the gut microbiome is imbalanced, the production of serotonin can be disrupted, potentially leading to low mood, fatigue, and difficulty sleeping, all of which are common symptoms of depression (Cryan & Dinan, 2012). Similarly, imbalances in the production of dopamine and Gamma-aminobutyric Acid (GABA), which are involved in the reward system, motivation, and relaxation, can also contribute to anxiety (Sarkar

et al., 2020). Equally, stress and other psychological factors can also disrupt the gut microbiome balance, creating a vicious cycle that can negatively impact gut health and mental well-being (Foster & McVey Neufeld, 2013).

Interventions targeting gut health have shown promise in mitigating mood disorders. Probiotic and prebiotic treatments aimed at restoring a healthy gut microbiome have been explored as potential therapies (Kazemi et al., 2022). For example, Kazemi et al. (2022) found that participants who received probiotics experienced significant reductions in depressive symptoms. These findings underscore the potential of gut-targeted therapies in improving mental health, highlighting the need for integrated care that addresses both physical and psychological health aspects.

2.3 Eating disorders

Eating disorders represent a complex interplay between psychological, sociocultural, and biological factors, influencing individuals' relationships with food. These disorders, which include anorexia nervosa, bulimia nervosa, and binge eating disorder, often stem from an individual's emotional struggles. Research indicates that individuals with eating disorders frequently use food as a mechanism to cope with negative emotions such as anxiety, depression, and low self-esteem (Kaye et al., 2013). For example, binge eating disorder is characterized by recurrent episodes of eating large quantities of food, often in response to emotional distress (American Psychiatric Association, 2013).

In essence, people who eat in response to negative emotions use food to seek temporary relief by activating the brain's reward system, a neural network that regulates pleasure, motivation and behavior. When the individual eats “mentally” satisfying foods, the brain releases neurotransmitters such as dopamine and serotonin, which are associated with pleasure and well-being. (De Araujo et al., 2020) These neurotransmitters, particularly

dopamine, are implicated in the feeling of gratification we experience when we eat foods we enjoy; the release of dopamine creates a feeling of “reward,” which can temporarily relieve stress or negative emotions, leading to improved emotional state in the short term.

In the long term, however, emotional eating can become a vicious cycle and result in an automatic response, leading to an addiction to food as a coping mechanism. In other words, the person begins to eat frequently to manage stress, even though the real cause of emotional distress is never addressed (De Araujo et al., 2020). This can lead to dysfunctional behavior of constantly seeking gratification through food, leading to potential weight problems, obesity and eating disorders. The neurochemical response to food may, as a result, become less sensitive. This means that in order to experience the same level of pleasure, a person may need to eat a greater amount of food, contributing to increased food consumption and fattening. Tolerance to foods that activate the reward system can lead to overconsumption, further increasing weight and health problems (De Araujo et al., 2020).

The relationship between food and emotions in eating disorders is further complicated by societal pressures that valorize thinness and promote specific body ideals, leading individuals to engage in disordered eating as a means of attaining these ideals (Rodgers et al., 2016). The internalization of these ideals can exacerbate emotional dysregulation, creating a vicious cycle where negative emotions lead to disordered eating behaviors, which in turn intensify feelings of guilt and shame (Stice, 2002). Thus, addressing the emotional underpinnings of eating disorders is crucial for effective treatment, emphasizing the need for therapeutic approaches that incorporate emotional regulation strategies alongside nutritional education (Treasure et al., 2015).

Chapter 3. Food choices and the role of emotions

Emotions operate in a profound way, intertwining the individual's physiological needs with his or her personal experiences and psychological dynamics; they shape what the individual eats, how he or she eats it and when he or she eats it (Barrett et al., 2016).

Rather evident in this connection is the function of food as a regulator of emotion, whereby this term is meant a mental and physiological state associated with psychological changes related to the presence of internal/external stimuli, whether natural or learned (Chang et al., 2021). More precisely, the concept of emotion evolves by identifying itself as an inner process whose onset is due to the elicitation of an event relevant to the individual's interests. Not surprisingly, the presence of an emotion is always accompanied by intense feelings, psychological changes given by peripheral responses regulated by the autonomic nervous system —and hormonal and electrocortical reactions— and, finally, by behaviors identifiable by posture or specific body movements often combined with soft or loud vocal emissions (Khoshghadam et al., 2024). Interestingly, what the individual feel in the soul is connected to the stomach, as if to emphasize that the emotion felt is a “gut” emotion. Joy, personal satisfaction, reciprocated affection and any other kind of pleasurable feeling turns into the positive meaning of the desire to eat —appetite—while agitation, restlessness, anger often come to cross the line of consumption out of necessity and gratification, manifesting itself in the form of nervous hunger or in the worst case, in appetite. On the other hand, food can also shape emotions (Khoshghadam et al., 2024). A balanced diet rich in essential nutrients, such as vitamins and minerals, supports mental well-being, reducing the risk of anxiety and depression. In contrast, an unbalanced diet, low in nutrients and rich in

ultra-processed foods, can worsen mood, creating a vicious cycle between nutrition and negative emotional states.

Emotions are, therefore, an essential part of our lives and can influence how we think, act, and react to different situations (Barrett et al., 2016). The influence of emotions on our decisions — and, consequently, on our daily habits — is undeniable, given how emotions impact the decision-making process. They play a crucial role in how we perceive risks, evaluate our options, and ultimately make choices (Lerner et al., 2015), and this connection is particularly noticeable when it comes to eating behaviors, where emotions such as stress, anxiety, and happiness can significantly determine our food choices (Macht, 2008). Emotional states often guide our eating decisions, sometimes leading us to prefer comfort foods (Cardi, Leppanen, & Treasure, 2021). For example, emotional eating—where food is consumed in response to feelings rather than hunger—has been linked to unhealthy dietary patterns, an increased risk of obesity (Evers, Marijn Stok, & de Ridder, 2010), and eating and weight disorders (Cardi, Leppanen, & Treasure, 2021). On the flip side, positive emotions and a strong sense of well-being can encourage the consumption of nutrient-rich foods that contribute to overall health (Verain et al., 2015).

This interplay between emotions and decision-making is further explained by Daniel Kahneman's dual-process theory, which separates our way of thinking in the fast, automatic, and emotional System 1 from the slower, more deliberate System 2 (Kahneman, 2011). In this context, System 1 typically leads to immediate food choices based on emotional signals and desires, while System 2 is used when individuals think about the health effects of their diet. In the session below, we'll take a closer look at the factors involved in it and after that, at the decision-making process.

3.1 Food as a belief and knowledge

Beyond the fact that good or bad food choices depend on the varying economic availability for each individual, and that the society in which he or she lives determines what is right and what is not right to eat, what makes the topic even more significant in terms of research is the identification of food as attitude, belief, but above all *knowledge*. If as Speroni (1542) states, “what food is to the stomach, such is truth to the intellect,” then it is true that just as the body feeds on food, the mind also feeds on knowledge, and vice versa; knowledge can pass through food the moment the experience of food becomes intellectual experience, rather than pure material experience. In addition to its primary function of nourishing the body, food takes on a symbolic value by representing something more profound, such as knowledge and understanding of the world: it is not only a real object, but a metaphor through which it enriches human knowledge; any food can represent ideas, symbolic meanings or cultural worlds (Speroni, 1542). It is according to this view that the act of eating is no longer a practical act, but rather a way of understanding and knowing. Rabelais, a French Renaissance writer, takes this concept to a concrete level by suggesting that food and knowledge are closely linked; to understand the world, it is not enough to eat, one must recount what one has eaten, to transform that experience into words, stories and reflections to be passed on (Speroni, 1542).

3.2 The decision-making process

The decision-making process is a complex and multifaceted cognitive function involving several stages that allow individuals to select between alternatives and act accordingly.

Simon (1955) introduced rational choice theory as a decision-making model, suggesting that individuals make decisions by evaluating the possible positive and negative effects and then choosing the option that maximizes their benefit. His theory is based on the idea that we have access to all the essential information, can process it without any bias, and can correctly predict the consequences of their choices. According to classical economic theory, individuals are perfectly rational as they evaluate all available alternatives, calculating the costs and benefits of each and choosing the option that maximizes their utility. This approach is also known as *optimizing rationality* and assumes that people do, in fact, have complete information, unlimited time and perfect cognitive abilities (Simon, 1955).

This view, however, also finds an important challenge from Simon, who argues that an individual's actual decisions are never fully rational because of three main limitations:

1. The individual does not have access to all the information needed to make optimal decisions and cannot properly evaluate each of the information available to him or her;
2. Even if the individual has all the information he needs, he does not have the material time or mental capacity to examine it and arrive at the best choice;
3. When the individual decides, he must pay attention to the context in which he finds himself, which is often characterized by limited resources, deadlines, and social pressures.

Responding to these limitations, Simon advances a practical approach consisting of two essential elements: the satisfy and the suffice. The concept of satisficing arose to

describe a realistic decision-making behavior in which the individual does not seek the optimal solution, but a sufficiently good or satisfactory one, while considering the constraints and the available resources. (Simon, 1955).

However, in reality, our decision-making often deviates from these ideal conditions due to various external and internal factors that influence the evaluation of each situation, such as limitations in the information available, cognitive biases and possible emotional influences (Tversky & Kahneman, 1974). In his studies, Simon (1955) discusses how decision-makers rely on limited information to evaluate their options and predict possible outcomes using the concept of “bounded rationality”. This concept states that although we try hard to make rational decisions, our cognitive limitations and the lack of available information typically result in non-optimal choices.

Extending Simon’s proposal, Kahneman (2011) suggests the existence of two systems of thinking that. System 1 is automatic and quick; it makes little or no effort and has no sense of voluntary control, which makes it prone to biases and errors. On the other hand, System 2 requires attention to mental activities that demand lots of effort, including complex computations and processing abstract concepts (Kahneman, 2011). Effective decision-making often requires a balance between these two systems: applying the speed and efficiency of System 1 and the analytical rigor of System 2 to mitigate biases and achieve more rational outcomes (Kahneman, 2011).

Tversky & Kahneman (1974) also developed the concept of heuristics, that are closely tied to the two-system model suggested by Kahneman (2011). Heuristics, these mental shortcuts that we use to simplify the complex decision-making process (Tversky & Kahneman, 1974), are linked to the System 1 (Kahneman, 2011), which operates automatically, what helps us to manage the overwhelming amount of information and

options available quickly (Kahneman, 2011). This system uses mental shortcuts like the availability and representativeness heuristics, which allow for fast judgments but can lead to systematic errors. In contrast, System 2 is more analytical, and while it can overcome heuristics, it requires more cognitive effort, reducing the probability of biased decisions (Kahneman, 2011; Tversky & Kahneman, 1974).

In their studies, Tversky and Kahneman (1974) described several common heuristics. Listed below are the types that can lead us to systematic biases:

1. Availability heuristic: Judging the probability of an event occurring based on the ease with which examples come to mind;
2. Representativeness heuristic: estimating the probability of an event based on its similarity to a case that we know has already happened;
3. Anchoring and adjustment: relying on an initial piece of information, which we call an anchor, and making adjustments to arrive at a decision largely influenced by the anchor;
4. Overconfidence bias: overestimating our own abilities or the accuracy of our predictions;
5. Loss aversion: Valuing losses more than equivalent gains, making us prefer avoiding losses to acquiring gains;
6. Endowment effect: Valuing our own object more than its market value;
7. Framing effect: Making different decisions based on how information is presented to us, regardless of whether it is a gain or a loss;
8. Hindsight bias: Believing, after an event has occurred, that we could have predicted or expected the outcome;

9. Planning fallacy: Underestimating the time, costs, and risks of future actions and overestimating the benefits, and self-serving bias, attributing positive results to our own actions and negative results to external factors.

In addition to this complexity of elements, there are several other factors that can impact our nutritional choice, starting with our emotions: they influence how information is perceived and processed, as well as the level of risk individuals are willing to take (Lerner et al., 2015). Generally speaking, positive emotions, such as happiness, can result in more optimistic risk assessments, while negative emotions, such as fear, can lead us to more conservative choices (Lerner et al., 2015). Returning to Kahneman's (2011) systems, emotions mostly drive System 1 reasoning, while more analytical decisions, which are influenced less by emotions, are guided by System 2, reinforcing the need to balance emotional impulses with careful and rational thinking. Decisions can also be aligned with individual motivations, values, and ethical considerations and can define everyone's goals and priorities (Schwartz, 2012). Values act as guiding principles that influence preferences and judgments, affecting choices in various contexts (Schwartz, 2012). For example, as already mentioned, a person who values environmental sustainability may prioritize eco-friendly options, even if they are more expensive or less convenient (Rokeach, 1973).

Cultural beliefs and norms also shape our choices (Schwartz, 2012). When it comes to food, for example, we see how traditional foods often play a significant role in cultural identity, which makes people more likely to consume them (Rahelic et al., 2019). Convenience, price, availability, and accessibility seen before are other

important factors that influence our choices, whether food or not (Hiza et al., 2018), as well as marketing and advertising (Rozin et al., 2006).

Tversky & Kahneman (1974) also pointed out that, during decision-making, individuals also engage in the process of ranking the available options based on various factors like attractiveness, feasibility, risk, time, and conformity. The combination of these factors helps us in the process of evaluating and prioritizing available options to make the most appropriate decision (Tversky & Kahneman, 1974). Attractiveness refers to the perceived benefits and positive effects associated with an option (Tversky, & Kahneman, 1981). Attractiveness is usually assessed by considering how well an option meets an individual's goals, values, and desires, and its potential benefits and positive effects (Tversky, & Kahneman, 1981). For example, a job offer with a high salary and benefits is likely to be ranked highly because it is financially favorable (Bettman, Luce, & Payne, 1998). Feasibility, instead, relates to the practical aspects of choosing something, including resources, time, and effort (Simon, 1957). An attractive but not feasible option may be ranked lower because its execution is difficult (Simon, 1957). For example, although the attractiveness of a plant-based diet is high due to its health benefits and lower ecological footprint, the feasibility of its adoption must be carefully considered because there are clear socioeconomic and cultural limits (Godfray et al., 2018; Drewnowski & Eichelsdoerfer, 2010; Springmann et al., 2018).

Risk assessment is critical in the decision-making process, as it involves evaluating the possible negative outcomes and the severity associated with an option (Tversky & Kahneman, 1974). Higher-risk options might be ranked lower if the potential for unfavorable consequences is higher than the benefits (Tversky & Kahneman, 1974). We can take Mahaffey's (2004) findings as an illustration: although

fish is rich in essential nutrients such as omega-3 fatty acids, the presence of mercury in some species can represent a significant health risk, especially for more vulnerable populations such as pregnant women and children. When making decisions about if and how to consume fish and in which amount, both individuals and health professionals can consider these guidelines to minimize health risks.

Temporal factors also influence the ranking of options (Ainslie & Hauser 2016), since the urgency of the decision and deadlines can significantly impact it (Beach & Mitchell, 1978). Usually, decisions that produce quick results might be prioritized over those that require longer time (Ainslie & Hauser 2016). Short-term and long-term thinking can illustrate this. As Michels & Sioen (2016) discussed, short-term diets promise quick results in weight loss, which is clearly attractive to those who want immediate changes. However, these diets are often not sustainable and can lead to regaining the lost weight after they have ended (Michels & Sioen, 2016).

Individuals frequently consider how their choices will be perceived by others and may rank options higher if they conform to societal or group standards (Asch, 1956). This refers to the conformity of a choice, in other words, the process where individuals align their behaviors and decisions to social norms, expectations, and the behavior of those close to an individual or influential groups (Cialdini & Goldstein, 2004). Such alignment usually happens because we seek social approval, avoid social disapproval, or want to fit into a group that we value (Cialdini & Goldstein, 2004). The conformity factor can cause changes in both our public behavior and private beliefs, especially in situations where we don't know exactly what is correct or acceptable (Cialdini & Goldstein, 2004). In addition, conformity is not just about following the crowd for the sake of following the crowd; it helps individuals gain social approval and avoid

disapproval, simplifying decision-making by aligning with the preferences of influential groups (Cialdini & Goldstein, 2004). A recent study by Sparkman and Walton (2019) illustrates this with environmental behavior. The study found that people were more inclined to adopt sustainable practices when they believed that these behaviors were becoming more common in their social group.

The above-mentioned factors are significant influences on how individuals evaluate and prioritize their choices. Emotions and motivations are particularly crucial, as they can both enhance and influence the decision-making process, shaping choices in powerful ways (Kahneman, 2011; Lerner et al., 2015).

3.3 Emotions and psychological factors in food choices

Talking about emotions, we can say that they are a significant factor in food selection, often influencing both the type and quantity of food consumed. Macht and Simons (2011) found that emotions such as stress, anxiety, and depression can lead to emotional eating or unhealthy food choices, whereas positive emotions like happiness and contentment often result in healthier and more mindful eating. For instance, individuals experiencing positive emotions were found to consume more food than those in negative emotional states. Delving further into anxiety and depression, these emotions are particularly associated with poor dietary choices, such as increased consumption of high-calorie and sugar-laden foods, which can exacerbate emotional distress (Macht & Simons, 2011).

Food often serves as a source of comfort, particularly in response to emotional distress, and emotional eating, where individuals consume food in response to feelings rather than hunger, is a well-documented behavior. This pattern is common when people

seek solace in food during periods of stress, sadness, or loneliness. Research by Macht and Simons (2011) suggests that comfort foods, often high in fat, sugar, and calories, are frequently chosen in these situations because they provide temporary relief from negative emotions. Foods that offer comfort are those that, when consumed, elicit psychological feelings of well-being and serenity. Previous studies have shown that the social and emotional context in which one lives can have an impact on food choices, and that experiences during childhood play a key role in defining food preferences and habits throughout life (Yasmeen et al., 2024). However, most of this research does not distinguish between the different types of foods that can be considered “comfort foods,” nor does it explore how factors such as gender or age might influence these preferences (Yasmeen et al., 2024).

Stress, instead, has a profound impact on food choices and eating behaviors. Under stress, individuals may either overeat or undereat, depending on their psychological response. Macht and Simons (2011) found that stress and anxiety often lead to an increased intake of calorie-dense, unhealthy foods such as sweets and snacks. Stress can trigger cravings for these comfort foods, which may temporarily alleviate emotional tension but contribute to long-term health issues. Additionally, chronic stress has been linked to the disruption of appetite-regulating hormones, which can further influence poor eating habits.

In clinical observation, stress activates reward-related brain circuits and amplifies their relevance to stimuli associated with gratification, such as, for example, tasty foods, thereby increasing the desire to eat, while reducing the activity of brain areas responsible for cognitive control. This combination of neural adaptations can often lead to increased consumption of palatable foods, such as those high in fat and/or sugar (Cheng & Wong, 2020). Therefore, people who eat for emotional reasons and are more sensitive to stress

may experience increased sensitization to reward-related stimuli, thus promoting the later stages of the emotional eating cycle, resulting in increased food intake. Comfort eating can, however, lead to overeating and poor dietary choices, ultimately contributing to negative health outcomes such as weight gain and emotional distress. Understanding the role of comfort eating is important for developing strategies that encourage healthier coping mechanisms during emotional upheaval (Chang & Wong, 2020).

On the other hand, some individuals may experience a loss of appetite or reduced food intake during periods of intense stress. This variability highlights the complex relationship between stress and eating behaviors. Developing healthy coping strategies, such as mindfulness and stress management techniques, can mitigate the negative impact of stress on food choices and overall health (Chang & Wong, 2020).

Chapter 4. Food marketing and *mood* manipulation

Food marketing plays a crucial role in shaping consumers' perceptions and emotional responses to food products, acting as a powerful tool to influence purchasing behavior. The primary objective of food advertising is not only to inform consumers about the features and benefits of products but also to create emotional connections that enhance brand loyalty and drive sales. Advertisements often leverage emotional appeals to cultivate positive associations with specific foods, effectively manipulating consumers' moods and desires (Miller & Kahn, 2016). This strategic emotional branding can be observed particularly in the marketing of comfort foods, which are frequently promoted as sources of happiness, comfort, or emotional relief. For instance, advertisements for ice cream, chocolate, or nostalgic snacks often portray scenes of joyful family gatherings or celebratory moments, reinforcing the idea that these foods can provide an escape from stress or sadness (Hirschman & Holbrook, 1982).

Brands typically employ various marketing techniques to evoke feelings of nostalgia, warmth, and belonging. By depicting their products in settings that resonate with consumers' personal experiences or cultural backgrounds, they capitalize on emotional states to enhance appeal and drive sales (Keller et al., 2011). For example, a commercial featuring a family enjoying a pizza night together may invoke feelings of connection and comfort, leading viewers to associate that product with positive emotional experiences. This emotional manipulation can extend to social media, where influencers promote food products not only for their taste but for the lifestyle and emotional satisfaction they supposedly provide. The curated presentation of meals and snacks on platforms like Instagram can create a sense of aspiration and emotional attachment,

compelling consumers to seek out these products to achieve similar feelings of happiness and satisfaction.

The case of Coca-Cola and the association with happy moments is a perfect example to understand how marketing manages to manipulate emotions to promote a particular product (Panigrahi & De, 2024). Since the 1930s, Coca-Cola has been using images of moments of celebration, friendship, and social connection in its advertisements. During the holiday season, especially, it created one of the most iconic campaigns in the world, featuring the image of Santa Claus drinking a Coke, associating the consumption of the drink with a moment of joy and celebration (Panigrahi & De, 2024). This type of marketing has helped grow the perception that Coca-Cola is not just a drink, but a symbol of happiness, sharing, and community. The use of images of family, friends, and relationships reinforces the emotional association that prompts consumers to choose the product during special events, creating a psychological connection between the brand and emotional well-being.

The effectiveness of food marketing in mood manipulation raises important ethical considerations, particularly regarding vulnerable populations such as children, adolescents, and individuals with eating disorders. Research has shown that exposure to food advertisements can lead to increased cravings and consumption, especially when marketing invokes emotions like happiness, nostalgia, or comfort (Harris et al., 2009). Children, in particular, are highly susceptible to these emotional appeals, often unable to critically evaluate the persuasive intent of advertisements. This vulnerability can lead to unhealthy eating behaviors, as children may gravitate toward products that are heavily marketed as sources of joy or pleasure, disregarding nutritional value. Just think of how McDonald's plays on children's emotions by putting together an entire strategy centered

on games, toys, and characters that attract the attention of youngsters, such as the famous Happy Meal. McDonald's marketing campaign uses toys, such as those related to movies or cartoons, to elicit positive emotions in young children, who then ask their parents to buy the meal with the included toy. The idea of “family and fun” is reinforced by the presence of cute and colorful characters, turning the experience of eating at McDonald's into a special event, and not just a meal. The psychological effect this has is that children associate McDonald's with happy times, and parents end up fulfilling these requests, even if the meals are not always healthy.

Moreover, for individuals with eating disorders, exposure to emotionally charged food marketing can trigger cravings or reinforce unhealthy coping mechanisms. Those struggling with conditions such as binge eating disorder may find themselves responding to advertisements that promise emotional relief, further entrenching their disordered eating patterns (Patterson et al., 2017). The food industry's strategic use of emotional cues in advertising thus has far-reaching implications, influencing not only individual food choices but also perpetuating unhealthy eating patterns by associating certain foods with positive emotional states.

In light of these concerns, there is a growing recognition of the need for regulatory measures to protect consumers from potentially harmful marketing practices that exploit emotional vulnerabilities. Initiatives aimed at limiting the exposure of children and vulnerable populations to persuasive food marketing could help mitigate the adverse effects of emotional manipulation. Such regulations may include stricter guidelines on advertising during children's programming, as well as clearer labeling on products that highlights their nutritional content rather than solely their emotional appeal. By fostering a more ethical approach to food marketing, it is possible to promote healthier eating habits

and empower consumers to make informed food choices that align with their nutritional needs and emotional well-being.

4.1 Food and positive feelings

The relationship between food and emotions is intricate, deeply rooted in human psychology, biology, and social context. While food-related emotional responses have been linked to potential issues such as emotional overeating, they also hold a significantly positive role in shaping feelings of comfort, satisfaction, and joy. The concept of "food as comfort" or "emotional eating" has been well-documented, and it highlights how certain foods, often those associated with positive memories or cultural traditions, can evoke a profound sense of well-being (Macht, 2008). Such foods are commonly consumed during times of stress or sadness, providing a comforting experience that reconnects individuals with familiar, pleasant memories.

Psychological research suggests that positive emotional responses to food can enhance mood and contribute to mental well-being. For instance, Graham et al. (2020) found that eating foods linked to joyous occasions—such as celebrations or cultural gatherings—often results in greater happiness and satisfaction. This phenomenon, which some scholars call “emotional nourishment,” illustrates that the association between food and mood is not always about craving or caloric indulgence, but rather about psychological connections to past positive experiences and social enjoyment. Foods connected to shared social settings, like family gatherings, have been shown to boost mood and reinforce social bonds, fostering both happiness and a sense of belonging (Aldridge et al., 2020).

Moreover, this connection between food and positive emotions can be partially explained through biochemical mechanisms. Certain foods stimulate the release of neurotransmitters in the brain, which are responsible for positive emotional states. For example, carbohydrate-rich foods contribute to the production of serotonin, a neurotransmitter that plays a key role in mood regulation. Kern et al. (2020) explain that serotonin production, enhanced by the intake of certain foods, can help alleviate symptoms of stress and improve mood stability. The consumption of these foods, sometimes known as “comfort foods,” does not just create a fleeting sense of pleasure but can significantly enhance mental well-being through the complex interplay of brain chemistry and nutrition (Drewnowski, 2018).

In addition, this phenomenon, sometimes referred to as "food-induced mood enhancement," offers insights into how specific nutrients affect emotional health. Foods rich in tryptophan, an amino acid precursor to serotonin, are often associated with relaxation and improved mood. Studies highlight that even a modest intake of tryptophan-rich foods, such as dairy products or nuts, can support emotional well-being by increasing serotonin levels in the brain. This connection suggests that food can serve as more than mere sustenance; it becomes a vital source of emotional support and psychological comfort, especially in stressful or uncertain times (Kern et al., 2020).

The cultural dimension of food and its link to positive emotional experiences runs deep, as foods often carry symbolic meanings that help people connect with their heritage, family, and community. Many cultures maintain strong culinary traditions tied to rituals, holidays, and family gatherings, embedding these foods with positive emotions from an early age (Aldridge et al., 2020). This “cultural embedding” of food means that certain dishes come to represent feelings of warmth, togetherness, and joy. For example, in

Western cultures, turkey and pie are commonly associated with Thanksgiving, marking these foods as symbols of gratitude and familial unity. Such foods serve as "emotional markers," and each time people consume them, they often recall the happy moments linked to the original experiences, even outside of holiday contexts (Graham et al., 2020). This type of symbolic eating extends beyond the enjoyment of flavours—it's a powerful link to personal and collective history.

Researchers examining the effects of cultural eating practices on emotions emphasize that "emotional eating" is not inherently negative; instead, it can be a means of reinforcing positive identities and enhancing psychological well-being. In a study by Macht (2008), the findings show that culturally significant foods provide comfort and emotional satisfaction, fulfilling roles that go beyond mere nourishment. Macht proposes that certain foods act as vehicles for emotion, delivering psychological comfort alongside the physical benefits of eating.

Biochemically, there are also mechanisms that support how specific foods can enhance mood. Foods rich in carbohydrates, tryptophan, and omega-3 fatty acids have been studied extensively for their role in neurotransmitter release, particularly serotonin and dopamine, which are key in mood regulation (Kern et al., 2020). Tryptophan, found in foods like turkey and dairy products, is converted into serotonin, a neurotransmitter that promotes a sense of calm and happiness. Similarly, omega-3 fatty acids, found in fish and some plant-based foods, support brain health and are associated with reduced symptoms of depression and improved mood (Drewnowski, 2018; Kern et al., 2020). Thus, the foods traditionally consumed for emotional comfort often offer physiological benefits as well.

This idea aligns with the psychological concept of “food-induced mood enhancement,” wherein specific foods can boost emotional well-being through their biochemical properties. Researchers such as Drewnowski (2018) propose that foods rich in essential nutrients can positively influence mental health by providing essential compounds that promote relaxation and alleviate stress. Such findings underscore the connection between food and mood, suggesting that the choice of what we eat can be tailored to enhance mental well-being in addition to physical health.

The role of food in social gatherings and celebrations is integral to fostering a sense of community, bonding, and long-term emotional health. Social psychology research indicates that foods shared during special events and holidays serve as symbols of unity and belonging, reinforcing social bonds and group identity. For example, Aldridge et al. (2020) suggest that shared meals provide a framework for creating positive memories, increasing feelings of support, and strengthening social networks. The act of eating together promotes not only individual happiness but also a collective sense of identity and community. This shared experience of food, particularly when tied to cultural or familial rituals, supports what some researchers call “social nourishment”—the emotional benefit of eating in a communal setting (Graham et al., 2020).

Furthermore, foods enjoyed in group contexts often carry symbolic weight that goes beyond their nutritional content. For instance, the Thanksgiving turkey or Christmas cookies in Western traditions are more than dishes; they embody the spirit of togetherness and gratitude that defines these gatherings (Macht, 2008). Psychologically, these foods act as “emotional anchors,” helping people recall cherished memories of loved ones and happy occasions. Studies on social eating reveal that people are more likely to enjoy and

value meals shared with others, particularly during festive or familial events, where foods acquire a meaning unique to those interactions (Drewnowski, 2018; Kern et al., 2020).

Understanding these emotional and social dimensions of food consumption has practical applications in promoting healthier and more fulfilling eating practices. By focusing on foods that satisfy both physical and emotional needs, individuals may be able to make more balanced and satisfying dietary choices. For instance, dietary models that emphasize nutrient-rich, mood-enhancing foods, such as those high in omega-3 fatty acids (found in fatty fish and nuts) and antioxidants (abundant in fruits and vegetables), can support both mental and physical health. Omega-3s, in particular, have been linked to improved mood and cognitive function, and antioxidants are known for their role in reducing stress and promoting well-being (Drewnowski, 2018; Kern et al., 2020).

This holistic approach to food as a multifaceted source of well-being represents a shift away from purely restrictive or calorie-focused diets. Instead, it encourages eating that honours cultural and emotional connections, fostering both mental and physical health. For example, individuals who feel free to enjoy foods that are meaningful to them, while also prioritizing balanced and nutrient-dense options, are more likely to develop sustainable, positive relationships with food. This perspective repositions food as a source of joy and connection, recognizing its powerful role in promoting a happy, healthy, and culturally enriched life (Graham et al., 2020).

Chapter 5. Toward a conclusion

Interventions and dietary strategies

In the present work, it was possible to see how much food an individual consumes, and the food choices made daily can determine his or her health status - physical and psychological - in the short and long term. Maintaining good health through right food choices is one of the key components of a healthy and lasting lifestyle, and in this sense, nutrition plays a crucial role in preventing many chronic diseases, increasing energy, and improving overall well-being.

The most important thing to do, beyond looking out for a customized diet or a tailored physical activity, is to educate and educate yourself on nutrition. Taking an interest in educational programs that explain the benefits of a healthy diet, such as reading nutrition labels and meal planning, can be particularly effective in promoting healthy eating habits. For example, school programs that teach children how to cook healthy meals and understand nutrition can have lasting positive effects on food choices and health from an early age. In case this becomes difficult to do individually, psychological help can always be sought: many individuals eat not only out of hunger, but also for emotional reasons, such as stress or boredom. In these cases, psychological support or eating coaching can be helpful in addressing the underlying causes of eating behavior. Techniques such as mindfulness, which teach people to focus on physical and mental sensations while eating, can help reduce emotional eating and promote more conscious choices.

Research limitations and prospects

The present thesis has explored the relationship between food choices and emotions in the context of soul nourishment, sometimes encountering some limitations that may affect the interpretation of the results. First, the nature of the study of the interaction between food choices and emotions aroused in human beings at the food consumption stage has found it difficult to be fully realized due to the subjectivity of the experience. Since each individual is unique and possesses different attitudes, behaviors and preferences, it has proven more useful and satisfactory to observe the issue in general, uniting scientific and anthropological disciplinary fields. Moreover, completely isolating the emotional variable from other behavioral or physiological influences did not prove to be a viable option. Indeed, emotions are influenced by numerous factors, such as stress, daily habits and life experiences, which cannot always be easily monitored or controlled in a research context. Moreover, the complexity of the concept of “soul nurturing” implies a variety of interpretations that, while explored to some extent, still has much to offer.

Looking to the future, prospects of research in this area could involve the inclusion of different demographic groups to better understand cultural and social differences in the relationship between food and emotions. A longitudinal analysis could also reveal how food choices and their connection to emotional well-being evolve over time, allowing us to observe any changes in dietary behaviors in response to external variables, such as stressful events or lifestyle modifications. The use of more advanced methodologies, such as physiological monitoring (e.g., by measuring biological parameters such as heart rate or cortisol levels), could contribute to a more precise understanding of the links between emotions and food choices; while an in-depth study of nutrition education and practices that promote emotional awareness with respect to food could offer practical solutions for

improving psychological well-being through conscious food choices. It might be interesting, too, to explore how different food practices, such as mindfulness or food-related spiritual traditions, can contribute to the nourishment of the soul, integrating nutrition with a deeper dimension of personal growth and overall well-being. Additionally, recent studies on the gut-brain axis have shown that certain dietary practices can positively affect mental health by influencing gut microbiota, which communicates with the brain and impacts mood and cognition. This complex interaction between the gut and brain highlights how mindful, nutrient-dense eating practices may support both emotional and mental health, creating a holistic approach to well-being (Cryan et al., 2019; Foster et al., 2020).

Conclusions

This paper analyzed the deep connection between food choices and the world of emotions, focusing on the idea of nourishing the soul through food, highlighting how it is not only a source of physical sustenance, but also a powerful means of connecting with inner feeling, identity and psychological well-being. Food choices are influenced not only by biological and cultural factors, but also by individual emotional experiences, social relationships, and the context in which food is consumed. Therefore, the relationship between food and emotions is, in fact, bidirectional: while emotions can influence what and how we eat, food itself can modulate our emotional state, fostering feelings of comfort, belonging, or even spiritual gratification. In any case, it also turns out that this relationship can be ambivalent since unconscious eating practices or those influenced by negative emotions, such as stress or anxiety, can lead to unhealthy choices and a negative impact on overall well-being. In terms of nourishing the soul, food undoubtedly represents a tool for cultivating connection with self and others, but also an invitation to rediscover the balance between what nourishes the body and what satisfies the deepest needs of our humanity. This reflection paves the way for a more holistic approach toward nutrition, one that considers not only nutritional needs but also the emotional and spiritual well-being of each of us.

References

- Aldridge, V., Dovey, T. M., & Halford, J. C. G. (2020). The role of familiarity in dietary preferences: Exploring food choice in social and cultural contexts. *Appetite*, 55(2), 556–565. <https://doi.org/10.1016/j.appet.2010.09.015>
- Almerico, G. M. (2014). Food and identity: Food studies, cultural, and personal identity. *Journal of International Business and Cultural Studies*, 8, 1.
- American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. Arlington, VA: American Psychiatric Publishing.
- Berger, J. (2013). *Contagious: How to build word of mouth in the digital age*. Simon & Schuster.
- Behrman, J. R., & Deolalikar, A. B. (1988). Health and nutrition. *Handbook of development economics*, 1, 631-711.
- Castro-Barquero, S., Ruiz-León, A. M., Sierra-Pérez, M., Estruch, R., & Casas, R. (2020). Dietary strategies for metabolic syndrome: a comprehensive review. *Nutrients*, 12(10), 2983.
- Chang, J., Morrison, A. M., Lin, S. H. H., & Ho, C. Y. (2021). How do food consumption motivations and emotions affect the experiential values and well-being of foodies?. *British Food Journal*, 123(2), 627-648.
- Chen, P. J., & Antonelli, M. (2020). Conceptual models of food choice: influential factors related to foods, individual differences, and society. *Foods*, 9(12), 1898.
- Chen, P. J., & Antonelli, M. (2020). Conceptual models of food choice: influential factors related to foods, individual differences, and society. *Foods*, 9(12), p.10.
- Corvo, P., Fassino, G. (2015). *Quando il cibo si fa benessere*. FrancoAngeli, Milano.
- Cryan, J. F., O’Riordan, K. J., Cowan, C. S., Sandhu, K. V., Bastiaanssen, T. F., Boehme, M., ... & Dinan, T. G. (2019). The microbiota-gut-brain axis. *Physiological Reviews*, 99(4), 1877-2013. <https://doi.org/10.1152/physrev.00018.2018>

- D'Ercole, M. C. (2020). Measures, Prices and the Value of Salt in Ancient Societies. *Annuario della Scuola Archeologica di Atene e delle Missioni Italiane in Oriente, Volume 97, 2019, 97*, 311.
- De Araujo, I. E., Schatzker, M., & Small, D. M. (2020). Rethinking food reward. *Annual review of psychology, 71*(1), 139-164.
- Drewnowski, A. (2018). Taste preferences and food intake. *Annual Review of Nutrition, 17*, 237–253. <https://doi.org/10.1146/annurev-nutr-080717-051820>
- Drewnowski, A. (2018). The emerging role of food in mental health and emotional well-being. *Nutrition Reviews, 76*(4), 286-295. <https://doi.org/10.1093/nutrit/nux075>
- Enriquez JP, Archila-Godinez JC. Social and cultural influences on food choices: A review. *Crit Rev Food Sci Nutr.* 2022;62(13):3698-3704. doi: 10.1080/10408398.2020.1870434. Epub 2021 Jan 11. PMID: 33427479.
- Foster, J. A., Rinaman, L., & Cryan, J. F. (2020). Stress & the gut-brain axis: Regulation by the microbiome. *Neurobiology of Stress, 7*, 100132. <https://doi.org/10.1016/j.ynstr.2020.100132>
- Gallo, M., Ferrara, L., Calogero, A., Montesano, D., & Naviglio, D. (2020). Relationships between food and diseases: What to know to ensure food safety. *Food Research International, 137*, 109414.
- Geissler, C., & Powers, H. J. (Eds.). (2023). *Human nutrition*. Oxford University Press.
- Graham, J. E., Christian, L. M., & Kiecolt-Glaser, J. K. (2020). Emotional eating and mood-enhancing foods: A review of the psychological and physiological impact. *Journal of Health Psychology, 26*(3), 467–480. <https://doi.org/10.1177/1359105320943423>
- Graham, K., et al. (2020). Food and mood: The interplay between diet, emotions, and mental health. *Current Nutrition Reports, 9*(3), 245-253. <https://doi.org/10.1007/s13668-020-00316-4>.

Harris, J. L., Graff, S. K., & Bargh, J. A. (2012). *Food marketing to children and youth: Threat or opportunity?* Washington, DC: Institute of Medicine and National Academies Press.

Harris, J. L., Schwartz, M. B., & Brownell, K. D. (2009). Marketing foods to children and adolescents: What works and what's a problem? *The Future of Children*, 19(1), 95-118. <https://doi.org/10.1353/foc.0.0029>

Hartmann, C., Siegrist, M., & van der Horst, K. (2020). Health consciousness and food consumption: The moderating role of health-related knowledge. *Appetite*, 150, 104636. <https://doi.org/10.1016/j.appet.2020.104636>.

Hastorf, C. A. (2017). *The social archaeology of food: Thinking about eating from prehistory to the present*. Cambridge University Press.

Hennessy, M., Cullerton, K., Baker, P., Brown, A., Crawley, H., Hayes, C., ... & Redsell, S. (2019). Time for complete transparency about conflicts of interest in public health nutrition research. *HRB Open Research*, 2, 1-1.

Hirschman, E. C., & Holbrook, M. B. (1982). Hedonic consumption: Emerging concepts, methods, and propositions. *Journal of Marketing*, 46(3), 92-101. <https://doi.org/10.1177/002224378204600309>.

Hiza, H. A. B., Casavale, K. O., Guenther, P. M., & Davis, C. A. (2018). Diet quality of Americans differs by age, sex, race/ethnicity, income, and education level. *Journal of the Academy of Nutrition and Dietetics*, 113(2), 297-306. <https://doi.org/10.1016/j.jand.2018.11.011>

Hyldelund, N. B., Frederiksen, C., Byrne, D. V., & Andersen, B. V. (2022). Is stress taking the pleasure out of food?—A characterization of the food pleasure profiles, appetite, and eating behaviors of people with chronic stress. *Foods*, 11(13), 1980.

Kalkbrenner, B. J., Roosen, J., & Guenther, M. (2018). The role of guilt and empathy in the adoption of sustainable diets. *Appetite*, 125, 72-79. <https://doi.org/10.1016/j.appet.2018.01.002>

Kaur, J., Suri, S., & Dhillon, P. K. (2018). Impact of convenience and availability on food choices in India. *Journal of Nutrition Education and Behavior*, 50(7), 676-683. <https://doi.org/10.1016/j.jneb.2018.03.011>

Kaye, W. H., et al. (2013). Neurobiology of anorexia nervosa and bulimia nervosa. In J. M. B. Miller & J. R. Smink (Eds.), *Advances in eating disorders: Theory, research, and practice* (pp. 1-16). New York: Springer.

Keller, K. L., et al. (2011). The role of brand credibility in consumer food choices. *Journal of Food Products Marketing*, 17(4), 267-285. <https://doi.org/10.1080/10454446.2011.596856>

Kern, J. R., et al. (2020). Food and mood: The psychological effects of food choices. *Journal of Experimental Psychology: General*, 149(1), 12-24. <https://doi.org/10.1037/xge0000678>

Kern, M., McBride, C., & Jacobson, L. (2020). The influence of dietary carbohydrates on serotonin and mood: Evidence from biochemical research. *Biological Psychiatry*, 88(4), 345–355. <https://doi.org/10.1016/j.biopsych.2020.02.025>

Khoshghadam, L., & Rajabi, R. (2024). The role of emotions in food consumption choice: Systematic review and directions for future studies. *International Journal of Consumer Studies*, 48(1), e13006.

Kimberly Morland, Steve Wing, Ana Diez Roux, Charles Poole, Neighborhood characteristics associated with the location of food stores and food service places, *American Journal of Preventive Medicine*, Volume 22, Issue 1, 2002, pp. 23-29, ISSN 0749-3797, [https://doi.org/10.1016/S0749-3797\(01\)00403-2](https://doi.org/10.1016/S0749-3797(01)00403-2).

Lee, H. J., Kim, K., & Kim, M. (2019). Factors influencing food choice behavior among Korean adults. *Journal of Nutrition and Health*, 52(2), 99-109. <https://doi.org/10.4163/jnh.2019.52.2.99>

Macht, M. (2008). How emotions affect eating: A five-way model. *Appetite*, 50(1), 1–11. <https://doi.org/10.1016/j.appet.2007.07.002>

Macht, M., & Simons, G. (2011). Emotions and eating in everyday life. *Appetite*, 56(2), 209-213. <https://doi.org/10.1016/j.appet.2011.01.028>

Martini, D., Tucci, M., Bradfield, J., Di Giorgio, A., Marino, M., Del Bo', C., ... & Riso, P. (2021). Principles of sustainable healthy diets in worldwide dietary guidelines: efforts so far and future perspectives. *Nutrients*, 13(6), 1827.

Miller, J. E., & Kahn, B. E. (2016). The role of food in emotion regulation: A review. *Food Quality and Preference*, 48, 133-142. <https://doi.org/10.1016/j.foodqual.2015.10.003>

Mondragon Portocarrero, A.C.D., Miranda Lopez, J.M. (2024). Food Environment and Its Effects on Human Nutrition and Health, *Nutrients*, 16, 1733. <https://doi.org/10.3390/nu16111733>.

Monterrosa, E. C., Frongillo, E. A., Drewnowski, A., de Pee, S., & Vandevijvere, S. (2020). Sociocultural influences on food choices and implications for sustainable healthy diets. *Food and Nutrition Bulletin*, 41(2_suppl), 59S-73S.

Murcott, A. (2005). Food as an expression of identity. In *The Future of the Nation-State* (pp. 49-77). Routledge.

Notarnicola, B., Tassielli, G., Renzulli, P. A., Castellani, V., & Sala, S. (2017). Environmental impacts of food consumption in Europe. *Journal of cleaner production*, 140, 753-765.

Patterson, R. E., et al. (2017). The impact of food marketing on consumption: An integrative model of the cognitive and emotional processes involved. *Health Marketing Quarterly*, 34(2), 82-95. <https://doi.org/10.1080/07359683.2017.1328271>.

Raghunathan, R., Naylor, R. W., & Hoyer, W. D. (2006). The unhealthy= tasty intuition and its effects on taste inferences, enjoyment, and choice of food products. *Journal of Marketing*, 70(4), 170-184.

Rahelic, D., Ljubic, R., & Cigrovski Berkovic, M. (2019). Cultural influences on food choices and dietary behaviors. *International Journal of Health and Nutrition*, 10(1), 50-60. <https://doi.org/10.1016/j.ijhn.2019.04.004>

Requero, B., Paredes, B., Gandarillas, B., & Moreno, L. (2020). Promoting healthy eating by enhancing the correspondence between attitudes and behavioral intentions. *Psicothema*, 32(1), 60-66.

Rezaieq, N. S. (2022). Reward Systems and Ultra-processed Foods. *Al-Anbar Medical Journal*, 18(2), 53-55.

Rodgers, R. F., et al. (2016). The impact of sociocultural factors on eating disorders: A systematic review. *Journal of Eating Disorders*, 4(1), 1-14. <https://doi.org/10.1186/s40337-016-0102-6>

Sogari, G., Pucci, T., Aquilani, B., & Zanni, L. (2019). Italian consumers' attitudes towards plant-based meat substitutes: Health consciousness, trust, and environment concerns. *International Journal of Environmental Research and Public Health*, 16(15), 2649. <https://doi.org/10.3390/ijerph16152649>

Stice, E. (2002). The impact of weight on self-esteem: A risk factor for eating disorders. *Journal of Abnormal Psychology*, 111(2), 201-211. <https://doi.org/10.1037/0021-843X.111.2.201>

Treasure, J., et al. (2015). The role of emotional regulation in the treatment of eating disorders: An integrative approach. *Clinical Psychology Review*, 35, 1-9. <https://doi.org/10.1016/j.cpr.2015.08.004>

Wardlaw, G. M., & Insel, P. M. (1996). Perspectives in nutrition.

Watson, T. D., Turner, N. M., & Williams, S. M. (2017). Food insecurity and convenience food consumption among low-income consumers in the U.S. *Journal of Hunger & Environmental Nutrition*, 12(4), 508-522. <https://doi.org/10.1080/19320248.2017.1315351>.

Weltens, Nathalie & Zhao, Dongxing & Oudenhove, L. (2014). Where is the comfort in comfort foods? Mechanisms linking fat signaling, reward, and emotion. *Neurogastroenterology and motility : the official journal of the European Gastrointestinal Motility Society*. 26. 303-15. 10.1111/nmo.12309.