Food Craving, Gender, and Mood in British and Greek Cypriots

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Candidate Declaration

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Abstract

This research investigates the phenomenon of food cravings through a cross-cultural lens, focusing on British and Greek Cypriot populations. It comprises two studies designed to explore the factors influencing food cravings across these cultures.

Study 1 utilized a questionnaire-based approach to explore how food cravings are understood and experienced in both cultures, particularly since the Greek Cypriot dialect lacks a specific word for "food craving." The results indicated that Greek Cypriots exhibited more diverse responses when describing craving, and reported significantly higher cravings for chocolate, salty snacks, and meat. Additionally, gender differences were found, as women craved sweets and chocolate more, while men reported stronger cravings for meat.

Study 2 adopted a mixed-methods design, integrating questionnaire responses with 24-hour dietary recall diaries and the International Positive and Negative Affect Schedule Short-Form (I-PANAS-SF). This enabled an investigation between food cravings, mood, and dietary intake. The results revealed cultural influences on the types of foods craved and on macronutrient intake. Gender differences also emerged, with women reporting more frequent cravings and men showing higher protein intake at dinner and in total. High cravers exhibited higher negative mood scores and differed in the types of foods they craved in comparison to low cravers, although no significant differences in dietary intake were observed. Participants who did not experience cravings the previous day consumed more snack calories and snack fat, suggesting that cravings do not necessarily drive increased snacking and may even arise when snack intake is restrained. Both previous-day cravers and non-cravers reported a decrease in positive mood during cravings, indicating consistent emotional shifts accompanying craving episodes.

In conclusion, this research emphasizes the multifaceted nature of food cravings, shaped by cultural, gender, and emotional factors. The findings offer important insights for developing nutrition strategies and health interventions that account for these variables.

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Literature Review

1. Introduction – Food: Nature's Drug?

The word "addiction" over the years has mainly been used in reference to drugs. However, according to the excessive appetite model of addiction, people can engage so strongly in activities other than drug abuse – such as drinking, smoking, gambling, sex and eating – that they then find it very difficult to moderate their behavior, which resembles addiction (Orford 2001). Hence, there has been a lot of discussion for the inclusion of compulsive overeating as an addiction disorder, since evidence support that it is sufficiently similar to conventional substance dependence (Davis and Carter 2009), suggesting that treatment approaches for food addiction could be beneficial for managing overeating behaviors (Adams et al., 2019).

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR), substance dependence is at hand when for over a period of 12 months an individual engages in any three of the following: 1) consumes more of the substance and for a longer period than intended, 2) has repeatedly and unsuccessfully tried to quit, 3) spends a significant amount of time trying to obtain, use or recover from using the substance, 4) experiences craving and urges to use the substance, 5) has impaired ability to fulfill major obligations at work, school, or home due to substance use, 6) continues use despite having suffered adverse effects from usage 7) reduces social, occupational or recreational activities in favor of further substance use, 8) continues using in situations where is dangerous to oneself or others, 9) continues using despite substance related mental or physical problems, 10) demonstrates symptoms of withdrawal, or 11) develops tolerance.

Researchers support that some of the above symptoms are also evident in bingeing-related eating disorders (BED), i.e. loss of control, consuming more than what was intended and for a longer period, vomiting or use of laxatives to compensate, continuing consumption despite feelings of guilt etc. (Corwin and Grigson 2009). On the other hand, it seems that there are also some differences in diagnostic criteria for BED and substance-related disorders, for example in the nature and details of tolerance and withdrawal effects, although of course in these respects there will also be differences across classes of different drugs (Paul et al., 2023; Rogers, 2017).

The most popular tool developed to specifically assess food addiction is the Yale Food Addiction Scale (YFAS) (Gearhardt et al., 2009; Meule & Gearhardt, 2014; Schulte & Gearhardt, 2017). In 2014, a systematic review noted that the average prevalence of food addiction as measured by the YFAS was around 20%, ranging from 5% to 57% and this diagnosis affected more women, individuals older than 35 years, and clinical samples (i.e., those who are seeking some type of medical/professional assistance) (Pursey et al., 2014). Praxedes et al 2022 systematic review and meta-analysis also confirmed that the prevalence of food addiction diagnosis was found to be 20% and was significantly higher in individuals with a clinical diagnosis of binge eating disorder compared to non-clinical samples (Praxedes et al., 2022).

Gordon et al. (2018) systematic review explored the concept of "food addiction" in humans and animals. The review focused on how well eight key characteristics of addiction applied to food: brain reward dysfunction, preoccupation, risky use, impaired control, tolerance/withdrawal, social impairment, chronicity, and relapse. The research revealed strong support for food addiction as a distinct concept, with similarities to how other substance use disorders are diagnosed. Brain reward dysfunction and impaired control were the most supported addiction characteristics linked to food. The study concluded that although both behavioral and substance-related factors are involved in addiction, the symptoms of food addiction more closely resemble those of substance use disorders than behavioral addictions. Interestingly, the authors suggested that processed foods high in added sugars and fats had the strongest potential to be addictive (Gordon et al., 2018).

Ultraprocessed foods, have been in fact identified as being the most implicated in addictive-like eating (Gearhardt & Schulte, 2021). These foods are typically energy-dense, high in added sugar, fat, or both, and often manipulated to be hyper-palatable through artificial enhancements. Gearhardt & DiFeliceantonio (2023) argue that the criteria used to identify addictive substances like tobacco can also be applied to certain highly processed foods. The authors moreover suggest that some highly processed foods can trigger compulsive consumption, mood swings, behavioral reinforcement, and strong cravings (Gearhardt & DiFeliceantonio, 2023).

In fact, most of the scientific data supporting or opposing food addiction, fixates on the similarities between drug craving and food craving (Pelchat 2009). But what is craving after all? Is it “wanting very much something you really like”? In the area of affective neuroscience, “wanting” represents the motivational magnet to a stimuli which causes it to be sought and “liking” is defined as the hedonic reaction to that stimuli ((Berridge, 1996, 2009)). In this framework, craving has been directly associated with “wanting”, as in many cases it results from being faced with such a stimulus (sight / smell / thought of a food / drug). In the same context the anticipated rewarding effects of “liking” when consuming the food or taking the drug, increase “wanting”, making the craving even more intense (Pelchat 2009).

Nevertheless, in the area of eating psychology, the definition of food craving has been described as problematic, since it is difficult to be observed directly and measured (Weingarten & Elston, 1990). As such, scientists usually rely on participants’ subjective understanding of the term (Gendall et al 1997), typically defined as an intense desire to consume a particular food (or type of food) that is difficult to resist (White et al 2002). Moreover, the lack of a single word referring to food craving in languages such as Arabic (Parker, Kamel et al. 2003) or Greek Cypriot Dialect, makes the real and global measurement of the phenomenon even more difficult.

In favor to the similarities with drug craving, researchers support that brain mechanisms of natural reward (i.e. food reward) overlap with the substrates mediating rewarding properties of drugs of abuse (Grigson 2002). Noteworthy is the notion that the dopamine brain system is a desire circuit that mediates our feelings of “wanting” but is not needed to mediate hedonic pleasure (“liking”), or hedonic reward learning. “Liking” and reward on the other hand are mediated through other brain neurotransmitter systems such as opioid and GABA/benzodiazepine systems (Berridge and Robinson 1998; Berridge 2009, Davis and Carter 2009, (Berridge & Robinson, 2016)). According to Berridge & Robinson, 2016, the "incentive salience theory of addiction" that addicts mesolimbic circuits over time become hyper-responsive to drug cues, which may cause strong cue-triggered ‘wanting’ to take drugs, leading to relapse, without necessarily experiencing an increase in “liking” the

substance (Berridge & Robinson, 2016). However, it appears that both drugs and food can cause an increase in dopamine and serotonin levels in brain reward pathways (Pelchat 2002; Di Chiara and Bassareo 2007), and they both demonstrate a decreased sensitivity of the dopamine-reward system when abused (Volkow, Wang et al. 2008).

Food and drug cravings may also be learned in similar ways. A former drug addict experiences drug craving when he returns to his old environment, even though he is no longer experiencing withdrawal symptoms. Focusing on the effects of the environment, (Caprioli, Celentano et al. 2007) based on an animal model indicated that the surroundings of an individual can influence his experience with drug use. Depending on the environment, a person could be more vulnerable in developing drug addiction and through Pavlovian conditioning, the environment can even trigger drug seeking behavior. The rewarding effects of a drug can also be altered depending on a person's living conditions and influence the probability of using it again. The "learning" aspect of addiction has also been addressed by the Berridge et al 2009 theory, in which they suggest that once reward-related cues are learned, those cues predict their associated rewards and in addition trigger motivational 'wanting' to obtain the rewards (Berridge, 2009).

As such, it has been demonstrated that environmental cues such as sight, smell, or even imagining a food can trigger food craving in a similar way as a drug (Fedoroff, Polivy et al. 1997). Some even argue that food craving is an acquired habit of consuming a specific food when hungry (Gibson and Desmond 1999). Just like drug addicts experience thoughts, feelings and urges about drugs even when they are not using them, so some people can experience "hedonic hunger" and be constantly preoccupied with food, even when they are not hungry (Lowe and Butryn 2007). Bowell and Kober 2016 meta-analytic review confirmed that food cue reactivity, cue-induced craving and tonic craving systematically and prospectively predict food-related outcomes (Boswell & Kober, 2016a).

Culture also seems to play a significant role in both drug use and food craving, through different pathways. Culture is a group's system of learned behavior, beliefs and values that are generally considered to be the tradition of that people and are passed on from

generation to generation. In addition to shared belief and value systems, culture comprises of language, social relationships, religious beliefs, dress, music, and of course foods (Larson and Story 2009).

In drug use, Eckersley 2005 supports that modern western culture (materialism and individualism), promotes images and ideals of life that do not meet individual needs or reflect reality, leading to diminished well-being, including addiction to drug use {Eckersley, 2005). As such, people may engage in drug use because they already have everything they need, and they want something more. On the other hand, food preferences, including cravings, are also claimed to be influenced by cultural factors (Rozin, 1996). Different cultures eat different foods and people like and crave the foods in their own cuisine, i.e. rice and sushi craving in Japan (Zellner et al., 1999; Komatsu 2007).

As Hetherington 2002 suggests, food intake nowadays also signifies lifestyle choices and is more influenced by behavioural, social, and environmental factors rather than nutrient need and people may crave even though they don't need food physically. However, in the case of both drugs and food, it is also believed that dissatisfaction in life due to unrealistic goals, or any other form of disappointment, leads people to find comfort in other sources (Eckersley 2005; Hetherington 2002). Lawson et al. (2020) review suggested that signs of food addiction appear worldwide, but differ among groups based on things like race, ethnicity, gender, and how much someone has adapted to a new culture. Problems arise because words like "craving" and "addiction" don't translate perfectly into every language, and how people talk about eating differently around the world. This makes it hard to compare food addiction across cultures.

2. Research Value & Objective

Given the above similarities between drug use and eating and the scientific notion of identifying overeating as an addiction disorder, the value of understanding the craving or desire for a specific food becomes evident. Food craving has during the years been associated with a number of unhealthy situations such as Binge Eating (Gendall, Joyce et al. 1998), higher body mass index (BMI) and noncompliance with dietary

restrictions (Pelchat 1997). Interestingly Abdella et al. (2019) noted that the gene variant that correlated with higher BMI, did not correlate with eating behaviors or cravings (Abdella et al., 2019). Moreover, the high prevalence rates of food cravings, suggest that it is a normative rather than a pathological phenomenon. Most of the individuals studied (52-97%) report to have experienced a craving for a certain food (Gendall et al 1997a, Gendall et al. 1997B, Weingarten & Elston 1991, Christensen & Petijohn, 2001, Pelchat, 1997). Additionally, individuals have been recorded to indulge in the craved food, in 8 out of 10 craving episodes (Weingarten, 1991). Differences have been noted in the types of foods craved according to gender, age, hunger state, time of day, and phase of the menstrual cycle (Gendall et al, 1997, Pelchat, 1997).

Even though the subject of food craving has been receiving attention in recent years, the studies and information on the subject are still only few. The published work so far, has mainly focused on women, possibly since they are an easier approachable sample on the subject. This has limited the evaluation of the phenomenon in reference to differences between the two genders. Moreover, the majority of the studies have been conducted using samples from USA (Macdiarmid and Hetherington 1995; Pelchat 1997; Christensen and Pettijohn 2001; Waters, Hill et al. 2001; Cepeda-Benito, Fernandez et al. 2003; Fedoroff, Polivy et al. 2003 etc.; Zellner, Garriga-Trillo et al. 2004; Martin, O'Neil et al. 2006) and cross-cultural research is scarce (Parker et al 2003, Zellner et al 1999, Komatsu 2007, (Cepeda-Benito et al., 2023; Hormes & Niemiec, 2017; Lawson et al., 2020; Yanovski, 2003)).

Furthermore, a large volume of the research on the area is focusing on the physiological origins of the phenomenon without reaching a clear commonly acceptable physiological mechanism. As scientists suggest, this may be the mere result of overlooking evidence which is inconsistent at first glance with the view that the body asks what it needs (Hill, 2007; Weingarten, 1990). It is thus apparent that the study of food craving between men and women among different cultures and in relation to other environmental factors will add new information on the available knowledge on the subject. This new knowledge could be then used to better understand the possible origins of food addiction and overcome health issues related to food craving such as disordered eating, chronic dieting and obesity.

3. Theories of Food Craving Mechanisms

According to Pelchat 1997, food craving is a complicated multileveled phenomenon, which can rise from and take the form of several psychological and physiological expressions (Pelchat 1997). As such, several theories have been investigated throughout the years regarding the phenomenon's origin and mechanism of action. An overview of these theories will set the foundation for the proposed study and help demonstrate possible gaps in the literature.

Physiological theories for example, include the conventional homeostatic explanation, whereby craving is evoked by need and, thus, cravings are used to correct bodily needs (Weingarten and Elston 1990). Based on this theory, specific foods are craved by individuals who are deprived of a specific nutrient i.e. salt craving in Addison patients. However, besides salt, no other deficiency-induced craving has been documented.

Along the same lines, the starvation/dietary restraint model proposes that binge eaters develop a destructive self-preserving cycle of dietary restraint, food craving and bingeing (Weingarten and Elston, 1990). Within this cycle, food craving has been described as a manifestation of the underlying calorific restriction, which increases the likelihood of uncontrollable consumption. Although this theory again supports that food cravings are a result of underlying biological need, it differs from the previous one in that food is craved because binge-eaters are deprived of calories rather than of a specific nutrient. However, according to Meule (2020) review, the relationship between food restriction and craving is more complex. His analysis indicated that while short-term, selective food deprivation may indeed increase food cravings, long-term energy restriction seems to decrease food cravings, suggesting that food deprivation can also facilitate extinction of conditioned food craving responses (Meule, 2020).

Another theory, the opioid-palatability hypothesis, suggests that the taste of palatable foods can lead to release of opioid peptides, which in turn stimulate appetite and consumption (Yeomans and Gray 2002). Actually, opioid antagonists have been shown to selectively reduce the consumption of foods rich in fat and sugar, implying that opioids may also play a role in the control of fat and sugar consumption

(Yamamoto 2003). As such, deviations in the human opioid peptide system may be linked to increased liking and compulsive overeating of sweet, high-fat foods. Also, as previously mentioned it has been demonstrated that food can cause an increase in dopamine and serotonin levels in brain reward pathways (Pelchat 2002; Di Chiara and Bassareo 2007), and they both demonstrate a decreased sensitivity of the dopamine-reward system when abused (Volkow, Wang et al. 2008). These have supported the scientists' conclusion that the dopaminergic system moderates food craving, by moderating the motivation to consume palatable food (Drewnowski, Krahn et al. 1992; Yamamoto 2003).

The Serotonergic theory suggests that the balance of protein and carbohydrate in a meal can affect brain serotonin neurotransmission, leading to mood changes (Rogers, 1995), which in turn can elicit cravings. The consumption of carbohydrates in the absence of proteins increases the availability of the serotonin precursor, tryptophan, thus increasing the level of serotonin in the brain (Pelchat 2002). Serotonin takes part in several functions such as pain sensitivity, blood pressure regulation and of course mood. Hence many people may seek and overeat food rich in carbohydrates to make themselves feel better (Wurtman and Wurtman 1995; Pelchat 2002). However, levels of serotonin should be influenced by nonsweet carbohydrates as well, which does not explain the higher frequency of sweet carbohydrate craving than non-sweet carbohydrate craving (Hill, Weaver et al. 1991).

It has also been assumed that craving is caused by the presence of a naturally occurring psychoactive, or mood-altering compound in the food. This is especially the case for chocolate, where numerous studies have shown the existence of this kind of compounds, such as anandamine (endogenous cannabinoid found in the brain), theobromine (weak central nervous system stimulant), methylxanthine (caffeine), tryptophane (essential amino acid involved in the production of serotonin) and magnecium (essential macromineral with relatively common deficiency in humans) (Moller 1992; Wang, Waller et al. 1992; di Tomaso, Beltramo et al. 1996; Planells, Rivero et al. 1999; Smit, Gaffan et al. 2004). However, the amount of these substances in chocolate appears to be too insignificant to significantly affect consumption. Furthermore, foods containing similar or higher levels of these very compounds, but lacking the hedonic properties of chocolate (e.g., magnesium in spinach), are rarely

craved (Michener and Rozin 1994). This aligns with the perspective of Gearhardt & DiFeliceantonio (2023) who argue that food addiction is not driven by specific foods, but by highly processed foods that contain a combination of ingredients (e.g., salt, sugar, fat, additives) that do not occur in combination naturally, but have been altered to enhance their sensorial properties and make them hyperpalatable leading to craving (Gearhardt & DiFeliceantonio, 2023).

The expectancy model, based on classical conditioning, suggests that cravings can be triggered by exposure to internal or external stimuli associated with the desired food (Hetherington, 2002; Weingarten and Elston 1990). External stimuli like sight or smell of a specific food can trigger cravings, like wanting pizza when walking by an Italian restaurant. Similarly, learned contextual cues, such as the place or time associated with eating a particular food, can lead to cravings, i.e. craving for popcorn at the movies. Folwarczny et al. (2022) even suggests that winter cues can make people crave higher-calorie foods (Folwarczny et al., 2022). Supporting this theory, Akker et al. (2018) propose that Pavlovian learning can explain how cravings and overeating are learned and potentially tackled. Certain cues, like the sight or smell of food, can trigger strong desires to eat even if not directly related to hunger. People can learn these associations in both controlled settings and everyday life. However, once formed, these associations can be challenging to break, especially in the long term. This difficulty in overcoming learned cues contributes to persistent cravings and overeating behaviors (van den Akker et al., 2018).

Along the same lines psychological affect-based theories propose that specific appetites might also become conditioned to prominent internal stimuli, concurrent with emotional states (e.g. mood & stress induced eating) (Ogden, 2003). In fact, several studies have found significant connections between food craving and dysphoric mood and emotional eating (Wurtman 1988; Wurtman 1990; Hill, Weaver et al. 1991; Christensen and Pettijohn 2001(Dicker-Oren et al., 2022a)). This is especially the case for sweet tasting food and has led some to believe that dysphoric individuals may consume carbohydrates as a type of self-medication (Leibenluft, Fiero et al. 1993, Ventura et al., 2014))(Corsica & Spring, 2008). Reents et al (2020) noted that hungry participants in a neutral mood preferred savory food, while those in a sated state

preferred sweet foods. Interestingly, participants in a negative mood showed no significant difference in craving sweet or savory foods regardless of hunger, suggesting emotional state may override hunger cues (Reents et al., 2020). Research has also shown that higher depressive symptoms were related to higher levels of emotional eating. Furthermore, emotional eating was related to the higher consumption of sweet energy-dense foods in both genders and non-sweet energy-dense foods among men independently of restrained eating and depressive symptoms.(Konttinen et al., 2010). Similarly, Doan et al (2022) noted that loneliness in adolescents is independently associated with an increased craving for sugar-sweetened beverages, independent of other negative emotional states or having a supportive and harmonious family environment (Doan et al., 2022).

There is also evidence that sweet taste and the mouthfeel of some foods is reinforcing (Wise 2006) and as such, craving could be created simply by standard learning mechanisms. In addition, carbohydrates' ability to raise blood sugar may also cause large effects on cognitive performance (Benton 1990) and thus people might become dependent on these mood changes or performance enhancements. In the same context, Gibson & Desmond, 1999, suggest that cravings for energy-rich foods, such as chocolate, are fundamentally strong appetites created by repeated reinforcing experience of eating such food when hungry. Also, people’s digestive processes adapt to eating sweet and high fat foods and as such they may find these foods more satisfying and a “quick food fix” (Hetherington, 2002).

According to Mela and Rogers, 1998 theory, attempting to resist the desire to consume specific foods, causes this desire to become more prominent and the experience is named craving rather than hunger, in order to get recognition for the intensity of the “problem”, rationalize excessive ingestion, avoid taking responsibility, and give an explanation or apologize for a shameful behavior. As for craving during diet, Polivy 1996 supports that dieters try to avoid eating highly preferred but “fattening” foods and it may be the mere attempt to restrict the intake of desired foods that makes them even more attractive and unleashes craving.

A more recent cognitive model of cravings, the elaborated intrusion (EI) theory of desire (Kavanagh, Andrade et al. 2005), places mental imagery at the heart of the

craving phenomenon. This theory suggests that episodes of craving begin when internal or environmental triggers, such as physiological deficit states, negative affect, external cues, other cognitive activity, and anticipatory responses to the target (such as salivation), draw out thoughts about the desired substance which feel spontaneous and intrusive. Such thoughts are pleasurable and thus encourage the individual to enrich and elaborate them. This elaboration process involves a controlled cognitive search for relevant semantic, episodic, and sensory information about the desired substance in long-term memory, which is then combined in working memory as vivid, quasi-lifelike images. This imagery is temporarily rewarding but ultimately distressing, highlighting people's awareness of not having the desired substance. The literature focusing on EI theory suggests that interventions targeting these cognitive aspects could be effective in reducing cravings and improving dietary behaviors. (Kavanagh et al., 2005; May et al., 2015; Schumacher et al., 2019a; Shahriari et al., 2019a).

When it comes to carbohydrate cravings specifically, research suggests the existence of a "carbohydrate-craving syndrome" in which carbohydrate intake medicates a dysphoric mood state(Corsica & Spring, 2008). A review by Ventura et al. (2014) identified five key neurobiological theories for carbohydrate cravings which have been separately addressed above and are summarised below:

- Serotonergic: Consuming carbohydrates increases brain serotonin levels, potentially leading to improved mood.
- Palatability and Hedonic Response: Highly palatable foods activate the brain's reward system, leading to pleasure and improved mood.
- Motivational System: Similar to addictive substances, carbohydrates can trigger the release of dopamine and endogenous opioids, which are associated with pleasure and improved mood.
- Stress Response: Highly palatable foods can activate the reward system and reduce stress hormone activity, leading to reduced anxiety and improved mood.
- Gene-Environment Interaction: For some individuals, eating may be a learned coping mechanism for negative emotions. This could stem from inadequate parenting, difficulty distinguishing hunger from other internal states, or a combination of factors. (Ventura et al., 2014).

Research shows that food cravings are complex experiences shaped by a mix of physiological, psychological, and cognitive factors (Pelchat, 1997; Weingarten & Elston, 1990; Kavanagh, Andrade, & May, 2005). A range of theories attempt to explain why cravings occur, from biological models focusing on homeostasis, serotonin, and dopamine (Rogers, 1995; Drewnowski et al., 1992; Volkow et al., 2008) to psychological emphasizing learning, emotions, and cognition (Hill et al., 1991; Ogden, 2003; May et al., 2015). However, no single model fully captures craving experiences. Together, these models provide a useful foundation for examining how cravings might differ between men and women (Lafay et al., 2001; Klimesova et al., 2020), vary across cultures (Zellner et al., 1999; Hormes & Niemiec, 2017), and be shaped by both environmental cues and emotional states (Reents et al., 2020; Doan et al., 2022). Building on this groundwork, the current study aims to explore these dimensions empirically, with the goal of deepening our understanding of food craving as a potential mechanism that contributes to food addiction and disordered eating (Gearhardt & DiFeliceantonio, 2023; Corsica & Spring, 2008).

4. Food Craving Scientific Landscape

4.1 Gender and food craving

As previously mentioned, most studies have focused on women, neglecting the evaluation of the phenomenon in men. However, differences have been noted in the types of foods craved according to gender, age and between the same sexes in different cultures (Pelchat 1997; Zellner, Garriga-Trillo et al. 1999; Christensen and Pettijohn 2001; Lafay, Thomas et al. 2001; Osman and Sobal 2006 (Abdella et al., 2019; Klimesova et al., 2020)).

Women's food cravings have been associated with a negative mood, especially when they indulged in them and higher difficulty in resisting them compared to men's (Lafay, Thomas et al. 2001). Women cravers report more frequently being in a state of boredom and solitude or annoyance and depression. As such, and in agreement with other studies (Weingarten and Elston 1991; Hill et al. 1991 and Hill et al. 1994) Lafay (2001) suggested that food cravings represent a rewarding experience for women in response to negative feelings. Men on the other hand, give in to their cravings while happy and relaxed, revealing that the phenomenon is indeed strongly related with

mood but in opposite ways in women and men. Interestingly, the Authors note that the term used to define craving might have been interpreted differently by men and women and this difference may have affected the study's results.

In a similar context Klimesova et al. (2020), also investigated the differences in food cravings between men and women with normal Body Mass Index (BMI). The study did not find significant differences in the overall intensity of food cravings between men and women. However, according to their findings, men associated cravings more with positive outcomes (reinforcement) like feeling good or satisfied after eating the desired food, whereas women scored higher for emotional cravings, suggesting they might be more likely to crave food in response to negative emotions. Also women (Klimesova et al., 2020).

Gender differences have been noted in the types of food craved as Wansink et al. (2003) found that males preferred warm, hearty, meal-related comfort foods (such as steak, casseroles, and soup), while females instead preferred comfort foods that were more snack related (such as chocolate and ice cream) (Wansink, Cheney et al. 2003). In addition, younger people preferred more snack-related comfort foods compared to those who were older. It seems thus that both gender and age influence one's food preference and has been suggested that social identification can help drive food preferences. Other studies have also noted similar differences in craving between men and women and different age groups (Pelchat 1997; Zellner, Garriga-Trillo et al. 1999).

Indeed, it seems that women tend to crave sweet fat, while men crave mostly salty fat (Zellner et al, 1999). Furthermore, although food craving in men has not been well documented, data suggest that women are twice as likely as men to be food cravers (Polivy, Coleman et al. 2005). However, according to Weingarten and Elston 1991, only 32% of women perceived that their cravings were linked to menstrual cycles and according to Polivy et al. 2005, women's craving for sweets declined with age. In fact, elderly adults seem to experience food craving in a lower frequency and demonstrate higher ability in resisting the craving, which suggests that cravings become less compelling as people age.

In summary, existing literature shows clear gender-related trends in food craving. While both men and women experience cravings, women tend to report higher frequency and stronger emotional associations, particularly in response to negative affect (Lafay et al., 2001; Hill et al., 1991; Christensen & Pettijohn, 2001). In contrast, men's cravings appear more reinforcement-driven and linked to positive mood states (Klimesova et al., 2020). Moreover, differences extend to the types of foods desired: women are more likely to crave sweet and high-fat foods such as chocolate and ice cream, whereas men prefer savory, meal-related comfort foods such as steak or casseroles (Wansink et al., 2003; Zellner et al., 1999). Age also appears to affect craving intensity and food type preference, with younger individuals prefering snack-related foods and older adults reporting lower craving frequency and greater resistance to indulgence (Polivy et al., 2005). These findings support the notion that food craving is a multidimensional phenomenon shaped by emotional, physiological, and social factors, and they provide an important foundation for the present study's examination of gender and emotional differences in food craving (Pelchat, 1997; Weingarten & Elston, 1991).

4.2 Culture and food craving

Food is a profound expression of cultural identity, with eating behaviors passed down from one generation to the next. Cultural food patterns shape preferences, perceptions, and the way food is consumed and prepared (Larson and Story 2009). As culture influences the types of food we eat, it is reasonable to expect these cultural influences to extend to food cravings as well. However, cross-cultural studies on food cravings are limited. The few existing studies do support the idea that food cravings differ across cultures (Hormes & Niemiec, 2017; Hormes & Rozin, 2010; Komatsu, 2008a; Osman & Sobal, 2006; Zellner & Garriga-Trillo, 1999)).

The available empirical evidence regarding the environmental determinants of eating behavior is generally limited, leaving uncertainties about which aspects of the environment hold greater influence than others (Larson and Story, 2009). Food choices and eating behaviors are shaped by various factors, including the physical availability of food in different settings such as the workplace, neighborhood, home, and school, as well as by parental influences and social norms. Additionally, food preferences arise from the interplay between the sensory and nutritional

characteristics of food, along with attitudinal, social, and economic factors (Sclafani, 2001; Drewnowski, 1997). Childhood experiences are particularly significant in shaping long-term food consumption preferences and habits (Mennella, 2006).

The framework model of food choice proposed by Chen & Antonelli (2020) builds on the above and suggests that the determinants of food choice can be categorized into five main categories: internal factors related to the sensory and perceptual features of food, external factors such as information availability and the physical environment, personal-state factors encompassing biological, physiological, and psychological aspects, cognitive factors including knowledge, attitudes, and preferences, and sociocultural factors like culture, economic variables, and political influences (Chen & Antonelli, 2020).

Given that food craving is closely linked to food preference and liking, it is reasonable to assume that cultural influences, such as parental habits and social context, will similarly impact food cravings. This implies that cultural factors play a significant role in shaping both food choices and cravings.

The first cross-cultural study on food craving was conducted by Zellner et al. 1999, who compared food liking and craving between Spanish and American participants (Zellner, Garriga-Trillo et al. 1999). The two cultures demonstrated differences in the degrees and patterns on liking of foods which are part of their cuisine, i.e. they liked more foods that are more common in their diet. In both cultures, as in Pelchat 1997, more women craved sweet foods than savories and more men craved savories than sweets. Chocolate craving in specific was more frequent in American women than in American men, however no such gender difference was evident for the Spaniards. These interesting results were repeated in the Osman & Sobal 2006 study who, after controlling for cultural involvement measures (country of birth, years spent in that country, media use, and cultural identification), also reported differences in American men and women but not among Spaniards (Osman and Sobal 2006). In another study Zellner et al. 2004, compared Spanish and American chocolate cravers and found that differences occurred cross-culturally as Spaniards craved chocolate after eating or studying, whereas Americans craved it in the evening (Zellner, Garriga-Trillo et al. 2004). However, no differences were found across gender in the same culture,

indicating that chocolate craving has more prominent cultural characteristics than physiological.

A preliminary study by Komatsu 2007 on food craving in Japanese women revealed that rice is the most commonly craved food in Japan, with chocolate and other western or traditional food items following (Komatsu 2008). Taking into consideration that rice is consumed 7 times more in Japan than in Western societies, the study's results are also in accordance with Zellner et al. 1999 who support that the continues exposure to a culture's cuisine influences craving. Holtzman (2019) also investigated food craving among the Japanese population and confirm contradictions with what is typically observed in Western populations (Holtzman, 2019a). The most craved food was again rice, followed by psychoactive drinks like beer and coffee, and then hot tea. This pattern diverges from Western studies, which often highlight cravings for high-calorie, high-sugar, or high-fat foods. The study also noted that cravings in Japan can be driven by a desire for normalcy or healthiness, reflecting cultural norms and values. Moreover, the term used for "craving" in Japanese ("Izon-do") carries connotations of dependency and mild negativity, suggesting a nuanced understanding of cravings that differs from the straightforward desire implied by the English term.

In the same context, Parket et al. 2003 compared food craving in Egypt with North America and Spain and reported that Egyptian women reported more frequent cravings for savories and not for sweets, unlike the previous results for Spaniards and Americans (Parker, Kamel et al. 2003). As there is no single word in Egyptian Arabic to refer to food cravings besides in pregnancy, participants were asked what food they want intensely and frequently participants, especially elder ones, did not understand what was being ask. This study not only highlights the importance of culture in food craving, but also indicates that the absence of a global definition of the phenomenon risks the real measurement of its presence.

Hormes and Niemiec (2017) investigated the cultural basis of food cravings, specifically the common belief in menstruation-induced chocolate cravings. Their findings challenge biological explanations, demonstrating that foreign-born women were significantly less likely to report these cravings compared to American-born women (Hormes & Niemiec, 2017). Notably, even among those who craved chocolate,

cravings were stronger for women who were more acculturated to American society. This suggests that cultural norms may be a key factor shaping experiences of food cravings, including menstrual chocolate cravings.

Hormes and Rozin (2010) study investigated the conceptualization and linguistic representation of "craving" across various languages, aiming to understand its universality and significance beyond English-speaking contexts. Through an examination of dictionaries and consultations with native speakers, the research explored synonyms for "craving" in 25 languages, alongside related terms such as "love," "like," "urge," "desire," "adore," and "addiction" in 20 languages (Hormes & Rozin, 2010). The results revealed that 64% of the languages analyzed via automated translation had a craving synonym, whereas only 17% did based on native speaker input. Synonyms for craving were typically limited to desires for substances or drugs, indicating restricted application. The study concluded that the concept of craving holds limited importance and relevance outside English-speaking cultures, challenging its status as a natural category in addiction research.

In summary, cross-cultural research demonstrates that food craving is not a universal experience but one shaped by cultural exposure, language, and social context (Zellner et al., 1999; Parker et al., 2003; Komatsu, 2008; Hormes & Niemiec, 2017). While Western studies often emphasize cravings for chocolate or other high-fat, high-sugar foods, findings from other countries like Japan, Egypt, and Spain show culturally specific craving patterns influenced by local diets and food availability (Komatsu, 2008; Parker et al., 2003; Holtzman, 2019). Moreover, linguistic and conceptual variations, such as the meaning of *izondo* in Japanese or the absence of a precise term for craving in Arabic, suggest that the construct of “craving” may be culturally bound rather than universally understood (Hormes & Rozin, 2010). These insights suggest that food craving arises from an interaction between of environmental, social, and cultural factors, going beyond biological and psychological models. Therefore, the present study aims to build on these findings by examining how cultural context shapes the expression, interpretation, and frequency of food cravings across populations.

4.3 Types of food craved

Most people experience cravings for sweet snacks, candy, or desserts. Chocolate is consistently identified as the most craved item, especially among women (Hill & Heaton-Brown 1994; Zellner et al. 1999; Osman & Sobal 2006; Komatsu 2008) although carbohydrate craving has also been widely reported (Wurtman 1990; Wurtman and Wurtman 1995; Gendall, Joyce et al. 1999; Christensen and Pettijohn 2001; Spring, Schneider et al. 2008). Craved foods tend to be higher in calories, fat, and palatability and lower in protein and fiber compared to habitual diets (Gilhooly et al. 2007). Overall, cravings reliably increase the intake of highly palatable foods but not bland ones (Massicotte et al. 2019a). Although some evidence suggests sex differences, for example men craving savory foods more often than sweet, the findings remain inconsistent.

A major theme in the literature concerns how the type of food craved depends on the composition of the previous meal. Some work indicates that consuming a protein-rich meal can heighten cravings for sweet, carbohydrate-rich foods and even precipitate binge-like episodes (Gendall, Joyce et al. 1999). These binge episodes tend to be rich in fat despite the subjective craving for sweetness, and sweet-tasting foods often contain disproportionately high sucrose levels relative to noncraved meals. Similar patterns—where fat predominates during binges despite a craving for carbohydrates—have been observed elsewhere (Van der Ster Wallin et al. 1994). Yet other findings suggest that the macronutrient composition of meals eaten during sweet cravings sometimes resembles that of ordinary meals, with overeating linked specifically to increased fat intake (Schlundt et al. 1993). Together, these studies point to a complex relationship between perceived craving, taste preferences, and macronutrient consumption.

Research on cravings has also expanded to consider individual differences in how often and how intensely people crave certain foods. Most reported cravings seem to be centered on high-calorie snacks, with chocolate frequently mentioned (Richard et al., 2017). Individuals who experienced stronger cravings were more likely to think about these high-calorie foods throughout the day, and this association between craving intensity and snack-related thoughts was especially pronounced among high cravers. Moreover, frequent thoughts about snacks—regardless of craving intensity—

predicted greater snack consumption. These findings suggest that individuals with heightened food cravings may be more cognitively oriented toward high-calorie foods and therefore more likely to act on their cravings.

Further insight into the dynamics of cravings comes from examining how hunger and cravings fluctuate across the day for different types of foods (Reichenberger et al., 2018). Hunger and general cravings for palatable foods have been reported to follow similar daily rhythms, typically peaking around lunchtime and dinnertime. However, cravings for snack-type foods such as sweets and salty snacks showed a different trajectory, increasing gradually throughout the day and diverging from hunger cues. In contrast, cravings for main-meal foods closely mirrored the two-peak pattern characteristic of hunger. These patterns suggest that while hunger and cravings may align for meal-related foods, snack cravings follow a distinct temporal pattern that may be shaped by separate circadian influences.

Another overarching theme is the interaction between mood and cravings, particularly for carbohydrate-rich foods. People who crave carbohydrates tend to report greater distress prior to craving episodes and experience increased relaxation and positive affect afterward (Christensen & Pettijohn 2001). Carbohydrate craving intensity has been shown to correlate with negative mood states (Wurtman & Wurtman 1986; Wurtman 1988; Wurtman 1990), reinforcing the idea that such cravings may function as a form of mood regulation. Experimental work further demonstrates that inducing negative mood increases the likelihood of choosing carbohydrate-rich foods, which subsequently improve mood (Spring et al. 2008). In contrast, protein cravers often report anxiety or hunger beforehand but feel more energetic or normal after consuming protein-rich foods (Christensen & Pettijohn 2001), suggesting that different craving types may fulfill different emotional needs.

Hormonal fluctuations add another dimension, particularly in women. Cravings are often more intense during the menstrual cycle, with many women reporting sweet cravings during the premenstrual and menstrual phases (Bancroft et al. 1988; Dye et al. 1995). While some evidence shows no direct relationship between craving severity and mood during these phases (Bancroft et al. 1988), other research finds that stronger cravings co-occur with more severe depression symptoms across different

menstrual phases (Dye et al. 1995). Whether these patterns are biologically or psychologically driven or a combination of both, remains an open question.

Genetic factors also play a role in why people differ in how strongly they crave sweet foods. Humans seem to be naturally inclined toward sweetness, an inclination that may have evolved because sweet-tasting foods were typically safe and high in energy (Keskitalo et al., 2007). Research in this area has shown notable heritability estimates: about 40% for how pleasant individuals find sweet tastes, roughly 50% for how often they consume sweet foods, and around 31% for how strongly they crave them. These figures suggest that genetics meaningfully shape both the enjoyment of sweet flavors and the behaviors associated with them.

Additionally, food cravings have been examined through the lens of addiction-like processes, particularly in relation to high–glycemic index carbohydrates. These foods can trigger rapid increases in dopamine, reinforcing food-seeking behavior in a manner that resembles the action of addictive substances (Lennerz & Lennerz, 2018). With repeated exposure, these dopamine spikes may lead to a down-regulation of dopamine receptors, leaving individuals driven to consume such foods not for pleasure but to stave off withdrawal-type discomfort. This perspective offers a useful explanation for why cravings for sweet, high-GI foods can feel unusually intense and difficult to manage.

In summary, the reviewed literature highlights that the types of foods people crave (particularly sweet and high-fat foods) are influenced by a complex interaction of biological, psychological, and environmental factors. Although chocolate and carbohydrate-rich foods are the most frequently reported cravings, these vary according to mood, hormonal state, time of day, and previous food intake (Christensen & Pettijohn, 2001; Gendall et al., 1999; Wurtman & Wurtman, 1995; Reichenberger et al., 2018). Emotional states, especially negative affect, are strongly linked with carbohydrate cravings that temporarily elevate mood, indicating a psychological rather than physiological drive (Spring et al., 2008; Macht & Mueller, 2007). The heritable aspect of sweet preference (Keskitalo et al., 2007) and the high energy density of craved foods (Gilhooly et al., 2007) suggest that cravings may contribute to overeating and higher BMI. These findings reinforce the importance of examining food craving

not only as a normative experience but also as a potential behavioral pathway toward food addiction and disordered eating, directly supporting the present study's objective to explore how craving mechanisms differ across individuals and contexts.

4.4 Chocolate craving

Chocolate is constantly seen as one of the most craved foodstuffs and is the most frequently examined craved food in the literature (Hill, 2007). It includes simultaneous emotions of love and hate, being loved for its pleasurable taste but disliked for its high caloric and sugar content. Explanations for chocolate craving remain diverse and controversial, as with the rest of food cravings.

The role of sensory preferences and learned appetite in chocolate craving has been highlighted in previous research. Rozin et al. (1991) reported that chocolate was the most craved food among females, with no significant relation between its liking among children and their parents (Rozin et al., 1991). They argue that chocolate craving and liking are motivated mainly by a desire for the sensory properties of chocolate, which may originate largely from cognitive factors. The liking for the sensory properties could stem from an innate or acquired preference for the sweetness, texture, and aroma of chocolate, or it could relate to interactions between the effects of chocolate consumption and a person's state.

On the contrary, Gibson and Desmond (1999) proposed that craving for chocolate is an appetite acquired through repeatedly eating chocolate when hungry (GIBSON & DESMOND, 1999). In their study, they divided chocolate cravers and non-cravers into two groups: "hungry-trained" and "full-trained." Hungry-trained subjects ate chocolate only when hungry, while full-trained subjects ate it after meals. Interestingly, for both cravers and non-cravers who ate chocolate only when hungry, cravings actually increased after two weeks. This increase was observed when subjects rated their cravings while in a hungry state. Conversely, for those who ate chocolate after meals, cravings decreased regardless of their current hunger level. These findings suggest that craving for chocolate can be increased or established, by repeatedly eating chocolate when hungry, whereas when chocolate is eaten repeatedly only when full, craving can be significantly reduced.

Research on cue exposure and conditioned responses further supports learning-based explanations. Van Gucht et al. (2008) suggested that repeated exposure to chocolate cues reduced craving and salivation, suggesting potential therapeutic applications of cue exposure. Along the same lines of cue exposure and in examining chocolate craving as an addiction, Tuomisto et al. (1999) similarly demonstrated that individuals identifying as “chocolate addicts” experienced heightened cravings, emotional arousal, and increased consumption when exposed to chocolate cues, though without strong physiological markers such as elevated heart rate. These individuals also showed higher depression and disordered eating symptoms, paralleling findings by Macdiarmid and Hetherington (1995) that “chocolate addicts” reported more craving, guilt, and negative affect, with chocolate consumption failing to improve mood. Collectively, these results suggest that cue reactivity, emotional distress, and perceived addiction-like responses can intensify chocolate craving.

Chocolate craving also appears strongly connected with mood regulation, emotional eating, and personality features. Parker and Crawford (2007) showed that individuals experiencing depression often crave chocolate, believing it reduces anxiety or irritability; chocolate cravers scored higher in traits such as irritability, anxious worrying, and rejection sensitivity. These findings indicate that chocolate may serve as a comfort food for individuals prone to emotional dysregulation. Fletcher et al. (2007) similarly demonstrated that exposure to chocolate images induced stronger cravings and guilt among dieters, highlighting how dietary restraint amplifies the emotional complexity of chocolate desire. Macht and Mueller (2007) further differentiated emotional eaters—who showed increased cravings and chocolate consumption during emotional states—from restrained eaters, who reported heightened guilt and negative affect. Together, these studies underscore that emotional processes shape not only the intensity of chocolate cravings but also the feelings associated with eating chocolate.

Another theme involves the distinction between craving, emotional eating, and actual mood outcomes. According to Parker et al. (2006), chocolate “craving” and chocolate “emotional eating” are two different phenomena that can coexist, but any mood changes after chocolate consumption last very briefly (Parker et al., 2006). Chocolate,

due to its pleasant taste, can provide its own reward by satisfying cravings. However, when consumed as a comfort food or an emotional eating strategy, it is more likely to lengthen rather than stop a dysphoric mood. Any reported mood benefits of chocolate consumption were considered temporary.

Chocolate craving has also been linked to menstrual cycle fluctuations, though interpretations vary. Early research found that women commonly experience heightened chocolate cravings during the perimenstrual phase (Tomelleri & Grunewald, 1987; Rozin et al., 1991), suggesting a possible hormonal influence. However, more recent evidence challenges this explanation. Hormes and Rozin (2009) observed that although chocolate cravings decreased after menopause, the reduction was far smaller than expected if hormones were the primary cause. Cultural factors may play an important role, as Zellner et al. (2004) found that American women were far more likely than Spanish women to report perimenstrual chocolate cravings, pointing toward culturally learned associations rather than physiological necessity.

Research on gender, disordered eating, and psychosocial influences adds another layer to our understanding of chocolate craving. One study reported links between BMI, craving intensity, preoccupation with chocolate, and feelings of losing control around chocolate, with women generally reporting stronger cravings and more difficulty managing them than men (Sanlier et al., 2022). The authors also found that higher chocolate craving scores were associated with elevated EAT-26 scores, pointing to connections with disordered eating patterns. Other work offers a more gender-specific perspective. Hormes et al. (2014) found that men who identified as chocolate cravers tended to report more guilt about eating chocolate but showed fewer dieting behaviors and fewer symptoms of eating disorders than male non-cravers. This pattern differs from what is typically observed in women, for whom chocolate cravings are more closely linked to disordered eating. Together, these findings suggest that cultural and psychological factors may influence how cravings relate to eating-related risk, and that these dynamics may operate differently across genders.

Chocolate craving demonstrates the broader complexity of food craving, comprising of sensory pleasure, emotional regulation, and sociocultural conditioning. Research consistently identifies chocolate as the most commonly craved food, particularly

among women, and closely tied to emotional states such as stress, guilt, and anxiety (Rozin et al., 1991; Macdiarmid & Hetherington, 1995; Parker & Crawford, 2007). Although hormonal explanations have been proposed for perimenstrual chocolate craving, cross-cultural evidence suggests that these patterns are more likely rooted in cultural and psychological associations than in biological necessity (Zellner et al., 2004; Hormes & Rozin, 2010). Chocolate craving also mirrors the dynamics of addictive behavior, involving cue reactivity, loss of control, and mood-related reinforcement (Tuomisto et al., 1999; Fletcher et al., 2007). Taken together, these observations position chocolate as a useful case for understanding how gendered expectations, cultural narratives, and emotional states intersect to shape the experience of food craving.

4.5 Eating Behavior and Food Craving

Research in this area has focused on the manifestation of food craving in binge eaters or restraint eaters, based on the notion that these populations experience the phenomenon at its zenith. Others argue that food craving is a reflection of the biological need underlying the calorific restriction (Weingarten & Elston, 1990), whereas other suggest that the link between chronic dieting and increased cravings reflects mainly psychological deprivation rather than caloric restrictions (Polivy, 1996). Put another way, dieters try to avoid eating highly preferred but “fattening” foods and it may be the mere attempt to restrict the intake of desired foods that makes them even more attractive and unleashes craving (Polivy et al, 2005).

People deprived of a palatable, irreplaceable food such as chocolate, overate it when it became available to them, responding as they claimed to chocolate craving. However, this was not the case for a less liked food such as vanilla (Polivy, Coleman et al. 2005). Moreover, restrained eaters demonstrated greater desire, were more likely to eat the food they were deprived of and ate more of it compared to unrestrained eaters. This has led scientists to believe that deprivation causes craving and overeating in general, but its effects are more apparent in restrained eaters.

Supporting this findings, Fedoroff et al. 1997, also found that after exposure to food cues, restrained eaters ate more than unrestrained eaters, but there was no difference in food intake when there was no pre-exposure to the cues (Fedoroff, Polivy et al.

1997). The smell cue in particular evoked in restrained eaters a greater general desire to eat, whereas the thought cue had a significant impact on food intake and a slight influence on ratings of desire to eat and craving. These data agree with a model proposed for incentive-induced hunger according to which, while the mere presentation of food cues immediately prior to eating does not enhance intake, extended exposure to conditioned food related cues does increase food consumption (Weingarten, 1985). Similarly in the study, in the no cues condition, merely presenting palatable food to restrained eaters did not make them overeat, as when they were exposed to the food cues for some time prior to eating.

Continuing their work, Fedoroff et al 2003 examined whether the increased consumption in restrained eaters, reflects a general desire to eat in response to food cues, or a specific craving for the cued food (Fedoroff, Polivy et al. 2003). Results indicated that restrained eaters ate more only when the food presented to eat was the same with the one in the prior food cue, showing a highly specific desire for the cued food. In fact, their intake of a food different from the cued food was similar to their intake following no prior cue.

On the contrary, Hill et al. 1991 suggested that food craving is only weakly related to dietary restraint but highly and significantly correlated with external eating (eating in response to external food cues), emotional eating and susceptibility to hunger (Hill, Weaver et al. 1991). They suggested that food cravings are more likely to occur in the presence of a high food related stimulus, in negative mood states and in times of hunger, but are not only from dieting per se. Moreover, cravers craved and ate in response to negative mood states, such as boredom and anxiety and scored higher on “emotional eating”. They experienced more dysphoric mood states during the day, negative mood almost always preceded craving, and mood was influenced by the fulfillment of that craving. As such, mood was characterized both as an antecedent and as consequence of craving. These findings were also supported in another study by Hill et al 1994, who reported that food cravings are hunger-reducing, mood-improving experiences, directed at wanting to consume highly pleasant tasting food and can be triggered by the external cue of thinking of that food (Hill and Heaton-Brown 1994).

Along the same lines, Burton et al 2007 suggested that external eating is the principal predictor of cravings with its effect being greater in men than women but for different types of food; fast food fats, fats and carbohydrates in males, carbohydrates and sweet foods in females. Restrained eating and emotional eating were also associated with craving but again their effect was gender - depended and subject to the food type. Furthermore, the study demonstrated that craving correlated positively with BMI measures in both men and women, suggesting that food craving is an intervening causal variable between responsivity to environmental cues and the development of obesity.

Dicker-Oren et al. (2022) examined the relationship between food cravings, restrained eating, hunger, and negative emotions in daily life. The findings revealed that restrained eating appeared as a central predictor, influencing both food cravings and hunger, as well as negative emotions like sadness and loneliness. Interestingly, food cravings were also predicted by hunger and stress, with hunger additionally predicting feelings of loneliness. When examining simultaneous associations, the study identified links between food cravings, hunger, and boredom, while higher anger levels were associated with lower restrained eating. Notably, stress and sadness emerged as key negative emotions within the network (Dicker-Oren et al., 2022b).

In an attempt to evaluate the effects of energy restriction on food craving, a number of studies have focused on craving during a Very Low Calorie Diet (VLCD) and a Low Calorie Diet (LCD) (Lappalainen, Sjoden et al. 1990; Harvey, Wing et al. 1993; Martin, O'Neil et al. 2006). Data support that food craving decreases during either type of diet, with more distinct decreases in VLCD. Hence, oppositely to previous findings, calorific restriction of certain foods did not lead to craving for these foods but rather diminished food craving. However, Lappalainen et al. 1990 found that the frequency of hunger and craving responses and reactivity to food stimuli show parallel decreases during fasting, but no changes during dieting.

With a focus on the longitudinal changes, Gilhooly et al. 2007 also looked at possible changes in food cravings in response to 6 months energy restriction diets (Gilhooly, Das et al. 2007). In contrast to previous studies which found a decrease in food

cravings with intentional dieting (Lappalainen, Sjoden et al. 1990; Harvey, Wing et al. 1993; Martin, O'Neil et al. 2006), in this study cravings had similar frequency both at baseline and after 6 months of dieting. In fact, after 6 months of dieting, craving strength and frequency of giving in to cravings were positively related to hunger. Additionally, subjects who lost more weight, craved higher energy-dense foods at the end of the dieting period, but reported giving in to food cravings less frequently compared to those who lost a lower percentage of weight. According to the Authors, other studies used a monotonous food plan which has been shown to increase sensory-specific satiety and decrease the cephalic phase response to food (gastric secretion stimulated by sight, smell, thought or taste of food) and this itself could be a plausible cause of reduced cravings.

Kahathuduwa et al. (2017) focused on the relationship between calorie restriction and food cravings in obese individuals through a systematic review and meta-analysis. The analysis revealed a decrease in overall food cravings after calorie restriction, along with reductions in cravings for specific categories like sweets, high-fat foods, starches, and fast food. Interestingly, factors like baseline weight, intervention type, duration, sample size, and the proportion of female participants contributed to variations between studies. Despite this heterogeneity, the overall findings support that calorie restriction leads to a decrease in food cravings over time. (Kahathuduwa et al., 2017)

Another disordered type of eating behavior that has been associated with food craving is binge eating. According to Gendal et al. 1998, cravers who binge have higher BMI, more frequent diagnoses of bulimia nervosa, a higher level of dietary restraint, and lower self-directedness (unstable self-concept, inadequate coping skills, susceptibly to overeating in the presence of disinhibitors, impulsivity etc) compared to cravers that do not binge and are satisfied with a “normal” amount of the craved food. Actually, cravers who did not binge had similar eating behavior characteristics to people who do not experience craving, indicating that previous findings of high levels of dietary restraint in food cravers are likely to be attributable to a subgroup that binge eats (Gendall, Joyce et al. 1998).

As binge eating episodes are a classic symptom of bulimia, Waters et al 2001, examined the role of food craving and mood in binge eating episodes of bulimic patients (Waters, Hill et al. 2001). Food craving episodes leading to a binge were associated with higher tension, lower mood and lower hunger than those not leading to a binge. Moreover, when a craving was followed by a binge, it resulted to further worsening of mood, whereas, when the craving did not lead to a binge, mood improved significantly. In the Authors attempt to explain these findings, they propose that mood improves when the craving does not result to binge, since the blocking of negative emotional state (bingeing in this case) can be highly reinforcing. They also advocate that, to justify bingeing in high tension, one should look at food craving as a motivational state associated with a strong desire for a positive outcome, which will offer relief from the aversive state (classical conditioning). Thus, in response to the craving and in order to obtain relief from tension (aversive state), they initiate bingeing. Finally, as they suggest, the reduction in hunger during binges that are associated with craving and affect, might be explained through the “escape” mechanism proposed by Heatherton and Baumeister (1991). Ego-threats result in both negative affect and a narrowing of attention and this has been linked with a reduction in awareness of internal states. Thus, the ego-threat cognitions that drive negative affect (and hence binges) are likely to reduce general internal awareness, including one’s perceived level of hunger.

Binge eating has also been linked with Polycystic Ovary Syndrome (PCOS) in women. Jeanes et al. (2017) investigated the prevalence of binge eating behaviors and food cravings in women with PCOS. The results revealed that food cravings, emotional eating, and body mass index were significant factors contributing to binge eating in women with PCOS. In fact, over 60% of obese women with PCOS classified as binge eaters and these women had the highest craving scores. Lean women with PCOS exhibited similar food cravings to healthy controls, however they had higher binge eating symptoms, suggesting a potential distinction between craving and binge eating behaviors (Jeanes et al., 2017).

The evidence reviewed in this section emphasizes the strong association between food craving and maladaptive eating patterns such as restraint, disinhibition, and binge eating. Individuals who consciously restrict their diet or engage in emotional eating

tend to experience stronger cravings and are more susceptible to overeating when exposed to food cues (Polivy et al., 2005; Fedoroff et al., 1997; Hill et al., 1991; Burton et al., 2007). This suggests that psychological deprivation and environmental stimulation play a more decisive role than physiological hunger. Moreover, food craving has been directly linked with binge eating disorder, higher BMI, and emotional dysregulation, as seen in both clinical and nonclinical populations (Gendall et al., 1998; Waters et al., 2001; Dicker-Oren et al., 2022). Even under calorie restriction, changes in craving patterns reflect complex adaptive mechanisms rather than simple deprivation effects (Kahathuduwa et al., 2017; Gilhooly et al., 2007). These findings underscore the relevance of studying craving as both a cause and consequence of problematic eating behaviors and support the broader objective of understanding how craving may serve as a psychological bridge between environmental influences, emotional states, and the development of food addiction.

4.6 Mental Imagery in Food Craving

More recent work has focused at craving induced by mental imagery of the desired food. The elaborated intrusion theory of desire claims that cravings begin with an intrusive thought about a particular food, which, if elaborated upon with vivid mental images, intensifies the craving (Kavanagh, Andrade et al. 2005). Based on the intrusion theory of desire (Kavanagh, Andrade et al. 2005), researchers have examined whether simply imagining or smelling a food item can elicit craving (Harvey, Kemps et al. 2005; Tiggemann and Kemps 2005) and whether visuo-spatial working memory-based techniques are able to reduce these cravings (Kemps, Tiggemann et al. 2004; Kemps, Tiggemann et al. 2005; McClelland, Kemps et al. 2006; Steel, Kemps et al. 2006; Kemps and Tiggemann 2007).

Schumacher et al. (2019b) examined the two-stage model of food cravings proposed by the Elaborated-Intrusion Theory, i.e cravings begin with thinking about the food and then if the thought is pleasant, it progresses to a vivid mental imagery. The findings revealed that only about a third of participants reported initial craving thoughts, while roughly half reported experiencing vivid mental imagery related to the craving. Imagery played a stronger role in predicting craving intensity compared to initial thoughts. However, neither thoughts nor imagery directly predicted whether someone would actually consume the craved food. The authors suggest that recognizing the initial

craving thought as simply a thought and not acting upon it was identified as a successful strategy for resisting cravings. (Schumacher et al., 2019b).

Zorjan and Schienle (2023) also investigated the role of mental imagery and craving intensity but focused on the effect on food consumption. The results support that cravings for specific foods were more likely to translate into actual consumption when accompanied by intense cravings and vivid mental imagery of the food, two hours prior to eating. Interestingly, the study also revealed evidence of self-control, as participants only consumed the craved food in about 38% of the case. The authors suggest that the craving-consumption link might be stronger in individuals with difficulties controlling their eating behavior (Zorjan & Schienle, 2023).

Data support that craving intensity increases following instructions to imagine a food induction scenario. In fact, the higher the vividness ratings of the imagined substance were, the higher was the level of craving of the desired food (Harvey, Kemps et al. 2005; Tiggemann and Kemps 2005; McClelland, Kemps et al. 2006; Kemps and Tiggemann 2007). The sensory modalities most involved in craving were visual (39.7%) and gustatory (30.6%) followed by olfactory (15.8%) (Tiggemann and Kemps 2005). As such, mental imagery seems to be a central feature of food craving, and as supported by Harvey et al. 2005 and Tiggemann & Kemps 2005, the stimulus of this imagery is primarily visual.

On the contrary, visuospatial tasks, such as saccadic eye movements, dynamic visual noise, or spatial tapping, have been shown to result in reduction of food cravings induced by imagery. The tasks reduced vividness and desire for the craved food, regardless of whether subjects were dieters or non-dieters and cravers or non-cravers (Kemps, Tiggemann et al. 2004; Kemps, Tiggemann et al. 2005). The effectiveness of the tasks was not influenced by imaging ability and habitual food craving (McClelland, Kemps et al. 2006) and was irrespective of hunger status, even though hungry subjects reported stronger food cravings (Steel, Kemps et al. 2006). Hence, visuospatial tasks could provide an effective mechanism in the management of food cravings that are psychological in origin, as well as those that are hunger-driven. Additionally, visual and olfactory imagery tasks were superior to auditory tasks in reducing food cravings, indicating that the obstruction of food craving is greater from tasks that introduce competing information in the same sensory modalities (visual &

olfactory) as those in which desire-related food images primarily occur (Kemps and Tiggemann 2007; Kemps and Tiggemann 2009).

A study by Shahriari et al. (2019b) explored the impact of different sensory imagery types (visual, smell, taste, sound) on food cravings, and how overall sensory vividness and perceived food availability moderate this effect. The findings again confirmed the elaborated intrusion theory as they revealed that visual imagery was the strongest trigger for food cravings, followed by smell, taste, and sound imagery. Interestingly, cravings were stronger if participants believed the food was readily available. Hunger, but not mood, was found to increase susceptibility to cravings and craving intensity positively influenced participants' willingness to pay and intended food intake (Shahriari et al., 2019b).

Research by Patel et al. (2015) investigated the link between body mass index (BMI) and mental imagery, specifically focusing on food and odor imagery. The analysis revealed a positive correlation between BMI and the perceived ability to vividly image odors and food, but not visual objects. Interestingly, odor imagery was the strongest single predictor of BMI. These findings suggest that a heightened ability to vividly imagine odors, particularly food smells, might be a contributing factor to the increased food cravings and reactivity to food cues observed in obese individuals (Patel et al., 2015).

Research on mental imagery highlights the cognitive basis of food craving, supporting the Elaborated Intrusion Theory of Desire, which proposes that cravings begin with intrusive thoughts and intensify through vivid sensory imagery (Kavanagh et al., 2005). Studies show that visual and olfactory imagery are the strongest predictors of craving intensity (Harvey et al., 2005; Tiggemann & Kemps, 2005; Shahriari et al., 2019b), while visuospatial distraction tasks can effectively reduce cravings (Kemps & Tiggemann, 2007). Individual differences, such as higher BMI being linked to stronger odor imagery, further illustrate the connection between imagery and overeating tendencies (Patel et al., 2015). These findings underscore craving as a cognitive-emotional process that may contribute to maladaptive eating behaviors and food addiction, aligning with this study’s aim to explore psychological mechanisms underlying food cravings across different populations.

4.7 Cultural Differences on Eating Between British and Greek Cypriots

Understanding cultural variation in eating behaviours is essential for understanding differences in food cravings across populations. Food cravings arise from physiological, psychological, and environmental triggers, many of which are shaped by the cultural food environment. The comparison between Greek Cypriots and British individuals is therefore theoretically meaningful because these populations differ substantially in their levels of exposure to ultra-processed foods (UPFs), their eating traditions, the social meaning of food, and food advertising environments; all of which may influence craving frequency, intensity, and food types craved.

UPFs are designed to be hyper-palatable, energy-dense, and rewarding, making them strongly associated with craving responses (Monteiro et al., 2018). The United Kingdom consistently ranks among the highest UPF-consuming nations in Europe. Adults obtain approximately 56–57% of their total energy intake from UPFs (Rauber et al., 2019), and adolescents exceed 65% (Mouzaki et al., 2024). This reflects a food environment heavily structured around ready meals, snack foods, and packaged products.

In contrast, Cyprus demonstrates substantially lower UPF exposure, with UPFs accounting for approximately 18–40% of total energy intake depending on age group (Hadjimbei et al., 2020; Naska, 2022). Although UPFs are becoming more common, traditional dietary habits remain influential, reducing overall consumption relative to the UK. These environmental differences are particularly relevant because higher UPF intake is associated with increased craving frequency and heightened reward-driven eating (Hall et al., 2019).

The Mediterranean diet was inscribed on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity in 2010, recognising it as not only a healthy dietary pattern but a cultural lifestyle encompassing hospitality, community bonding, seasonality, and a close relationship with local resources (UNESCO, 2010). These traditions may shape craving patterns by linking food desires to fresh, culturally meaningful, and sensory-rich foods rather than hyper-processed items. Cypriot eating patterns are in fact embedded in the Mediterranean diet, characterized by fresh, local

ingredients such as fruits, vegetables, legumes, grains, herbs, and olive oil (Hatzis, 2011). Meals often include meze—large platters of many small dishes—emphasizing abundance, variety, and shared social experience. Lunch and dinner tend to occur late in the day and are frequently long, communal meals.

Food holds significant social and cultural value in Cyprus. As locals usually note, *"anything of any importance in Cyprus always happens around food."* This cultural significance is evident in family gatherings centred on elaborate meals, celebrations featuring traditional dishes, hospitality expressed through abundant food offerings and community events structured around shared dining.

UK eating patterns differ markedly. While traditional mealtimes such as breakfast, lunch, afternoon tea, and dinner remain culturally recognized, modern British eating behaviour is characterised by flexibility, time constraints, and convenience reliance (Maguire & Monsivais, 2020). Many individuals skip meals, especially breakfast, and increasingly replace sit-down meals with snacking or ready-to-eat foods. A notable behavioural trend is the normalisation of eating while distracted, particularly dinner consumed in front of screens, which is linked to reduced satiety awareness and increased snacking (Caraher & Coveney, 2004). The UK also exhibits high rates of snacking, with crisps, confectionery, biscuits, and baked goods contributing substantially to daily energy intake. These items tend to be high in sugar, saturated fat, and salt—nutritional profiles strongly associated with reward-driven eating and cravings (Boswell & Kober, 2016b). Nutrition surveys show that most British adults do not meet the "five-a-day" fruit and vegetable recommendation, often due to cost, availability, and time limitations (Public Health England, 2019). Saturated fat, salt, and added sugar intakes remain above recommended levels. Convenience foods are deeply embedded in everyday life: the UK has one of Europe's largest ready-meal markets, and supermarket "meal deals" (sandwich + snack + sugary drink) are common lunch substitutes.

A further key difference between the two cultures lies in the visibility and marketing of foods, which directly influences craving triggers. In the United Kingdom, food advertising is heavily dominated by ultra-processed and high-calorie products,

including fast food, sugary drinks, chocolates, confectionery, and packaged snacks (Boyland et al., 2016). Such advertising is pervasive across television, social media, transport systems, billboards, and digital platforms. Exposure to these advertisements is known to increase both immediate food intake and craving intensity. In Cyprus, although food advertising is present, it places comparatively more emphasis on traditional dishes, fresh foods, and local ingredients, and exhibits less saturation of UPF-focused marketing (Filippou, 2018). Traditional foods remain more culturally visible and socially celebrated, reducing exposure to the types of food cues that typically trigger cravings for highly palatable processed products. This advertising contrast reinforces broader cultural differences in food environments and helps explain potential variations in craving patterns.

Together the above factors suggest that the comparison between Greek Cypriots and British individuals is justified by meaningful differences in their dietary cultures and food environments. The United Kingdom exhibits substantially higher levels of ultra-processed food (UPF) consumption, a convenience-oriented food culture, and pervasive UPF-focused advertising, whereas Cyprus is characterised by a more communal Mediterranean eating tradition, greater reliance on fresh produce, and culturally embedded meal practices. These differences extend to meal structure, snacking behaviours, and overall nutritional challenges, with British patterns aligning more closely with a modern Western diet while Cypriot habits reflect traditional Mediterranean principles. Because such cultural and environmental factors seem to contribute to the onset, frequency, and type of food cravings, comparing these two populations provides valuable insight into how cultural context influences the experience and expression of cravings.

5. Literature Review Conclusions

As the literature review has shown, further research into food craving has proved important for a number of reasons. Primarily because, even though it seems to be a normative phenomenon, it has been associated with a few pathological phenomena such as obesity, bulimia and binge eating. Moreover, further research is essential as scientists believe that compulsive overeating is adequately similar to conventional

substance dependence to even justify its inclusion as an addiction disorder (Davis and Carter 2009). The majority of the similarities between food overconsumption and substances abuse concern analogies between drug and food craving (Pelchat 2009). Given the above, investigating food craving will aid researchers and clinicians to understand, identify and offer the necessary support to food cravers / addicts.

The lack of a well-structured definition of food craving threatens the results of previous research on the subject as it generates a number of complications in its measurement and observation. Relying on participants subjective understanding of the term does not guarantee that what is being examined is in fact food craving or a simple desire and liking of a specific food. Given that the scarce cross-cultural studies have proved a difference in food craving between two different countries (Zellner, Garriga-Trillo et al. 1999; Parker, Kamel et al. 2003; Osman and Sobal 2006), the lack of definition creates even bigger implications in cultures were the translation of food craving is not possible in just a few words, such as in Greek Cypriot Dialect. In fact, most languages outside of English lack a fully equivalent translation of the term “craving” as based on automated translations, 64% of the 25 studied languages have a craving synonym, and based on native speaker, only 17% of 20 studied languages lexicalize craving (Hormes & Niemiec, 2017; Hormes & Rozin, 2010).

Another well-defined gap is the need for more extensive research on male population. The majority of the studies have focused on women subjects, mainly because it has been shown that they report food cravings more frequently than men, but probably also because women are more willing to discuss the subject. The few studies comparing gender characteristics in food craving, have confirmed a number of differences such as type of food craved, frequency and preceding mood (Pelchat 1997; Zellner, Garriga-Trillo et al. 1999; Christensen and Pettijohn 2001; Lafay, Thomas et al. 2001; Cepeda-Benito, Fernandez et al. 2003; Osman and Sobal 2006), which justifies the necessity of more and larger scale cross gender research.

Moreover, even though the relation of mood and food craving is one of the most frequently studied features of the phenomenon, results are controversial. There is a universal acceptance that negative mood may induce craving, however, it is not clear

if indulging in the craving is favorable or not. Some are in support of a positive effect on mood post consumption, (Hill and Heaton-Brown 1994) while others report negative effects (Macdiarmid and Hetherington 1995) due to feelings of guilt. In addition, cravers have demonstrated different personality profiles than non-cravers with higher levels of guilt, depression, external and emotional eating, low self-directedness, hunger susceptibility and disinhibition (Gendall, Joyce et al. 1998); (Gilhooly, Das et al. 2007). Given the above, the psychological profile of cravers and especially their mood, needs further study.

Restrained eating and chronic dieting have also been put under the microscope of researchers, who tried to identify whether the phenomenon could be explained through nutrient or psychological deprivation. However, conclusions were once again controversial. Some suggest that restrained eaters in comparison to unrestrained eaters have more frequent food cravings and are more sensitive and reactive to food cues (Polivy et al. 2005; Fedoroff et al. 1997). Extreme dietary restriction on the other hand, such as in Very Low Calorie Diets (VLCD), was proved to decrease food craving (Harvey et al. 1993; Martin et al. 2006; (Lappalainen, Sjoden et al. 1990). However Gilhooly et al.2007 found no difference in food craving after dieting and attributed this to the less monotonous diet that was followed by the participants. Once again the controversial findings of this area confirm that the phenomenon requires further investigation.

Additionally, the literature demonstrates that British and Greek Cypriot populations specifically, differ substantially in their food environments, cultural eating practices, and exposure to craving-relevant cues. Greek Cypriot dietary patterns are deeply rooted in the Mediterranean tradition, emphasising fresh, minimally processed foods, seasonal produce, and communal eating practices that foster regulated, socially meaningful relationships with food (Hatzis et al., 2011; UNESCO, 2010). In contrast, British eating patterns are increasingly characterised by convenience-driven behaviours, frequent snacking, irregular meal structures, and high consumption of ultra-processed foods (UPFs), which contribute over half of daily energy intake (Maguire & Monsivais, 2020; Rauber et al., 2019). This is notable given that UPFs are designed to be highly palatable and are strongly associated with increased cravings and reward-driven eating (Monteiro et al., 2018; Hall et al., 2019). Moreover, the UK

food environment is shaped by pervasive advertising of calorie-dense, ultra-processed products—an exposure shown to increase craving intensity and food intake (Boyland et al., 2016)—whereas Cyprus shows greater cultural visibility of traditional foods and lower UPF market saturation (Filippou et al., 2018; Hadjimbei et al., 2020). Collectively, these cultural and environmental differences are likely to influence the frequency, type, and meaning of food cravings across these two populations.

Taken together, these observations highlight significant gaps in our understanding of food cravings and raise important conceptual and empirical questions. Despite extensive research, there is still no universally accepted definition of “craving,” and some cultures—such as Greek Cypriots—do not have an exact word for the term. This raises fundamental issues regarding how cravings are identified, experienced, and reported across cultural groups. It also prompts broader questions: What exactly are researchers measuring when they assess cravings? If cravings do exist as a psychological and physiological phenomenon, why do individuals from different cultural backgrounds—and even different genders within the same culture—crave distinct types of foods? To what extent are cravings driven by biology, and to what extent are they shaped by cultural norms, emotional states, and environmental cues? Furthermore, why do individuals differ so much in how they feel before, during, and after a craving episode, and why do people who identify as frequent “cravers” tend to display different psychological and behavioural profiles than those who do not? These unanswered questions underscore the need for further culturally informed research. The current research was developed in direct response to these gaps, aiming to clarify how cravings are conceptualised and experienced across British and Greek Cypriot populations, and to advance understanding of the cultural, emotional, and gender-based mechanisms underlying this complex phenomenon.

Methods Used in Food Craving Research

1. Critique of Methods Used in Other Studies

Although food craving is receiving increased attention from researchers in recent years, this has not always been the case. As such, studies done on the subject from a bio-psychological view are scarce and the methods used are only a handful. The most common method of assessing food craving is self-reporting with the use of questionnaires or frequency reports. Self-report studies are able to study a large sample of people and a large number of variables relatively easy and can be carried out quite cheaply. However, people may not respond accurately either because they cannot remember or because they are exaggerating or embarrassed.

The measurement of food cravings has often been limited to asking participants one or various combinations of questions, such as whether, where, when, what, how often, and with what intensity cravings are experienced (Bancroft, Cook et al. 1988; Harvey, Wing et al. 1993; Macdiarmid and Hetherington 1995; Schlundt, Virts et al. 1993). Weingarten and Elston 1991 investigated the prevalence and food types of cravings by adding an open-ended question about what feelings subjects had after consuming craved foods, as well as two questions about whether food items other than the craved food would satisfy specific cravings and how often cravings lead to seeking and eating the desired food. Hill and Heaton-Brown 1994, developed a food-craving record with added questions to detect what contextual and sensory cues, feelings and intensities of hunger were associated with the experience of cravings. Gendall and her colleagues (Gendall, Joyce, et al., 1997; Gendall, Sullivan, et al.,1997; Gendall, Joyce, Sullivan, & Bulik, 1998) have developed a craving questionnaire that combines and refines the measurement of several of the dimensions assessed by the questionnaires described above.

In order to assess cravings as a psychological state in response to specific situations and to measure how cravings are manifested in a given population, Cepeda-Benito et al. 2000, developed two different instruments: the Food Cravings Questionnaire-State (FCQ-S) and the Food Cravings Questionnaire-Trait (FCQ-T). The FCQ-T is available in Dutch (Franken & Muris, 2005), English (Cepeda-Benito, Gleaves, Williams et al.), and Spanish (Cepeda-Benito, Gleaves, Fernandez et al.). Research has shown that the scores of the FCQ-T have been reliable and have passed many discriminant and

construct validity tests (e.g., Cepeda-Benito, Fernandez, & Moreno, 2003). However, as the authors note, it is possible that not all dimensions of food craving are adequately addressed and assessed in these questionnaires (Cepeda-Benito et al. 2000).

Another frequently administered self-reporting tool is the Food Craving Inventory (FCI), which was developed by White et al., 2002. Because previous research suggested that individuals crave particular classes of foods, the FCI was designed to measure the frequency of cravings for specific foods (high fats, carbohydrates/starches, sweets, and fast-food fats). This instrument was found to be a psychometrically valid self-report measure of specific food cravings, however, as the creators note, when using FCI one should take into consideration that food craving may be conditioned to cultural and geographical factors and as such certain amendments may be needed. Nevertheless, the FCI has also been adapted to Hispanic and Japanese samples with good reliability and validity scores (Perez Siwik and Senf, 2006; Komatsu 2008).

A different technique used to assess food craving is the measurement of excreted salivation, based on the notion that the presentation of a desired food item elicits salivary flow (Tuomisto, Hetherington et al. 1999; Van Gucht, Vansteenwegen et al. 2008). The mechanism of saliva release is complex since it involves an interaction between the sympathetic and parasympathetic system with potential influences from the surrounding myoepithelial cells (Bradley, 1991). According to Mattes 2000, cognitive cues as well as stimulation of the external sensory systems (such as sight, sound, olfaction and taste) are effective stimulus for salivation (Mattes 2000). However one should take into account that one function of saliva is to clear undesirable substances from the mouth and as such saliva flow rate can be increased when presented with unpalatable, bitter or dry foods, or foods that are difficult to clear from the mouth (Guinard and Brun 1998). Furthermore, repeated olfactory and gustatory stimulation lead to reduced salivation (Epstein, Paluch et al. 1996).

In order to assess dietary consumption in relation to food craving, researchers have used almost all of the available tools: 24h dietary recalls, food diaries and food frequency questionnaires (van der Ster Wallin et al., 1994; Krauchi et al., 1988; Waters et al., 2001; Gilhooly et al., 2007; Hill et al., 1991). Dietary recalls ask subjects to list the foods they have consumed the preceding 24h. They can be completed relatively

quickly, however individuals may forget foods they have consumed and it's not considered adequate for measuring an individual's usual diet, as day-to-day consumption may differ considerably (Gersovitz, Madden et al. 1978). Nevertheless, simple 24h recalls have compared surprisingly well with weighted food records (Bingham, Gill et al. 1994). Food diaries ask subjects to record their intake as they eat and are usually complete over a period of time (3-7 days). This creates a burden on the participants, and subjects may alter their diets to simplify their records or not record their actual intake (Sempos, Johnson et al. 1985). Food frequency questionnaires focus on usual intake and subjects respond to questions regarding the frequency of intake of each food from a list of foods, over a certain period. They can be easily administered; however if a food item that contributes significantly to a subject's diet is not listed, the questionnaire may not provide an adequate information (Potosky, Block et al. 1990). A common disadvantage of all three methods is that responses may be biased by the subject's perception of what constitutes an appropriate diet. Furthermore, portion size overestimation or underestimation has been observed in all methods of food intake assessment (Freudenheim 1993).

2. Current Research Value

Given the similarities between drug use and eating and the scientific notion of identifying overeating as an addiction disorder, the value of understanding the craving or desire for a specific food becomes evident. Food craving has over the years been associated with a number of unhealthy situations such as Binge Eating (Gendall, Joyce et al. 1998), higher body mass index (BMI) and noncompliance with dietary restrictions (Pelchat 1997). Moreover, the high prevalence rates of food cravings suggest that it is a normative rather than a pathological phenomenon. Most of the individuals studied (52-97%) report to have experienced a craving for a certain food (Gendall et al 1997a, Gendall et al. 1997B, Weingarten & Elston 1991, Christensen & Petijohn, 2001, Pelchat, 1997). Additionally, individuals have been recorded to indulge in the craved food, in 8 out of 10 craving episodes (Weingarten, 1991). Differences have been noted in the types of foods craved according to gender, age, hunger state, time of day, and phase of the menstrual cycle (Gendall et al, 1997, Pelchat, 1997).

Even though the subject of food craving has been receiving increased attention in recent years, the studies and information on the subject are still only few. The

published work so far, has mainly focused on women, possibly since they are an easier approachable sample on the subject. This has limited the evaluation of the phenomenon in reference to differences between the two genders. Moreover, the majority of the studies have been conducted using samples from USA (Macdiarmid and Hetherington 1995; Pelchat 1997; Christensen and Pettijohn 2001; Waters, Hill et al. 2001; Cepeda-Benito, Fernandez et al. 2003; Fedoroff, Polivy et al. 2003 etc.; Zellner, Garriga-Trillo et al. 2004; Martin, O'Neil et al. 2006) and cross-cultural research is scarce (Parker et al 2003, Zellner et al 1999, Komatsu 2007). Although the word craving does not exist in all languages, a literature search revealed only the Parker et al. 2003 study partly addressing this issue.

Furthermore, a large volume of the research on the area is focusing on the physiological origins of the phenomenon without reaching a clear commonly acceptable physiological mechanism. As scientists suggest, this may be the mere result of overlooking evidence which is inconsistent at first glance with the view that the body asks what it needs (Hill, 2007; Weingarten, 1990). It is thus apparent that the study of food craving between men and women among different cultures and in relation to other environmental factors will add new information on the available knowledge on the subject. This new knowledge could be then used to better understand the possible origins of food addiction and overcome health issues related to food craving such as disordered eating, chronic dieting and obesity.

3. Current Research Objective

As indicated through the Literature Review, food cravings are increasingly recognized for their connection to pathological conditions such as obesity, bulimia, and binge eating. Some researchers even equate compulsive overeating to addiction disorders (Davis & Carter, 2009), with analogies drawn between drug and food cravings (Pelchat, 2009). Understanding food cravings is essential for developing interventions to support individuals struggling with overeating and related conditions.

However, the lack of a standardized definition of food cravings complicates existing research. Relying on participants' subjective understanding makes it unclear whether food cravings or simple desires are being studied. This issue is particularly evident in cross-cultural research, where languages like Greek Cypriot dialect lack a direct term

for "food craving." Prior studies have identified cultural differences in cravings (Zellner et al., 1999; Parker et al., 2003), underscoring the need for further investigation.

Moreover, the underrepresentation of male participants in food craving studies leaves an incomplete picture. While women tend to report cravings more frequently, research comparing genders has found significant differences in the types of food craved, the frequency of cravings, and the emotions tied to them (Pelchat, 1997; Zellner et al., 1999). More balanced research is needed to fully understand these differences.

The link between mood and food cravings also remains contentious. While negative mood is known to trigger cravings, its impact on mood post-consumption is unclear, with some studies reporting positive effects (Hill & Heaton-Brown, 1994) and others noting feelings of guilt (Macdiarmid & Hetherington, 1995). Cravers have been shown to exhibit distinct psychological profiles, including higher guilt, depression, and emotional eating (Gendall et al., 1998; Gilhooly et al., 2007), suggesting that the emotional dimension of food cravings requires further study.

Given these gaps, this research aims to explore food cravings across British and Greek Cypriot populations, focusing on cultural, gender, and psychological factors. Study I investigated how food cravings are understood and experienced in these cultures, including whether Greek Cypriots experience cravings without a specific word for it. Gender differences will also be examined. Study II explored the relationship between food cravings, mood, and eating behaviors, considering cultural influences. This research aimed to provide a comprehensive understanding of the phenomenon and may contribute to developing targeted dietary interventions.

4. Current Research Design

This research took a comparative approach to understanding food cravings:

- Cross-cultural: It involved participants from different cultures (i.e., British and Greek Cypriot) to see if cravings are universal or influenced by cultural background.
- Gender comparison: The study compared food cravings between male and female participants, exploring whether gender differences influence the frequency, type, or intensity of cravings.

- Mixed methods: It combined quantitative and qualitative methods. Quantitative methods (like likert scale or closed type questionnes) provided precise data, while qualitative methods (like open ended questions) offered deeper insights into participants' experiences.

This combination aimed to capture a more complete picture of food cravings than either approach could achieve on its own.

Cross-cultural research is essential in understanding the universality or cultural specificity of phenomena such as food craving (Hormes, 2010). This approach allows researchers to explore whether certain behaviors or experiences are consistent across different cultures or if they vary significantly based on cultural norms, values, and practices. By comparing findings from diverse cultural contexts, researchers can identify underlying similarities and differences, contributing to a more comprehensive understanding of the phenomenon.

The main difficulties faced due to the cross-cultural character of the research were the language barrier and the possible cultural nuances. The language barrier is one of the primary challenges in cross-cultural research and is the potential for misinterpretation or misunderstanding due to language differences (Pelzang, & Hutchinson, 2018). To address this, participants in the Greek Cypriot sample were chosen from those fluent in English, ensuring that language proficiency did not hinder communication or data collection. The cultural nuances observed in research findings may not solely reflect cultural variations but could be influenced by other factors such as education, sex, or socioeconomic status. To mitigate this, efforts were made to control for extraneous variables by selecting participants with similar educational backgrounds, age and gender representation across groups.

The use of mixed methods aimed to overcome the limitations of a single design. Together quantitative and qualitative data provide both precise measurement and generalizability of quantitative research and the in-depth, complex picture of qualitative research. Mixed methods research combines quantitative and qualitative data collection and analysis techniques to gain a more comprehensive understanding of complex phenomena (Schoonenboom & Johnson, 2017).

According to Wasti et al 2022, the mixed method approach offers several strengths and weaknesses:

Strengths:

- Provides a holistic view: Combining quantitative and qualitative data allows exploration of multiple dimensions of a phenomenon, providing a richer understanding.

- Enhances validity: Using data from different sources strengthens the validity of findings and interpretations.

- Supports theory development: Qualitative data can help generate hypotheses or theories, which can then be tested quantitatively.

- Complements weaknesses: Each method compensates for the limitations of the other, leading to a more robust research design.

Weaknesses:

- Time-consuming: Conducting both quantitative and qualitative phases of research can be resource-intensive and time-consuming.

- Data integration challenges: Integrating data from different sources and methods requires careful consideration to ensure coherence and consistency.

- Complexity: Mixed methods research is more complex to design, implement, and analyze compared to single-method approaches.

5. Methods Used in Current Research

The present research employed two distinct methodologies to investigate the phenomenon of food craving: Study I utilized a questionnaire-based approach, while Study II adopted a mixed-methods design integrating questionnaire responses with 24-hour dietary recall diaries and the International Positive and Negative Affect Schedule Short-Form (I-PANAS-SF). Ethical approval was obtained from the University's Ethic's Committee for both studies. In both studies participants were recruited recruited from online university and social network forums, and they completed an online survey incorporating various components.

In Study I, a questionnaire was developed to measure participants' comprehension of the terms "craving" and "food craving," as well as the type, frequency, and intensity of their cravings. The questionnaire comprised three open-ended questions prompting participants to offer their own definitions of craving and food craving, and to specify

their most craved food or food type. The questionnaire underwent initial testing with British and Greek Cypriot participants, with subsequent revisions leading to the final version administered online.

Qualitative coding techniques were used to analyze the open-ended questions. Responses were categorized based on emerging themes and patterns (e.g., desire, need). Quantitative data from the Likert scales were analyzed statistically to assess food craving frequency and intensity across the different nationality and sex groups.

In Study II, participants provided demographic information, including age, nationality, weight, and height to determine Body Mass Index (BMI) and were then instructed to record all food and drink consumed the previous day in a 24-hour recall diary, which included four meals (breakfast, lunch, dinner, and snacks) and a visual hand guide for portion sizes. Following this, participants were presented with the definition of food craving and responded to questions about the frequency of experiencing cravings, types of food craved, and current dieting status.

For participants reporting food cravings the previous day, additional questions were posed regarding the specific foods craved, activities during cravings, and completion of the I-PANAS-SF to assess affective states. For those not reporting food cravings, the I-PANAS-SF was completed to gauge affective states during hypothetical craving situations.

Responses to open-ended questions underwent qualitative coding to identify emerging themes or patterns. Furthermore, 24-hour recall diary entries were analyzed using nutritional analysis software to calculate the caloric and macronutrient content of recorded meals, considering potential limitations such as participant memory and reporting accuracy. Additionally, the lack of established I-PANAS-SF mean scores for Cyprus limits generalizability of the negative affect data for this population.

The combination of the two studies allowed for a comprehensive exploration of food craving phenomenon, encompassing participants' subjective experiences, dietary behaviors, and affective states. These methodological approaches offer valuable insights into the complexity of food cravings and contribute to a deeper understanding of their psychological and physiological underpinnings.

1st Study: Food Craving Understanding, Gender and Culture

1. Introduction

Given the importance of culture in food craving, the absence of a global definition of the phenomenon and the lack of a single word adequately describing food craving in Cypriot dialect, this study was created to investigate the cross-cultural nature of food cravings by comparing experiences between British and Greek Cypriot populations.

2. Objective

The objective of this study was to investigate the cross-cultural nature of the experience of food craving and, if confirmed, to identify potential cultural influences on food cravings. Given the absence of a single Cypriot dialect word exclusively denoting food cravings, it was crucial to ensure that the definition and comprehension of craving, in general, and food craving, in particular, were consistent for both British (BR) and Greek Cypriot (GCY) participants.

The study also conducted a comparative analysis of the type, frequency, and intensity of food cravings between a sample of British participants and a sample of Greek Cypriot normal eaters. Additionally, the research explored potential variations in craving patterns between male and female respondents.

3. Method

Participants

A total of 436 participants were initially recruited through academic and professional mailing lists, social media platforms (e.g., Facebook), and the Sheffield Hallam University Online Research Participation System (SONA). Participation was voluntary, and individuals recruited via SONA received course credits that could be used either as bonus points or to fulfil programme requirements. A summary report of the study was made available to all participants upon request.

Inclusion criteria required participants to be at least 18 years old and to self-identify as either British or Greek Cypriot. Demographic information collected included age,

gender, nationality, and ethnicity. Responses were screened for completeness, and cases with missing data were excluded from analysis.

Participants were approached through a combination of channels, including SONA, relevant academic and professional mailing lists, snowball sampling via participant referrals, and posts on social media platforms such as Facebook. These methods were used concurrently to broaden the reach of the study and facilitate access to individuals with varying backgrounds. Most Greek Cypriot participants were fluent in English, which is widely taught from early primary education and commonly used in both educational and everyday settings in Cyprus (Cambridge University Press, 2022; Ministry of Education, Culture, Sport and Youth, 2024), which facilitated their participation in an English-medium study.

Design

This study employed a questionnaire design to explore how food cravings are understood and experienced across two cultural groups (British and Greek Cypriot). The primary variables of interest were participants' conceptual understanding of "craving" and "food craving," and the self-reported frequency, intensity, and types of foods craved.

Materials

A Food Craving Comprehension Questionnaire was developed for this study to assess participants' understanding and experiences of food cravings. The questionnaire was informed by the Food Cravings Inventory (FCI; White, Whisenhunt, Williamson, Greenway, & Netemeyer, 2002) but adapted to capture both the conceptual definition and cultural interpretation of food craving. The original Food Cravings Inventory (FCI; White et al., 2002) is a 28-item self-report measure assessing the frequency of cravings across four categories: high-fat foods, sweets, carbohydrates/starches, and fast-food fats. Participants rate each item on a 5-point Likert scale from Never to Always, providing a standardized measure of craving frequency and food type.

In contrast, the present study developed a questionnaire to capture both the conceptual understanding and subjective experience of food cravings rather than solely their frequency. It included three open-ended questions inviting participants to define craving and food craving in their own words and to identify their most craved

foods. This qualitative component was designed to explore cultural and linguistic variations, particularly among Greek Cypriot participants, where no direct equivalent of the term “craving” exists.

A subsequent Likert-scale section assessed craving frequency and intensity across six food categories—chocolate, sweet foods (excluding chocolate), meat, fat, salty foods, and carbohydrates—adapted from the FCI but simplified for cross-cultural use. Chocolate was examined separately due to its prominence in craving literature (Hill, 2007).

Thus, while informed by the FCI’s structure, the present instrument diverged in focus and purpose, emphasizing cultural, gender, and psychological dimensions of craving comprehension rather than standardized measurement. In more detail, the developed questionnaire consisted of three open-ended questions and a structured section measuring craving frequency and intensity. Open-ended items asked participants to:

- What do you think is meant by the term craving
- What do you think food craving is?
- Which food or type of food do you crave the most?

Closed-ended items used a 5-point Likert scale (0 = never to 5 = all the time) to assess the frequency of cravings, and a parallel scale (0 = weak to 5 = strong) to assess intensity across the six food categories: chocolate, sweet foods (excluding chocolate), meat, fatty foods, salty foods and carbohydrates. Participants’ open-ended responses were coded using the following categories:

- Desire: craving defined as a strong desire to consume something.
- Want: feeling of wanting to eat something.
- Need: craving described as a bodily necessity.
- Urge: explicit use of the term “urge.”
- Other: alternative expressions such as “hunger,” “liking,” “lust,” “longing,” “motivation,” “thinking about food without desiring it,” or “no answer.”

A copy of the full questionnaire, including item wording and response options, is provided in Appendix B.

Procedure

The questionnaire underwent initial testing with both British (BR) and Greek Cypriot (GCY) participants, followed by subsequent revisions. The final version was in English

and administered anonymously online using Qualtrics, after obtaining ethical approval from the University Research Ethics Committee (Appendix A). Prior to commencing the questionnaire, participants were presented with an introductory information page that outlined the purpose of the study, inclusion criteria, voluntary nature of participation, and assurances of data confidentiality (Appendix B). In accordance with the approved ethical procedures, continuation beyond this page was considered to constitute informed consent to participate in the study.

Participants first answered demographic questions, followed by the open-ended definition questions, and then completed the Likert-scale items. The order of items remained constant for all participants to ensure consistency. Completion took approximately 10–15 minutes.

Data Analysis

Participant-provided definitions of craving and food craving were analysed using an inductive content-analytic approach informed by principles of reflexive thematic analysis (Braun & Clarke, 2006). Initial codes were developed through an inductive review of all responses, during which recurrent lexical choices and semantic themes were identified. The final coding categories were established by grouping responses according to their predominant descriptive term or conceptual emphasis.

Participant-provided definitions of craving and food craving were coded as follows: those using "desire" described food craving as a strong desire to consume something, while those categorized as "want" characterized it as the feeling of wanting to eat something. Responses coded as "need" identified craving as a bodily necessity, and those under "urge" included the word "urge" as a definition of the phenomenon. Responses coded as "other" encompassed terms such as "strong feeling," "eating," "passion," "hunger," "lust," "liking," "longing," "internal motivation," "additional taste," "thinking about the food without desiring it," and no answer. This approach ensured that coding captured both the most frequent descriptive patterns and the diversity of participants' conceptualisations.

The questionnaire employed a 5-point Likert scale to evaluate the frequency (0=never, 5=all the time) and intensity (0=weak, 5=strong) of food cravings for seven different food groups: chocolate, sweet food (excluding chocolate), meat, fat, salty, and carbohydrates (e.g., pasta, rice, bread). These food groups were chosen based on

reported types of cravings in the literature. Chocolate was assessed separately from other sweets due to its predominant presence in the food craving literature (Hill 2007). Demographic information, including age, sex, nationality, and ethnicity, was also collected.

4. Participants

A total of 436 participants were initially recruited for the study. Recruitment source was not recorded for the majority of participants, which prevents reliable calculation of the contribution from each recruitment source. Accordingly, only a qualitative account of the recruitment strategies employed is presented.

After removing missing responses and responses other than British or Cypriot nationalities, the sample was reduced to a total of 389 participants. This sample consisted of 263 (67.6%) British participants, out of which 77 males (19.8%) and 186 females (47.8%), and 126 Cypriot participants (32.4%), out of which 45 (11.6%) were males and 81 (20.8%) were females.

To address the unequal sizes of the two nationality subsamples and reduce sampling bias, British participants younger than 19 were removed from the analysis. This step was necessary because the Cypriot group did not include anyone in this age range. Keeping the younger British participants would have created an uneven age distribution between the two groups and introduced age-related differences that could distort the findings. Adolescents under 19 often differ from adults in several important ways, including how much independence they have around food, their exposure to dieting culture, their emotional regulation, and the types of food environments they encounter, factors that can influence eating behaviour and food cravings (Patrick & Nicklas, 2005; Steinberg, 2005; Story et al., 2002). By removing these younger participants, the two nationality groups were better aligned in age, helping ensure that any differences observed in the study were more likely due to cultural factors rather than developmental ones. This resulted in a more balanced sample of a total of 299 participants, out of which 175 (58.5%) were British (67 / 22.4% males and 108 / 36.1% females) and 124 (41.5%) were Cypriot (43 / 14.4% males and 81 / 27.1% females). The composition of the sample is presented in the figure below:

Table 1: Participant Demographics by Nationality and Gender

Nationality	Gender	n	% of Total	Mean Age
British	Male	67	22.4%	24.4
	Female	108	36.1%	21.9
Cypriot	Male	43	14.4%	27.9
	Female	81	27.1%	29.9
Total	—	299	100%	—

**Note. British subsample = 175 participants (67 males, 108 females). Cypriot subsample = 124 participants (43 males, 81 females).*

5. Analysis

The data from the weighted sample were analysed using Jamovi, with only statistically significant findings reported in the main text; non-significant results are located to the appendices (Appendix C). Two set of comparisons were conducted: comparisons by nationality and comparisons by sex. All significant results are summarised in the table below:

Table 2: Significant Differences in Craving-Related Variables Across Comparison Groups

Comparison Group	Variable / Outcome	Test	p	Direction of Effect
British vs. Cypriots	Definition of craving /food craving	χ^2 / Fisher's Exact	< .001	British more likely to select "need"; Cypriots more likely to select "other."
British vs. Cypriots	Chocolate craving intensity	Kruskal–Wallis	< .001	Cypriots > British
British vs. Cypriots	Chocolate craving frequency	Kruskal–Wallis	< .001	Cypriots > British
British vs. Cypriots	Salty craving intensity	Kruskal–Wallis	.002	Cypriots > British
British vs. Cypriots	Salty craving frequency	Kruskal–Wallis	.004	Cypriots > British
British vs. Cypriots	Meat craving intensity	Kruskal–Wallis	.016	Cypriots > British
British vs. Cypriots	Meat craving frequency	Kruskal–Wallis	.010	Cypriots > British
Male vs. Female	Most craved food	χ^2 / Fisher's Exact	< .001	Females: chocolate, sweets, salty snacks; Males: meat
Male vs. Female	Chocolate craving intensity	Kruskal–Wallis	< .001	Female > Male
Male vs. Female	Chocolate craving frequency	Kruskal–Wallis	< .001	Female > Male
Male vs. Female	Sweet craving intensity	Kruskal–Wallis	< .001	Female > Male
Male vs. Female	Sweet craving frequency	Kruskal–Wallis	< .001	Female > Male
Male vs. Female	Salty craving frequency	Kruskal–Wallis	.043	Female > Male
Male vs. Female	Meat craving intensity	Kruskal–Wallis	< .001	Male > Female
Male vs. Female	Meat craving frequency	Kruskal–Wallis	< .001	Male > Female

Cypriots showed higher craving intensity and frequency across multiple food categories and differed from British participants in how they defined craving. Females reported stronger and more frequent cravings for chocolate, sweets, and salty foods, whereas males showed higher cravings for meat. These findings are summarised above, and the detailed results are presented in the following sections.

5.1. British vs Cypriots Comparison of Nominal Variables (x^2 difference)

Chi-square tests of difference were conducted to examine whether nationality (independent variable) was associated with differences in several categorical outcomes (dependent variables): participants' definitions of craving, definitions of food craving, and their most frequently craved food type. These analyses allow for comparison of how British and Cypriot participants conceptualise cravings and the kinds of foods they report craving most often. More specifically:

5.1.1. Nationality vs Definition of Craving & Food Craving

The comparison of the responses to the questions "What do you think craving / food craving is?" indicated that both the majority of British and Cypriots described craving and food craving as either a "desire" or a "want". The two populations differed in their third favorite description with Cypriots giving "other" responses and British reporting "need". These results suggest that Cypriots are less coherent on their views on craving. The differences between the two populations reached statistical significance with a p-value of < 0.001 on the chi-squared test for craving and food craving and a p-value of <0.001 and p=0.002 on the Fisher's exact test for craving and food craving respectively, as presented in the tables below. This indicates that British and Cypriot people tend to describe their food cravings differently.

***Table 3:* Contingency Table and Chi-Square Test for Craving Definition by Nationality**

Craving Definition	British n (%)	Cypriot n (%)	Total n (%)
Want	71 (40.6%)	43 (35.0%)	114 (38.3%)
Need	20 (11.4%)	7 (5.7%)	27 (9.1%)
Desire	62 (35.4%)	45 (36.6%)	107 (35.9%)
Urge	13 (7.4%)	4 (3.3%)	17 (5.7%)
Other	9 (5.1%)	24 (19.5%)	33 (11.1%)
Total	**175 (100%)**	**123 (100%)**	**298 (100%)**

Statistic	Value	df	*p*

χ^2	18.90	4	< .001
Fisher's Exact Test	—	—	< .001
N	298	—	—

x^2 test of associations between nationality and craving definition yielded p-value <0.001. Fisher's exact test yielded p-value <0.001. Both tests indicate high statistical significance.

***Table 4:* Contingency Table and Chi-Square Test for Food-Craving Definition by Nationality**

Food-Craving Definition	British *n* (%)	Cypriot *n* (%)	Total *n* (%)
Want	67 (38.3%)	35 (28.5%)	102 (34.2%)
Desire	59 (33.7%)	41 (33.3%)	100 (33.6%)
Need	18 (10.3%)	13 (10.6%)	31 (10.4%)
Urge	12 (6.9%)	3 (2.4%)	15 (5.0%)
Other	12 (6.9%)	29 (23.6%)	41 (13.8%)
Hunger	7 (4.0%)	2 (1.6%)	9 (3.0%)
Total	**175 (100%)**	**123 (100%)**	**298 (100%)**

Statistic	Value	df	*p*
χ^2	20.90	5	< .001
Fisher's Exact Test	—	—	.002[a]
N	298	—	—

x^2 test of associations between nationality and food craving definition yielded p-value <0.001. Fisher's exact test yielded p-value=0.002. Both tests indicate high statistical significance.

5.1.2. Nationality vs Most Craved Food

Since the question "What food or type of food do you crave most?" was open-ended, many participants listed more than one item. For analysis, the first food mentioned was treated as the most craved. Responses were coded into 11 categories as in Annex C. "Carbs" category includes responses such as "carbohydrates", "rice" and "bread"; "Salty" includes "savoury foods" and "salty", "Meat" includes "meat", "chicken" and "kebab" and "Sweets" includes "biscuits", "cake", "sugary foods" and "sweets in general". Foods that did not fit these categories were coded separately. As in most studies, chocolate was the most frequently reported craving.

Chi-square and Fisher's exact tests showed no significant association between nationality and most craved food ($p > .05$), indicating similar craving patterns across nationalities.

5.2. Male vs Female Comparison of Nominal Variables (x^2 associations)

Using x^2 test of associations (contingency tables), male participants were compared with female participants in terms of how they define craving and food craving and what

is their most craved food. This data analysis provided significant insights into how both genders perceive and experience food cravings. Specifically:

5.2.1. Gender vs Definition of Craving & Food Craving

Responses to “What do you think craving/food craving is?” showed that most males and females described it as a “desire” or “want.” Their third most common descriptions differed slightly—males chose “other,” while females chose “need.” Chi-square and Fisher’s exact tests found no significant associations between sex and these descriptions ($p > .05$), indicating that men and women define food cravings similarly.

5.2.2. Gender vs Most Craved Food

As previously discussed, Responses to “What food or type of food do you crave most?” were coded into 11 categories and compared by gender. Analysis showed significant differences between males and females, as more women reported chocolate and sweets craving and more men reported craving for meat with a p-value of < 0.001 on the chi-squared test and on the Fisher's exact test. This suggests distinct gender-based craving patterns, with women more likely to crave sweet or salty snacks and men more likely to crave meat.

Table 5: Association Between Sex and Most Craved Food (χ^2 Test)

Most Craved Category	Male (n = 110)	Female (n = 189)	Total (N = 299)
Chocolate	16	54	70
Junk Food	10	8	18
Meat	29	4	33
Sweets	14	50	64
Salty	9	14	23
Crisps	2	20	22
Pizza	4	3	7
Carbs	3	4	7
Cheese	4	4	8
Pasta	5	10	15
Other	14	18	32

$\chi^2(10) = 61.70, p < .001.$

Fisher’s exact test (Monte Carlo) $p < .001$.

x^2 test of associations between nationality and food craving definition yielded p-value <0.001. Fisher's exact test yielded p-value <0.001. Both tests indicate high statistical significance.

5.3. British vs Cypriots Comparison of Ordinal / Continues Variables (Kruskal-Wallis non parametric test)

The effect of Nationality was examined against continues and ordinal variables of the questionnaire. Hence, the British group was compared with the Cypriot group in terms of:

- Chocolate Craving Intensity and Frequency
- Sweet Craving Intensity and Frequency
- Salty Craving Intensity and Frequency
- Fat Craving Intensity and Frequency
- Meat Craving Intensity and Frequency
- Carbs Craving Intensity and Frequency

Tests of normality indicated that the data violated assumptions of normality for all variables. Shapiro–Wilk tests were significant for every variable (all ps < .001), and several variables showed moderate skewness (e.g., AG = 0.58; AH = 0.50) and substantial negative kurtosis (e.g., T = −1.89). Given these deviations from normality, along with the ordinal nature of the Likert-scale measures, non-parametric analyses were used.

Using One-way Anova (Kruskal-Wallis) non parametric test, the data analysis showed that there were significant differences between British and Cypriot participants in terms of Chocolate Craving Intensity and Frequency, Salty Craving Intensity and Frequency and Meat Craving Intensity and Frequency. Nationality served as the independent variable, and craving intensity/frequency scores for each food type served as dependent variables. These findings highlight variations in dietary patterns and nutrition between the two populations. The statistical analysis of each of the above-mentioned variables is presented in the Figure below.

***Table 6:** Kruskal-Wallis British and Cypriot populations comparison*

Variable	χ^2	df	Kruskal–Wallis p	Post-hoc p (DSCF)	Direction of Effect
Chocolate Craving Intensity	11.03	1	< .001	< .001	Cypriot > British
Chocolate Craving Frequency	19.40	1	< .001	< .001	Cypriot > British
Salty Craving Intensity	9.47	1	.002	.002	Cypriot > British
Salty Craving Frequency	8.12	1	.004	.003	Cypriot > British
Meat Craving Intensity	5.76	1	.016	.017	Cypriot > British
Meat Craving Frequency	6.71	1	.010	.009	Cypriot > British
Sweet Craving Intensity	0.03	1	.857	–	–
Sweet Craving Frequency	0.71	1	.401	–	–

Fat Craving Intensity	1.69	1	.193	–	–
Fat Craving Frequency	2.00	1	.158	–	–
Carbs Craving Intensity	0.34	1	.562	–	–
Carbs Craving Frequency	0.49	1	.483	–	–

Kruskal-Wallis tests and pairwise comparisons among British and Cypriot populations on various variables.

The Figure above provides the results of Kruskal-Wallis tests comparing British and Cypriot participants on various variables. According to the findings:

i. Chocolate Craving: Significant nationality differences were observed for both chocolate craving intensity and frequency (both $p < .001$). Descriptive statistics indicated higher chocolate craving levels among Cypriot participants. Dwass–Steel–Critchlow–Fligner post-hoc tests confirmed that Cypriot individuals reported significantly stronger and more frequent chocolate cravings compared to British individuals.

ii. Salty Craving: Significant effects were also found for salty craving intensity ($p = .002$) and frequency ($p = .004$). Post-hoc comparisons showed that Cypriot participants experienced significantly higher salty craving intensity and frequency relative to British participants. Dwass-Steel-Critchlow-Fligner pairwise comparisons indicated that Cypriot participants have significantly higher salty cravings compared to British participants.

iii. Meat Craving: A significant nationality effect was found for meat craving intensity ($p = .016$) and frequency ($p = .010$). Post-hoc tests again demonstrated that Cypriot individuals reported significantly higher meat cravings than British individuals on both measures.

In summary, no significant differences were found between British and Cypriot participants for sweet, fat, or carb craving intensity and frequency (p = 0.158–0.857). Significant differences were observed for chocolate, salty, and meat cravings, with Cypriots reporting higher levels. These results suggest that nationality may influence the intensity and frequency of specific food cravings.

5.4. Male vs Female Comparison of Ordinal / Continues Variables (Kruskal-Wallis non parametric test)

The effect of gender was examined against continues and ordinal variables of the questionnaire. Hence, the male participants were compared with the female participants in terms of:

- Chocolate Craving Intensity and Frequency
- Sweet Craving Intensity and Frequency
- Salty Craving Intensity and Frequency
- Fat Craving Intensity and Frequency
- Meat Craving Intensity and Frequency
- Carbs Craving Intensity and Frequency

Normality assumptions were violated across all variables. Shapiro–Wilk tests indicated significant departures from normality for every variable (all ps < .001). Several variables showed moderate skewness (e.g., AG = 0.58; AH = 0.50) and substantial negative kurtosis (e.g., sex = −1.71). Because the variables were also measured on ordinal Likert-type scales, the data did not meet the assumptions required for parametric tests. Therefore, non-parametric analyses were used.

Using One-way Anova (Kruskal-Wallis) non parametric test, the data analysis showed that there were significant differences between male and female participants in terms of chocolate craving intensity and frequency, salty craving intensity and frequency and meat craving intensity and frequency. Gender served as the independent variable, with craving intensity and frequency scores for each food type as the dependent variables. These findings highlight variations in dietary patterns and nutrition between the two populations. The statistical analysis of each of the above-mentioned variables is presented in the table below.

Table 7: Kruskal-Wallis Gender Comparisons

Variable	χ^2	df	Kruskal–Wallis p	Post-hoc p (DSCF)	Direction of Effect
Chocolate Craving Intensity	23.67	1	< .001	< .001	Female > Male
Chocolate Craving Frequency	18.08	1	< .001	< .001	Female > Male
Sweet Craving Intensity	12.52	1	< .001	< .001	Female > Male
Sweet Craving Frequency	13.20	1	< .001	< .001	Female > Male
Salty Craving Frequency	4.10	1	.043	.046	Female > Male
Meat Craving Intensity	22.82	1	< .001	< .001	Male > Female
Meat Craving Frequency	23.93	1	< .001	< .001	Male > Female

Salty Craving Intensity	2.05	1	.152	—	n.s.
Fat Craving Intensity	3.98	1	.046	—	n.s.
Fat Craving Frequency	3.23	1	.072	—	n.s.
Carbs Craving Intensity	1.10	1	.293	—	n.s.
Carbs Craving Frequency	1.18	1	.278	—	n.s.

Kruskal-Wallis tests and pairwise comparisons among Male and Female populations on various variables

The table above provides the results of Kruskal-Wallis tests comparing male and female participants on various variables. According to the findings:

i. Chocolate Craving: There were significant gender differences in both chocolate craving intensity and frequency (both $p < .001$). Descriptive patterns indicated higher craving levels among female participants. Dwass–Steel–Critchlow–Fligner post-hoc comparisons confirmed that women reported significantly stronger and more frequent chocolate cravings than men.
ii. Sweet Craving: Significant gender effects were also found for sweet craving intensity and frequency (both $p < .001$). Post-hoc analyses similarly showed that female participants had significantly higher sweet craving intensity and frequency relative to male participants.
iii. Salty Craving: A significant gender difference emerged for salty craving frequency ($p = .0043$). Post-hoc tests demonstrated that women reported significantly more frequent salty cravings than men. No significant difference was found for salty craving intensity.
iv. Fat Craving: For fat craving intensity, the overall Kruskal–Wallis test indicated a significant effect ($p = .0046$). However, post-hoc comparisons did not remain significant after correction for multiple comparisons ($p = .056$*), suggesting that the median difference between men and women may not be robust.
v. Meat Craving: Significant gender differences were observed for both meat craving intensity and frequency (both $p < .001$). Post-hoc comparisons revealed that men reported significantly stronger and more frequent meat cravings than women, opposite to the pattern observed for chocolate, sweet, and salty cravings.

In summary, the above analysis underscores gender as a significant factor influencing food cravings. Women reported stronger cravings for sweets, chocolate, and salty snacks, while men reported more intense and frequent meat cravings. No significant gender differences were found for salty craving intensity, fat craving frequency, or carb

craving measures. Overall, these results indicate that gender plays a key role in shaping specific food preferences.

6. Study I Discussion

The analysis presented sheds light on the influence of nationality and gender on individuals' perceptions and experiences of food cravings.

Starting with the comparison between British and Cypriot participants, the findings reveal significant differences in how individuals from these two nationalities define and experience food cravings. British participants were more likely to describe craving and food craving as a "need," while Cypriots tended to provide more diverse responses, indicating potential differences in coherence regarding their views on craving. Additionally, Cypriot participants reported significantly higher levels of chocolate, salty, and meat cravings compared to British participants. These findings suggest cultural variations in dietary patterns and nutrition between the two populations.

Moving on to the comparison between males and females, the analysis highlights gender as a significant factor influencing food cravings. Women exhibited higher cravings for sweets, chocolate, and potentially salty snacks, while men showed more intense and frequent cravings for meat. These gender differences in food preferences underscore the complexity of how gender shapes individuals' craving experiences. However, no significant disparities were observed in cravings related to salty foods, fat, or carbs, indicating that gender may not play as prominent a role in shaping preferences for these types of foods.

Overall, the findings emphasize the multifaceted nature of food cravings and the various factors, including nationality and gender, that contribute to individuals' cravings. Understanding these differences can have implications for public health initiatives, dietary interventions, and personalized nutrition strategies tailored to specific cultural and gender-related preferences and needs. Further research exploring the underlying mechanisms driving these differences could provide valuable insights into addressing dietary patterns and promoting healthier eating behaviours across diverse populations.

2nd Study: Food Craving, Mood and Culture

1. Introduction

Food cravings are often linked to emotional states and specific psychological triggers. Understanding the relationship between food cravings, dietary consumption, and mood can provide valuable insights into eating behaviors and their implications for health. Therefore, building on Study I findings, this study was created to explore the emotional and cultural factors that might contribute to food cravings and their consequences.

2. Objective

The objective of this study was to examine the relationship between food craving, dietary consumption and mood. It was hypothesized that people who experience and give in to their food cravings will have increased caloric consumption and will present different emotional characteristics than non – cravers. Since the previous study indicated significant differences between British and Greek-Cypriots, this study again addressed both populations, in order to identify possible cultural attributes of food craving.

3. Relationship to Study I

Study II was conducted alongside Study I, and the two studies were designed to complement each other in a sequential yet overlapping research study on food cravings. Study I showed that although British and Greek Cypriot participants understood the general concept of craving in broadly comparable ways, they nevertheless defined and experienced food cravings differently. British participants tended to describe cravings as a “need,” whereas Greek Cypriot participants provided more diverse and less uniform descriptions. In addition, Study I identified clear cross-cultural differences in the types and frequency of cravings, as well as gender-related differences in craving patterns. These findings emphasised that while the core idea of a craving is shared, the experience and expression of cravings vary culturally and by gender.

These insights provided the foundation for Study II. Since Study I showed that British and Greek Cypriot participants differ in how cravings are experienced, Study II sought to determine whether these differences also extend to the behavioural and emotional consequences of cravings. Accordingly, the objective of Study II was to examine the relationship between food craving, dietary consumption, and mood, and to test the hypothesis that individuals who experience and act upon cravings would have higher caloric intake and distinct affective profiles compared with non-cravers. Including both cultural groups again allowed for the exploration of whether the craving–consumption–mood relationship itself might be shaped by cultural patterns identified in Study I.

In this way, Study II built directly on the findings of Study I, extending the investigation from how cravings are understood and experienced to how they are behaviourally enacted and emotionally processed across cultural contexts.

4. Method

Participants

A total of 418 people completed the survey. Participants were recruited through a variety of online university forums, social media platforms, relevant academic and professional mailing lists, snowball sampling via participant referrals, and the Sheffield Hallam University Online Research Participation System (SONA). There were no nationality-based inclusion criteria; however, most recruitment posts were distributed in British or Cypriot online fora.

Participation was voluntary, although individuals recruited via SONA received course credits that could be used either as bonus points or to fulfil mandatory course requirements and a dietary analysis of participants' reported daily consumption was made available upon request.

Most Greek Cypriot participants were fluent in English, which is widely taught from early primary education and commonly used in both educational and everyday contexts in Cyprus (Cambridge University Press, 2022; Ministry of Education, Culture, Sport and Youth, 2024). This facilitated their participation in an English-medium study.

All participants completed the questionnaire via the online survey platform Qualtrics. Demographic information collected included age, gender, height, weight, nationality, and ethnicity.

Responses were screened for completeness, and any cases with missing data were excluded from analysis. The combination of diverse recruitment channels was used to broaden the reach of the study and ensure access to individuals with varied backgrounds.

Design

The study employed a cross-sectional, online survey design (Appendix D). It combined quantitative self-report measures (e.g., frequency of cravings, affect ratings, caloric and macronutrient intake) with qualitative responses to open-ended questions about craving experiences. The design allowed for the examination of associations between food cravings, affect, and recent dietary intake within a naturalistic 24-hour recall framework.

Materials

24-Hour Food Intake Recall Diary

Participants completed a structured 24-hour food intake recall diary divided into four meal categories: breakfast, lunch, dinner, and snacks. A visual hand guide for portion sizes was included to support accuracy. The 24-hour dietary recall method is one of the most widely used approaches in nutritional epidemiology and was developed and standardized by researchers working within public health and nutrition sciences, including Thompson and colleagues at the U.S. National Cancer Institute. It has been extensively validated and demonstrates good reliability when administered systematically, particularly when supported by portion-size aids or memory prompts (F. E. Thompson & Subar, 2013; Shim et al., 2014).

The 24-hour recall method was chosen because it provides detailed, ecologically valid information on actual consumption and allows researchers to link cravings with specific eating behaviors. Unlike food frequency questionnaires, which capture habitual intake over extended periods, the 24-hour recall supports the examination of both the type and timing of consumption as well as associations between cravings, intake, and mood (Shim et al., 2014; F. E. Thompson & Subar, 2013a). Nutritional analysis software and food composition databases were used to calculate the caloric and macronutrient content of reported foods. The visual guide is illustrated below:

Try to provide portion sizes wherever possible. If in doubt about the portion size, please use the following guidelines:

1 Fist = 1 Cup
Best for:
Cereals, Pasta, Rice, Drinks, Fruit, Salad, etc

Handful = 30 - 60gr
E.g.
30gr nuts or candie
60gr crisps or pretzels

Palm = 90gr Meat (thickness & size)
E.g.
Poultry, Pork, Beef, Fish

Thumb = 30gr Cheese
E.g.
Gouda
Mozzarella
Feta

Thumbtip = 1 teaspoon
Best for:
Butter, Oil, Mayonnaise, etc

Food Cravings Measures

Participants were provided with a standardized definition of food cravings and rated how often they experience them on a 4-point scale (1 = almost never, 4 = all the time). They also identified specific foods typically craved, reported whether they were currently dieting, and indicated whether they experienced any craving the previous day. Participants who reported a craving provided additional details regarding the food craved, their activity at the time, their behavioral response, and their affective state.

Affective Measures (I-PANAS-SF)

Affective states were assessed using the International Positive and Negative Affect Schedule Short-Form (I-PANAS-SF;(E. R. Thompson, 2007)). The International Positive and Negative Affect Schedule Short-Form (I-PANAS-SF) was developed by Thompson (2007). The I-PANAS-SF contains ten positive and negative affective states that are derived from the original 20 PANAS (Watson et al., 1988) item pool. The five positive affective states are: active, determined, attentive, inspired, and alert. The five negative affective states are: afraid, nervous, upset, hostile, and ashamed. In accordance with the guidelines of the tool, when filling I-PANAS-SF, participants utilized a 5-point scale (1= Very Slightly or Not at All, 2=A Little, 3=Moderately, 4=Quite a Bit, 5=Extremely) in which they determined if a concept applies.

The measure has demonstrated good internal consistency (α values typically ranging from .74 to .83 across diverse cultural samples) and strong construct validity, maintaining the two-factor structure of the original PANAS. Thompson (2007) also conducted cross-cultural validation across multiple countries, confirming that the items

function reliably and consistently across cultural groups, which makes the I-PANAS-SF particularly suitable for use in studies involving British and Cypriot participants.

Participants' final scores were calculated by summing the values for the ten items on both the positive and negative sides, resulting in scores ranging from 5 to 25. The higher scores on both PA and NA items indicate the tendency to experience a positive and negative mood. Normative data indicate mean scores of 19.48 (SD = 2.89) for Positive Affect and 11.21 (SD = 2.04) for Negative Affect in the United Kingdom; comparable norms for Cyprus are not available. Participants who did not experience a craving the previous day completed the I-PANAS-SF in reference to their typical affect during cravings and their general affect. In case participants reported food craving the previous day, they completed I-PANAS-SF on how they felt at the time of the craving and how they feel in general.

Procedure

The survey was in English and administered anonymously online using Qualtrics, after obtaining ethical approval from the University Research Ethics Committee (Appendix A). Prior to commencing the questionnaire, participants were presented with an introductory information page that outlined the purpose of the study, inclusion criteria, voluntary nature of participation, and assurances of data confidentiality (Appendix B). In accordance with the approved ethical procedures, continuation beyond this page was considered to constitute informed consent to participate in the study.

Participants first answered demographic questions, followed by the 24-hour food intake recall diary, reporting all food and drink consumed the previous day. Participants next completed the food cravings measures, followed by the I-PANAS-SF, either in relation to the previous day’s craving episode or to their typical craving-related affect if no craving was reported.

Data Analysis

Quantitative data (e.g., frequency of cravings, affect scores, caloric and macronutrient intake) were analyzed using descriptive and inferential statistics appropriate to the research questions. Positive and negative affect scores were computed by summing relevant I-PANAS-SF items. Nutritional data were derived from participant entries using standardized food composition software.

Qualitative responses to open-ended questions (e.g. descriptions of craved foods and activities during cravings) were analysed using thematic content analysis following Braun and Clarke's (2006) guidelines, consistent with the approach employed in Study I (Braun & Clarke, 2006). Initial codes were generated inductively through a detailed review of all responses, with attention to recurrent lexical choices and semantic patterns. These codes were then organised into higher-level categories that reflected shared descriptive features or conceptual themes.

Moreover, responses provided in the 24h recall diaries were analysed using nutritional analysis software and databases. Based on the recorded meals, the caloric and macronutrient content of each meal was calculated including:

- Breakfast: calories, grams of carbohydrates, grams of protein, and grams of fat
- Lunch: calories, grams of carbohydrates, grams of protein, and grams of fat
- Dinner: calories, grams of carbohydrates, grams of protein, and grams of fat
- Snacks: calories, grams of carbohydrates, grams of protein, and grams of fat
- Total daily intake: calories, grams of carbohydrates, grams of protein, and grams of fat

It's important to note that while this method provides a reasonable estimate, there can be limitations, such as reliance on participant memory and potential underreporting or misreporting of food intake (Shim et al., 2014; F. E. Thompson & Subar, 2013b).

5. Participants

A total of 418 people completed the questionnaire. After removing missing responses and responses other than British or Cypriot nationalities, the sample was reduced to a total of 243 participants. This sample consisted of 167 (69.3%) British participants, out of which 31 males (12.9%) and 136 females (56.4%), and 76 Cypriot participants (31.2%), out of which 21 (12.1%) were males and 55 (22.6%) were females.

To minimise sampling bias and improve comparability between groups, British participants aged under 19 were removed from the dataset, as the Cypriot sample contained no individuals in this age range. Retaining younger British participants would have resulted in an uneven age distribution and introduced developmental differences

that could affect eating behaviour and craving patterns. Adolescents differ from adults in areas such as autonomy around food choices, exposure to dieting norms, emotional regulation, and the food environments they navigate (Patrick & Nicklas, 2005; Steinberg, 2005; Story et al., 2002). Excluding these younger participants ensured that any group differences were more likely attributable to cultural factors rather than age-related variation. Following this adjustment, the final sample comprised 174 participants: 98 British participants (30 males, 17.2%; 68 females, 39.1%) and the Cypriot subsample remained unchanged. The composition of the sample is presented in the figure below:

Table 8: Participant Demographics by Nationality and Gender

Nationality	Sex	n	% of Total	Cumulative %	Median Age
British	Male	30	17.2%	17.2%	23.2
British	Female	68	39.1%	56.3%	21.7
Cypriot	Male	21	12.1%	68.4%	28.1
Cypriot	Female	55	31.6%	100.0%	26.9

Note. *Sex is coded as 1 = male and 2 = female. Percentages refer to the proportion of the total sample. Median ages are reported for each subgroup.*

6. Analysis

The data from the weighted sample were analysed using Jamovi, with only statistically significant findings reported in the main text; non-significant results are located to the appendices (Appendix E). Three groups of comparisons were conducted: comparisons by nationality, comparisons by sex, comparisons by craving frequency, and comparisons between individuals who experienced cravings the previous day and those who did not. All significant results are summarised in the table below:

Table 9: Summary of All Statistically Significant Findings Across Comparison Groups

Comparison Group	Variable	Test / Adjusted p	Direction of Effect	Summary of Result
Nationality (British vs. Cypriots)	Most-craved food (nominal)	$\chi^2(11)=22.40$, p=.021; Fisher p=.025	—	Types of foods most frequently craved differ by nationality.
	Activity during craving (nominal)	$\chi^2(4)=9.64$, p=.047; Fisher p=.025	—	Activity during cravings differs by nationality.
	Lunch protein	p=.023	Cypriot > British	Cypriots consume more protein at lunch.
	Dinner calories	p=.023	British > Cypriot	British consume more calories at dinner.
	Total carbohydrates	p=.023	British > Cypriot	British have higher overall carbohydrate intake.
	Dinner carbohydrates	p=.044	British > Cypriot	Higher carb intake at dinner among British.
Sex (Male vs. Female)	Diet status (nominal)	$\chi^2(2)=8.43$, p=.015; Fisher p=.014	—	Diet status differs by sex.
	Craving frequency (nominal)	$\chi^2(3)=9.78$, p=.021; Fisher p=.017	—	Females report more frequent cravings.
	Most-craved food (nominal)	$\chi^2(11)=28.90$, p=.002; Fisher p=.006	—	Food categories craved differ by sex.
	Craved yesterday (nominal)	$\chi^2(1)=13.30$, p<.001	Female > Male	Females more often craved the previous day.
	Dinner protein	p=.023	Male > Female	Males consume more protein at dinner.
	Total protein	p=.023	Male > Female	Males consume more total daily protein.
Craving Frequency (Low vs. High Cravers)	Most-craved food (nominal)	$\chi^2(11)=21.7$, p=.027; Fisher p=.021	—	Food categories differ by craving frequency.
	Craved yesterday (nominal)	p<.001	High > Low	High-frequency cravers more likely to have craved yesterday.
	Negative mood	p=.024	High > Low	High cravers experience more negative mood.
Cravers vs. Non-Cravers (Yesterday)	Snack calories	p=.024	Non-cravers > Cravers	Non-cravers consume more snack calories.
	Snack fat	p=.048	Non-cravers > Cravers	Non-cravers consume more snack fat.
	Positive mood: general vs. during craving (Cravers)	p=.004	General > During craving	Positive mood drops during cravings.
	Positive mood: general vs. during craving (Non-cravers)	p=.003	General > During craving	Positive mood drops even among non-cravers.

Note. *This table summarises all variables that reached statistical significance before correction. Tests include chi-square (χ^2), Fisher's exact tests, and non-parametric comparisons. Direction of effect refers to the group demonstrating the higher value or stronger effect.*

As evident from the table, significant differences emerged across nationality, sex, craving frequency, and recent craving experience. Nationality was linked to differences

in most-craved foods, activities during cravings, and several dietary intake measures. Sex differences appeared in diet status, craving patterns, and protein intake. High-frequency cravers showed distinct craving patterns and higher negative mood, while those who did not crave the previous day consumed more snack calories and fat. Across groups, positive mood was consistently lower during cravings than in general. The results are detailed in the following sections.

5.1. British vs Cypriots Comparison of Nominal Variables (x^2 associations)

Using x^2 test of associations (contingency tables), participants from the two nationalities were compared in terms of self-declared diet status, food craving frequency, most craved food, whether they experienced food craving the previous day, the food that was craved, how they responded to the food craving and what type of activity they were engaged in while experiencing the phenomenon. In these analyses, nationality served as the independent variable, while each nominal craving-related measure functioned as a dependent variable.

The data analysis offered valuable insights into the dietary behaviors and experiences related to food cravings of individuals in the UK (British) and Cyprus (Cypriot). The results are summarised in the table below:

Table 10: Summary of Chi-Square Tests for Nationality and Nominal Variables

Variable	χ^2 Value	df	p (Chi-Square)	p (Fisher's Exact)	Significant?
Diet Status	—	—	.091	.093	No
Food Craving Frequency	—	—	.615	.592	No
Most-Craved Food	22.40	11	.021	.025	**Yes**
Experienced Craving Yesterday	—	—	.476	.536	No
Food Craved Yesterday	—	—	.192	.185	No
Response to Craving	—	—	.523	.581	No
Activity During Craving	—	—	.047	.025	**Yes**

Note. *Table presents chi-square statistics and Fisher's exact p-values for associations between nationality and nominal variables. Statistical significance is evaluated at p = .05.*

As indicated in the table above, statistically significant findings were evident in the responses of the two nationalities in relation to the type of food craved and in the activity participants were engaged in during the craving.

5.1.1. Nationality vs Type of Food Craved

When comparing responses to the question “what food do you crave the most”, the analysis suggested that while there are some variations in the types of foods craved, there are also commonalities. The types of food craved the most per subsample is indicated below.

Table 11: Most Craved Food among British and Cypriots

Most Craved Food Category	**British**	**Cypriot**	**Total**
Savoury	5	1	6
Chocolate	18	14	32
Other	9	2	11
Sweet	20	23	43
Crisps	8	2	10
Carbs	13	5	18
Fast Food	4	7	11
Meat	5	8	13
Cheese	5	1	6
Fruits & Vegetables	1	3	4
Salty	1	4	5
Chinese	0	2	2
Total	89	72	161
Test	**Value**	**df**	**p**
χ^2	22.40	11	.021
Fisher’s Exact (Monte Carlo)	—	—	.025
N	161	—	—

x^2 test of associations between nationality and most craved food yielded p-value <0.021. Fisher's exact test yielded p-value <0.025. Both tests indicate high statistical significance.

The chi-squared test and the Fisher's exact test yielded both below the typical significance level of 0.05 used in hypothesis testing. These results suggest that there is statistical evidence to conclude that there is a significant association between the most craved food categories and nationality among the individuals in the sample. The results suggest that certain food preferences are shared across the two cultures while other are more dominant in one of the two groups.

5.1.2. Nationality vs Activity while Craving

Participants that reported experiencing food craving the previous day were subsequently asked “What were you doing at the time you experienced food craving”. By comparing the responses of the two nationalities, it seems that though there may be some shared experiences, differences exist as well. The different types of activities per nationality are presented in Figure below. According to the data analysis, the chi-

squared test produced a p-value of 0.047, while the Fisher's exact test yielded a p-value of 0.025. This suggests that the choice of activity during food cravings may be related to an individual's nationality in this sample.

Table 12: Activity During Food Craving by Nationality

Activity During Craving	British	Cypriot	Total
Studying	14	1	15
Relaxing	16	17	33
Working	4	3	7
Social	2	3	5
Other	9	7	16
Total	45	31	76

Test	**Value**	**df**	**p**
χ^2	9.64	4	.047
Fisher's Exact Test	—	—	.025
N	76	—	—

x^2 test of associations between nationality and activity while yielded p-value=0.047. Fisher's exact test yielded p-value=0.02. Both tests indicate statistical significance among the two nationalities.

5.2. British vs Cypriots Comparison of Ordinal / Continues Variables (Kruskal-Wallis non parametric test)

The effect of nationality was examined on continuous and ordinal variables, including BMI, General Mood, and dietary consumption. British and Cypriot participants were compared, with nationality as the independent variable and each measure serving as a dependent variable.

Normality assumptions were violated across most variables. Shapiro–Wilk tests indicated significant departures from normality for nearly all measures in both groups, with the majority of British variables showing $p < .001$ and many Cypriot variables also falling below .05. Several variables displayed marked skewness—for example, SnackCal (British) showed skewness = 12.7, and TotalCal (British) = 12.5—along with extreme kurtosis values such as SnackCal (British) = 162 and TotalCal (British) = 161. Even variables with more moderate deviation (e.g., NegativeMood skewness = 0.905, PositiveMood skewness = –0.449) still failed normality tests (Skewness Statistics are included in Annex E). Given these significant distributional violations and the presence of heavily skewed calorie variables, the data did not meet assumptions required for parametric tests. Therefore, non-parametric analyses were used.

Kruskal–Wallis tests revealed significant differences between British and Cypriot participants in BMI, breakfast carbohydrate intake, lunch and dinner macronutrients, total daily calories, and total carbohydrate intake. After Holm–Bonferroni correction across 23 tests, three variables remained significant: lunch protein (p = .023), dinner calories (p = .023), and total daily carbohydrates (p = .023), with dinner carbohydrate intake approaching significance (adjusted p = .044). All other variables were non-significant after correction. The statistical analysis of the above-mentioned variables is below.

Table 13: Summary of Kruskal-Wallis test and Holm-Bonferroni adjustment for Nationality and Ordinal Variables

Variable	Raw p	Holm-Corrected p	Post-hoc p (DSCF)	Direction of Effect
GramProtLunch	0.001	**0.023**	< .001	**Cypriot > British**
DinnerCal	0.001	**0.023**	< .001	**British > Cypriot**
TotalGramCarbs	0.001	**0.023**	< .001	**British > Cypriot**
GramCarbsDin	0.002	**0.044**	.002	**British > Cypriot**
GramCarbsLunch	0.006	0.120	—	n.s.
BMI	0.016	0.352	—	n.s.
TotalCal	0.018	0.396	—	n.s.
GramProtDin	0.021	0.441	—	n.s.
GramCarbsBreak	0.046	1.000	—	n.s.
GramFatDin	0.052	1.000	—	n.s.
NegativeMood	0.097	1.000	—	n.s.
All remaining p > .05	—	**1.000**	—	—

Note. *Table presents raw and Holm-Bonferroni–adjusted p-values for Kruskal–Wallis tests assessing differences between British and Cypriot participants on ordinal variables. Post-hoc p-values are based on Dwass–Steel–Critchlow–Fligner (DSCF) pairwise comparisons. "Direction of effect" indicates the group with higher ranked values. n.s. = non-significant after correction.*

As indicated in the table above, statistically significant findings were evident in the differences between the two nationalities in the following:

I. **Lunch Macronutrients (GramProtLunch).**

A significant difference was found between the two nationality groups in protein intake at lunch, $p < .001$ (Holm-corrected $p = .023$). Descriptive statistics indicated that Cypriot participants reported higher protein consumption at lunch than British participants.

Post-hoc Dwass–Steel–Critchlow–Fligner pairwise comparisons were conducted to determine which groups differed. Results showed that British

participants consumed significantly less protein at lunch compared with Cypriot participants (W = 4.92, $p < .001$).

II. **Dinner Caloric Intake (DinnerCal).**

A Kruskal–Wallis test revealed a significant effect of nationality on dinner caloric intake, with $p < .001$ (Holm-corrected $p = .023$). Descriptive statistics indicated that British participants consumed more calories at dinner compared to Cypriot participants.

Post-hoc Dwass–Steel–Critchlow–Fligner comparisons confirmed this difference, showing that British individuals had significantly higher dinner-time caloric intake than Cypriot individuals.

III. **Dinner Macronutrients (GramCarbsDin).**

A Kruskal–Wallis test showed a significant effect of nationality on carbohydrate intake at dinner, $p = .002$ (Holm-corrected $p = .044$). Descriptive statistics indicated that British participants consumed more carbohydrates at dinner than their Cypriot counterparts. Post-hoc Dwass–Steel–Critchlow–Fligner tests confirmed this difference, demonstrating that British participants had significantly higher dinner-time carbohydrate intake (W = –4.48, $p = .002$).

IV. **Total Macronutrients (TotalGramCarbs).**

For total macronutrient intake, only total carbohydrate consumption differed significantly between the two nationality groups, $p < .001$ (Holm-corrected $p = .023$). British participants reported higher total daily carbohydrate intake than Cypriot participants.

Post-hoc Dwass–Steel–Critchlow–Fligner tests supported this finding, showing that British participants had significantly greater total carbohydrate intake (W = –5.44, $p < .001$).

In summary, Kruskal–Wallis tests and Holm–Bonferroni–adjusted pairwise comparisons revealed significant nationality differences in protein intake at lunch, and carbohydrate and caloric intake at dinner and overall. Cypriot participants consumed more protein at lunch, while British participants had higher caloric and carbohydrate intake at dinner and across the day, reflecting clear nationality-based dietary patterns.

5.3. Males vs Females Comparison of Nominal Variables (x^2 associations)

Using x^2 test of associations (contingency tables), the sex of the participants was compared with their self-declared diet status, food craving frequency, most craved food, whether they experienced food craving the previous day, the food that was craved, how they responded to the food craving and what type of activity they were engaged in while experiencing the phenomenon. In these analyses, gender served as the independent variable, and the various nominal viariables functioned as the dependent variables.

The analysis provided meaningful insights into gender differences in dietary behaviours and food-craving experiences. A summary of these findings is presented in the table below:

Table 14: Summary of Chi-Square Tests for Gender and Nominal Variables

Variable Compared with Sex	χ^2 Value	df	p (Chi-Square)	p (Fisher's Exact)	Significant?
Diet Status	8.43	2	.015	.014	**Yes**
Food Craving Frequency	9.78	3	.021	.017	**Yes**
Most-Craved Food	28.90	11	.002	.006	**Yes**
Experienced Craving Yesterday	13.30	1	< .001	< .001	**Yes**
Food Craved Yesterday	—	—	.881	.725	No
Response to Craving	—	—	.523	.581	No
Activity During Craving	—	—	.454	.432	No

Note. *Table presents chi-square statistics and Fisher's exact p-values for associations between sex and nominal variables. Statistical significance is evaluated at α = .05.*

As indicated in the table above, statistically significant findings were evident in the responses of the two gender in relation to their current diet status, their food craving frequency, the type of food craved and whether they experienced food craving the previous day.

5.3.1. Sex vs Weight Loss Diet

The comparison of the responses to the question "Are you currently on a Diet?" showed that in the male population, 3 participants reported to be currently on a diet, 30 participants were not on a diet, and 17 were watching their weight. Among the female population, 22 participants reported to be currently on a diet, 46 were not on a diet, and 54 were watching their weight. The analysis revealed that with a p-value of 0.015 on the chi-squared test and with a p-value of 0.014 on the Fisher's exact test,

there was strong evidence to suggest a significant association between diet and gender among the participants in the sample.

5.3.2. Sex vs Food Craving Frequency

The analysis of the responses to the question “how often do you experience food craving?”, indicated that among the male population, 2 of them reported "Almost Never" craving food, 16 reported "Rarely" craving food, 25 reported "Often" craving food, and 7 reported craving food "All the time." As for the female participants, 6 reported "Almost Never" craving food, 19 reported "Rarely" craving food, 56 reported "Often" craving food, and 41 reported craving food "All the time." The associated p-value for the chi-squared test is 0.021 and the Fisher’s exact test yielded a p-value of 0.017. These results suggest that the frequency of experiencing food cravings (when the definition of food craving is given) is different between male and female population.

5.3.3. Sex vs Type of Food Craved

When comparing responses to the question “what food do you crave the most”, the analysis indicated a significant association between an individual's most craved food category and their sex in the sample. This implies that there may be differences in food cravings between males and females in the studied population, particularly in relation to specific food categories. The chi-squared test produced a p-value of 0.002, and the Fisher's exact test yields a p-value of 0.006, both below the typical significance level of 0.05 used in hypothesis testing. The results suggest that certain food preferences are shared across the two populations while other are more dominant in one of the two groups.

Table 15: Sex by Most Craved Food Category

Most Craved Food Category	Male	Female	Total
Savoury	2	4	6
Chocolate	7	25	32
Other	4	7	11
Sweet	10	33	43
Crisps	2	8	10
Carbs	3	15	18
Fast Food	7	4	11
Meat	10	3	13
Cheese	1	5	6
Fruits & Vegetables	0	4	4
Salty	0	5	5
Chinese	1	1	2
Total	**47**	**114**	**161**

Test	Value	df	p
χ^2	28.90	11	.002

Fisher's Exact (Monte Carlo)	–	–	.006
N	161	–	–

x^2 test of associations between sex and most craved food yielded p-value=0.002. Fisher's exact test yielded p-value=0.006 with the use of a Monte Carlo simulation. Both tests indicate statistical significance..

5.3.4. Sex vs Experiencing Food Craving Yesterday

The comparison of the responses to the question "Did you experience food craving yesterday?", indicated that in the male population, 12 of them experienced food cravings yesterday (Yes), while 38 did not (No). Amongst female participants, 66 experienced food cravings yesterday (Yes), and 55 did not (No). The associated p-value for the chi-squared test was <0.001 and Fisher's exact test yielded a p-value <0.001. These results indicate that there is strong statistical evidence to conclude that there is a significant association between whether an individual experienced craving yesterday and their sex in the sample. This implies that there are differences in the prevalence of cravings between males and females in the studied population.

5.4. Male vs Female Comparison of Ordinal / Continues Variables (Kruskal-Wallis non parametric test)

Males and females were compared on BMI, General Mood (Positive and Negative), and dietary consumption. In these analyses, gender served as the independent variable, and dietary intake measures (e.g., protein, calories, carbohydrates) and mood scores functioned as dependent variables.

Normality assumptions were violated across the majority of variables for both males and females. Shapiro–Wilk tests indicated significant departures from normality for nearly all variables, with most p-values < .001 and only a few exceptions in the male group (e.g., p = .149 for GramCarbsBreak). Several variables demonstrated substantial skewness and kurtosis, including SnackCal (female skewness = 13.6, kurtosis = 185) and TotalCal (female skewness = 13.3, kurtosis = 181). Even variables with more moderate skew (e.g., male NegativeMood skewness = 1.13) or flatter distributions (e.g., male TotalGramCarbs kurtosis = –1.05) still failed normality tests (Skewness Statistics are included in Annex E). These distributional violations, combined with extreme values and wide variability across intake measures, indicate that the assumptions required for parametric tests were not met. Therefore, non-parametric methods were used for all gender-based analyses.

Using One-way Anova (Kruskal-Wallis) non parametric test, analysis of gender differences revealed a few significant effects on BMI, dinner calories, lunch and dinner protein intake, and total daily protein intake. Most other measures, including mood and other dietary variables, showed no significant gender-related differences. After applying a Holm–Bonferroni correction for 23 comparisons, only dinner protein (GramProtDin) and total daily protein intake (TotalGramProt) remained significant, while all other differences became non-significant. The statistical analysis of the above-mentioned variables is *presented below.*

Table 16: Summary of Kruskal-Wallis test and Holm-Bonferroni adjustment for Gender and Ordinal Variables

Variable	Raw p	Holm-Corrected p	Post-hoc W (male vs female)	Post-hoc p	Direction of Effect
GramProtDin	**0.001**	**0.023**	**–6.07**	**< .001**	**Male > Female (higher dinner protein)**
TotalGramProt	**0.001**	**0.023**	**–5.32**	**< .001**	**Male > Female (higher total daily protein)**
BMI	0.044	0.484	–	–	n.s.
NegativeMood	0.248	1.000	–	–	n.s.
PositiveMood	0.112	1.000	–	–	n.s.
Breakcal	0.880	1.000	–	–	n.s.
GramProtBreak	0.684	1.000	–	–	n.s.
GramCarbsBreak	0.531	1.000	–	–	n.s.
GramProtLunch	0.021	0.230	–	–	n.s.
DinnerCal	0.023	0.253	–	–	n.s.
GramCarbsDin	0.091	1.000	–	–	n.s.
All remaining p > .05	—	1.000	—	—	—

Note. *Table reports raw and Holm–Bonferroni–adjusted p-values for Kruskal–Wallis tests examining gender differences on ordinal dietary and mood variables. Post-hoc comparisons use the Dwass–Steel–Critchlow–Fligner (DSCF) method; negative W values indicate higher scores in females. n.s. = non-significant after correction.*

As indicated in the table above, statistically significant findings were evident in the differences between the two genders in the following:

I. Dinner Macronutrients (GramProtDin): Only protein intake at dinner showed a significant difference between male and female participants (p = 0.001, corrected p = 0.023). Dwass-Steel-Critchlow-Fligner pairwise comparisons indicated that males consumed significantly more protein at dinner than females.

II. Total Macronutrients (TotalGramProt): Across total daily macronutrients, only protein intake differed significantly between the groups (p < 0.001, corrected p

= 0.023). Pairwise comparisons similarly showed that males had a significantly higher total daily protein intake compared to females

In summary, the Kruskal–Wallis tests and pairwise comparisons (which remained statistically significant after the Holm–Bonferroni adjustment) indicated meaningful differences between the two genders in protein intake at dinner and total daily protein intake. The results provide specific insights into how gender affects these dietary and health-related variables within the studied population.

5.5. Cravers vs non Cravers Comparison of Nominal Variables (x^2 associations)

Participants were categorized into two groups, low cravers and high cravers, based on their responses to the food craving frequency question. Specifically, individuals who reported craving food "almost never" or "rarely" were classified as low cravers, while those indicating cravings "often" or "all the time" were classified as high cravers. Subsequently, these newly defined groups underwent analysis to explore potential associations with various factors, including self-declared diet status, the most frequently craved food, recent experiences of food craving, the specific food craved, responses to food cravings, and the type of activity engaged in during these episodes. The results are summarised in the table below:

Table 17: Summary of Chi-Square Tests for Craving Frequency and Nominal Variables

Variable Compared with Sex	χ^2 Value	df	p (Chi-Square)	p (Fisher's Exact)	Significant?
Diet Status	0.081	—	.081	.079	No
Most-Craved Food	**21.7**	**11**	**.027**	**.021**	**Yes**
Experienced Craving Yesterday	**—**	**1**	**< .001**	**< .001**	**Yes**
Food Craved Yesterday	—	—	.878	.756	No
Response to Craving	—	—	.110	.185	No
Activity During Craving	—	—	.483	.449	No

Note. *Table presents chi-square statistics and Fisher's exact p-values for associations between craving frequency (low vs. high cravers) and nominal variables. Statistical significance is evaluated at p = .05.*

As indicated in the table above, statistically significant findings were evident in the responses of high and low cravers in relation to the type of food craved and whether they experienced food craving the previous day.

5.5.1. Craving Frequency vs Type of Food Craved

When comparing responses to the question “what food do you crave the most”, the analysis indicated a significant association between an individual's most craved food category and their craving frequency. This implies that there may be differences in food cravings between high and low cravers in the studied population, particularly in relation to specific food categories. The types of food craved the most per subsample is indicated below in Figure 1, with the higher preference marked in bold. The chi-squared test produced a p-value of 0.027, and the Fisher's exact test yields a p-value of 0.021, both below the typical significance level of 0.05 used in hypothesis testing. The results suggest that certain food preferences are shared across the two populations while other are more dominant in one of the two groups.

Table 18: Most Craved Food by Food Craving Frequency

FCFreq	Savoury	Chocolate	Other	Sweet	Crisps	Carbs	Fast Food	Meat	Cheese	Fruits & Vegetables	Salty	Chinese	Total
Low	4	3	4	8	1	5	2	6	0	0	2	1	36
High	2	29	7	35	9	13	9	7	6	4	3	1	125
Total	6	32	11	43	10	18	11	13	6	4	5	2	161

Test	**Value**	**df**	**p**
Pearson χ^2	21.7	11	.027
Fisher’s exact test[a]	—	—	.021
N	161	—	—

x^2 test of associations between low and high cravers in regards to their most craved food yielded p-value=0.027. Fisher’s exact test yielded p-value=0.021. Both tests indicate statistical significance.

5.5.2. Craving Frequency vs Experiencing Food Craving Yesterday

The analysis of responses to the question "Did you experience food craving yesterday?" showed notable distinctions between low and high cravers. Among low cravers, 6 individuals reported experiencing food cravings yesterday (Yes), while 37 did not (No). Conversely, among high cravers, 72 experienced food cravings yesterday (Yes), and 56 did not (No). The chi-squared test produced a p-value of <0.001, and the Fisher's exact test yielded a p-value <0.001. These results provide robust statistical evidence supporting the conclusion that there is a significant association between the occurrence of food cravings yesterday and an individual's overall craving frequency.

5.6. Craving Frequency Comparison of Ordinal / Continues Variables (Kruskal-Wallis non parametric test)

High and low cravers were compared using Kruskal-Wallis non-parametric tests on BMI, General Mood (Positive and Negative), and dietary consumption. The independent variable was craving group (high vs. low), and dependent variables included age, BMI, mood scores, and macronutrient and caloric intake across meals and total daily consumption.

The data analysis showed that there were a few significant differences between high and low cravers. In summary, the Kruskal-Wallis test revealed differences in I-PANAS-SF Negative Mood Score and Snack caloric, carbohydrates and fat consumption (SnackCal, GramCarbsSnack & GramFatSnack). Other variables, such as age, BMI and most nutritional variables, did not show significant differences. These findings provide insights into specific aspects of food craving frequency. A Holm–Bonferroni correction was applied to control the family-wise error rate across 24 Kruskal–Wallis tests. After correction, only Negative Mood remained statistically significant (adjusted p = .024). Snack calorie intake (adjusted p = .069) and snack fat intake (adjusted p = .110) approached significance but did not survive the correction. All remaining variables were non-significant after multiple-comparison adjustment. The statistical analysis of each of the above-mentioned variables is presented below.

Table 19: Summary of Kruskal-Wallis test and Holm-Bonferroni adjustment for high and low cravers and Ordinal Variables

Variable	Raw p	Holm-Corrected p	Post-hoc W	Post-hoc p	Direction of Effect
Negative Mood	0.001	0.024	4.69	< .001	High > Low
Snack Calories	0.003	0.069	—	—	n.s.
Gram Fat Snack	0.005	0.110	—	—	n.s.
Gram Carbs Snack	0.031	0.713	—	—	n.s.
BMI	0.245	1.000	—	—	n.s.
Gram Protein Breakfast	0.256	1.000	—	—	n.s.
Gram Carbs Lunch	0.301	1.000	—	—	n.s.
All remaining p > .05	—	1.000	—	—	n.s.

Note. *Table presents raw and Holm–Bonferroni–adjusted p-values for Kruskal–Wallis tests comparing high and low cravers on ordinal variables. Post-hoc comparisons (where applicable) are based on the Dwass–Steel–Critchlow–Fligner (DSCF) method. n.s. = non-significant after correction.*

As indicated in the table above, statistically significant findings were evident in the differences between high and low cravers in Negative Mood. The p-value is <0.001 and 0.024 corrected. Dwass-Steel-Critchlow-Fligner pairwise comparisons as

indicated in the Figure below reveal that high cravers have a higher score of Negative Mood compared to low cravers.

5.7. Experiencing Food Craving Yesterday Comparison of Ordinal / Continues Variables (Kruskal-Wallis non parametric test)

Participants were compared based on whether they experienced food cravings the previous day. Craving status (craver vs. non-craver) served as the independent variable, with dependent variables including BMI, General Mood (Positive and Negative), and dietary consumption, focusing particularly on snack calories and snack fat intake.

The data analysis showed that there were a few significant differences between people that experienced food craving and those that did not. In summary, the Kruskal-Wallis test revealed differences in Negative Mood, lunch fat, snack calories, protein, carbohydrates and fat, and total caloric and fat intake. Other variables, including age, BMI, and most nutritional measures, were not significant. After Holm–Bonferroni correction across 24 tests, only snack calories (p = .024) and snack fat (p = .048) remained significant; all other variables, including Negative Mood and total intake measures, were no longer significant. The statistical analysis of each of the above-mentioned variables is presented below.

Table 20: Summary of Kruskal–Wallis Test Results with Dwass-Steel-Critchlow-Fligner Post-hoc Comparisons Between Yesterday's Cravers and Non-Cravers

Variable	Raw p	Holm-Corrected p	Post-hoc W	Post-hoc p	Direction of Effect
Snack Calories	0.001	0.024	-5.57	< .001	No Craving > Craving
Gram Fat Snack	0.001	0.048	-5.81	< .001	No Craving > Craving
Gram Protein Snack	0.007	0.147	—	—	—
Total Calories	0.019	0.399	—	—	—
Total Gram Fat	0.032	0.672	—	—	—
Negative Mood	0.034	0.714	—	—	—
Gram Fat Lunch	0.037	0.777	—	—	—
Gram Carbs Snack	0.041	0.861	—	—	—
All remaining variables	—	1.000	—	—	—

Note. *Table presents Kruskal–Wallis statistics and Holm–Bonferroni–adjusted p-values for comparisons between participants who reported a craving the previous day and those who did not. Post-hoc comparisons use the DSCF method. Direction of effect indicates the group with higher ranked values.*

According to the findings, significant differences between yesterday's cravers and non-cravers were observed for both caloric and fat intake during snacking.

I. Snack Calories (SnackCal): Non-cravers consumed significantly more calories than cravers ($p < .001$, Holm-corrected $p = .024$). Dwass-Steel-Critchlow-Fligner pairwise comparisons confirmed this difference ($W = -5.57$, $p < .001$).
II. Snack Fat (GramFatSnack): Similarly, non-cravers consumed significantly more fat than cravers ($p < .001$, Holm-corrected $p = .048$), as shown by pairwise comparisons ($W = -5.81$, $p < .001$).

The analysis based on Kruskal-Wallis tests with Holm–Bonferroni adjustment showed that participants who did not experience food cravings the previous day consumed significantly more calories ($p < .001$) and fat ($p < .001$) from snacks than those who did. These findings suggest that, contrary to expectations, individuals who did not report cravings the previous day consumed more energy-dense snack foods, pointing to a more complex relationship between craving experiences and actual eating behaviour.

5.8. Mood of Cravers and Non Cravers while craving vs Mood in general (paired samples t-test)

Using paired samples t-test, the participants' responses on the Positive and Negative Affect Schedule (I-PANAS-SF) were compared for how they feel when experiencing food craving and how they feel in general, depending on whether they experienced food craving yesterday. Participants are categorized below as "cravers" if they experienced food cravings and as "non-cravers" if they did not experience food cravings yesterday. The independent variable was type of affect (craving vs. general), and the dependent variables were positive and negative affect scores. More specifically the following comparisons were made:

- Cravers Negative Mood while craving vs Cravers Negative Mood in general
- Cravers Positive Mood while craving vs Cravers Positive Mood in general
- Non-Cravers Negative Mood while craving vs Non-Cravers Negative Mood in general
- Non-Cravers Positive Mood while craving vs Non-Cravers Positive Mood in general

The data analysis indicated interesting and statistically significant differences in mood changes among cravers and non-cravers while craving versus in general. A Holm–Bonferroni correction was applied across the four paired-sample t-tests. The positive mood comparisons remained statistically significant for both Cravers (adjusted p = .004) and Non-Cravers (adjusted p = .003). However, neither of the negative mood comparisons survived correction (Cravers: adjusted p = .171; Non-Cravers: adjusted p = .633). These findings presented in the figures below.

Table 21: Summary of paired t-test and Holm-Bonferroni adjustment for Craving and Mood

Comparison	Mood Type	t	df	Raw p	Holm-Adjusted p	Direction of Effect
Cravers	Positive Mood	-8.441	61	< .001	0.004	General > Craving
Non-Cravers	Positive Mood	-11.119	81	< .001	0.003	General > Craving
Cravers	Negative Mood	-1.936	61	0.057	0.171	n.s.
Non-Cravers	Negative Mood	-0.479	81	0.633	0.633	n.s.

Note. *Table reports paired-samples t-test results comparing general mood with mood during cravings. Adjusted p-values use the Holm–Bonferroni method. "Direction of effect" indicates which mood condition had higher mean scores. n.s. = non-significant.*

Given the above, the paired samples t-test of Cravers showed a marginally significant decrease in negative mood (p = 0.057) while craving compared to their negative mood in a general state. On the other hand, their positive mood had a highly significant decrease (p < 0.001) during craving compared to their general positive mood. The descriptive statistics for cravers further indicate that, cravers negative mood decreased from 9.60 to 8.68 during craving, while their positive mood decreased from 14.65 to 9.29. This suggests that craving, particularly in cravers, may be associated with a noticeable decrease in mainly positive moods.

Table 22: Descriptive Statistics for PANAS Mood Scores While Experiencing Food Craving vs. General Mood

Group / Mood Type	N	Mean	Median	SD	SE
Cravers – Negative Mood	62	8.68	7.50	3.89	0.494
Cravers – General Negative Mood	62	9.60	9.00	3.57	0.453
Cravers – Positive Mood	62	9.29	9.00	4.31	0.548
Cravers – General Positive Mood	62	14.65	15.00	4.41	0.560
Non-Cravers – Negative Mood	82	8.17	6.00	4.14	0.457
Non-Cravers – General Negative Mood	82	8.39	8.00	3.26	0.360
Non-Cravers – Positive Mood	82	8.80	8.00	4.07	0.450
Non-Cravers – General Positive Mood	82	15.02	16.00	4.52	0.499

Note. *Table displays descriptive statistics (N, mean, median, SD, SE) for PANAS positive and negative mood scores among cravers and non-cravers, assessed during a craving episode and in general.*

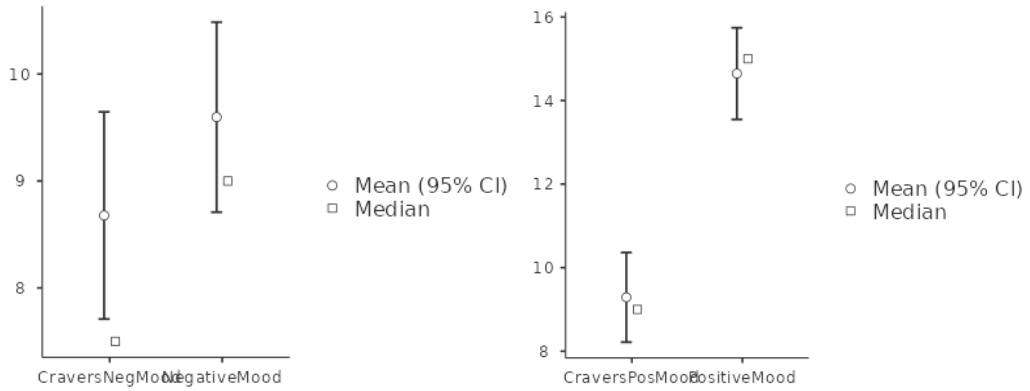

Figure 12. Cravers Changes in Negative and Positive Mood while craving vs in general

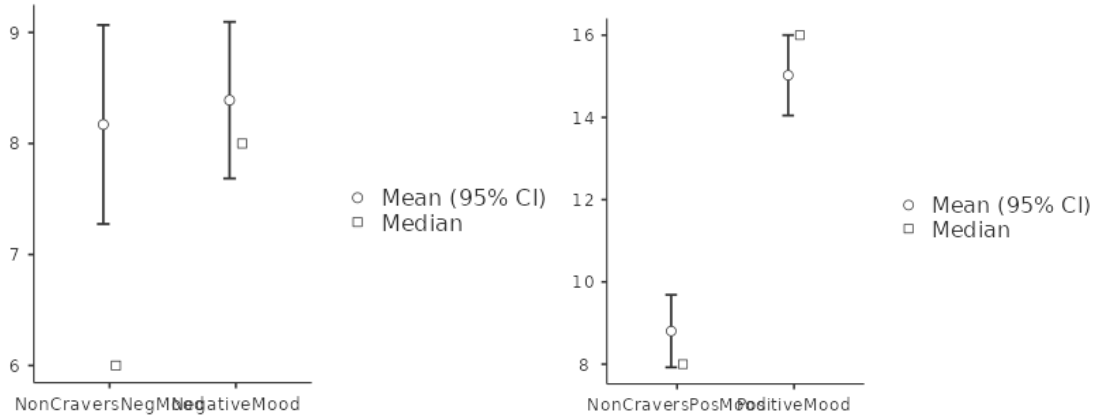

Figure 3. Non Cravers changes in Negative and Positive Mood when craving vs in general

In the case of non-cravers, the paired samples t-test showed no significant change in negative mood ($p = 0.633$) while craving compared to their negative mood in a general state. However, similarly to the case of cravers, there was a highly significant decrease in positive mood ($p < 0.001$) during craving compared to their positive mood in a general state. The descriptive statistics for non-cravers indicate that negative mood changes only slightly from 8.39 to 8.17 during craving, whereas positive mood decreases more evidently from 15.02 to 8.80. This suggests that non-cravers experience a notable decrease only in positive mood during craving, and there is no significant change in their negative mood.

7. Study II Discussion

The present study examined the associations between food cravings, dietary intake, mood, nationality, sex, and craving-related behaviours. Across the analyses, several

meaningful patterns emerged, although many variables showed no significant relationships after adjusting for multiple comparisons.

Based on the data analysis comparing food cravings between British and Cypriots, the study showed noteworthy associations, implying a potential cultural influence on this phenomenon. While the analysis did not identify significant links between nationality and diet status, food craving frequency or response to cravings, it did expose substantial differences in preferred craved foods and activities associated with cravings. Furthermore, the study highlighted significant disparities in protein intake at lunch, carbohydrate and caloric intake at dinner, and total daily carbohydrate intake. These findings underscore the significance of recognizing cultural differences in dietary practices, emphasizing the necessity for interventions to be tailored to accommodate these variations.

Regarding sex-related differences in food cravings, the study identified noteworthy associations. Females reported a significantly higher frequency of food cravings, whether cravings were experienced on the previous day and the two genders differed in their most craved food, indicating a distinct pattern in craving experiences between genders. Additionally, females were significantly more likely to be on a diet or watching their weight compared to men, which may further contribute to the observed differences in craving frequency and type. However, no significant associations were found in activities linked to cravings or the actual response to cravings. Furthermore, the analysis revealed significant associations in dietary variables such as protein intake at dinner and total daily protein intake. These findings provide insight into sex-related variations in nutrient intake that may be relevant to understanding differences in craving patterns and valuable information for customizing dietary interventions to address the unique needs and preferences of each gender group.

Regarding differences between participants reporting high and low food craving frequency, the study found no distinctions in BMI, or meal-specific variables. However, high cravers reported significantly higher negative mood scores, suggesting an emotional component to more frequent craving experiences. The types of foods craved also differed between high and low cravers, indicating qualitative differences in craving patterns associated with craving frequency. After adjustment for multiple comparisons, no significant differences emerged in dietary intake, suggesting that

affective factors may be more closely linked to craving frequency than to actual consumption. Understanding the connection between negative mood high cravers is essential for developing effective strategies that address the emotional aspects associated with heightened food cravings.

In regard to differences in food craving between individuals who experienced or did not experience food cravings the previous day, the study revealed several notable findings. Individuals experiencing cravings exhibited significantly lower snack caloric and fat intake, contrary to assumptions that cravings drive higher snack intake. This suggests that craving episodes and eating behaviour may not align in predictable ways and that individuals may snack for reasons unrelated to cravings (e.g., habit, availability, boredom). On the other hand, this pattern may suggest that inhibiting or restraining snack intake may itself contribute to the emergence of cravings, as reduced snacking could increase psychological or physiological drive toward desired foods. After multiple-comparison adjustment, no mood differences emerged between the two groups.

The impact of mood and the emotional dimension of food craving is accentuated in the comparison of Positive and Negative Affect Schedule (I-PANAS-SF) scores during craving versus general states among both cravers and non-cravers. Both groups shared a common experience of a decrease in positive mood during cravings, highlighting a universal aspect of mood change during these episodes. However, cravers demonstrated a marginal decrease in negative mood, indicating a more distinct emotional response compared to non-cravers. These findings underscore the relationship between cravings and mood changes, revealing potential distinctions between individuals who commonly experience cravings and those who do not. The different emotional state observed in cravers, including both positive and negative mood alterations, suggest a more complex interplay between mood and the occurrence of food cravings.

In conclusion, the findings from this study highlight the multifaceted nature of food cravings. Cultural background and sex were associated with specific craving patterns and dietary behaviours, while craving frequency was strongly linked to negative mood. Importantly, experiencing a craving did not straightforwardly predict higher snack intake, indicating a more intricate interplay between cravings and actual eating

behaviour. These insights underscore the need for future research that examines cravings through a culturally informed and psychologically grounded lens, recognizing individual differences in both emotional and dietary responses.

Discussion

Understanding food craving is vital, especially considering its parallels with drug addiction and its implications for health. Overeating, recognized as an addictive disorder, underscores the importance of researching the desire for specific foods. Food craving has long been linked to various health issues, including Binge Eating, higher BMI, and noncompliance with dietary restrictions (Gendall, Joyce et al. 1998; Pelchat 1997). Moreover, its prevalence, affecting a significant portion of the population, suggests it's a normative rather than an aberrant phenomenon (Gendall et al. 1997a, Gendall et al. 1997B, Weingarten & Elston 1991, Christensen & Petijohn, 2001, Pelchat, 1997).

The literature review has identified several significant gaps in research on food craving. Firstly, there's a clear need for more extensive investigation into male populations, as the majority of existing studies have predominantly focused on women (Macdiarmid and Hetherington 1995; Pelchat 1997; Christensen and Pettijohn 2001; Waters, Hill et al. 2001; Cepeda-Benito, Fernandez et al. 2003; Fedoroff, Polivy et al. 2003; Zellner, Garriga-Trillo et al. 2004; Martin, O'Neil et al. 2006), potentially overlooking gender-specific differences. Additionally, cross-cultural studies on food craving are very limited (Zellner, Garriga-Trillo et al. 1999; Parker, Kamel et al. 2003; Osman and Sobal 2006), which inhibits the identification of potential cultural variations in food craving and limits the applicability of research findings across diverse cultural contexts.

Also, the absence of a universally accepted definition of food craving presents a challenge, complicating research efforts and hindering accurate measurement and observation of the phenomenon across different populations and languages. Furthermore, existing research often produces contradictory conclusions regarding various aspects of food craving, including the relationship between mood and food craving, the effects of restrained eating and chronic dieting, and the underlying physiological mechanisms (Hill and Heaton-Brown 1994; Macdiarmid and Hetherington 1995; Hill, 2007; Weingarten, 1990).

Addressing these identified gaps through comprehensive and inclusive research efforts is essential to advance the understanding of food craving and its implications for health and well-being. To address these gaps, the conducted research adopted a cross-cultural approach, studying food craving in British and Greek Cypriot cultures. The studies examined gender differences and the interplay between food craving and cultural factors. By addressing these issues, the research aimed to provide valuable insights to advance the understanding of food craving and its implications in different cultures and genders.

The first study (Study I) aimed to explore the understanding of the term "food craving" in two distinct cultures: British and Greek Cypriot. Given that the Greek Cypriot dialect lacks a single word to describe this phenomenon, this provided an opportunity to investigate whether individuals who lack a specific term for it still experience it. In contrast, the second study (Study II) delved into the relationship between food craving and eating behavior through the lens of culture. This study aimed to detect whether cravings for different types of food stem from behavioral, cultural, or gender-related characteristics. By examining these aspects, the research sought to clarify how cultural food patterns influence eating behaviors and cravings. The results of Study I and Study II collectively shed light on the intricate relationship between nationality, gender, mood, and food cravings.

1. Cultural Influences on Cravings - Results:

The findings from both studies highlight the substantial impact of cultural and national backgrounds on food cravings. This aligns with the notion from the literature review that culture influences food cravings (Zellner, Garriga-Trillo et al. 1999; Pelchat 1997; Osman and Sobal 2006; Zellner et al. 2004; Komatsu 2008; Parker et al. 2003).

Study I revealed significant differences in how individuals from the two different nationalities define and experience food cravings. British participants tended to view cravings as a “want”, a “desire” or a “need”, which might suggest a more rigid or fixed attitude towards cravings. In contrast, the Cypriots’ diverse responses could indicate a more flexible or varied understanding of cravings, potentially influencing how cravings are managed culturally. Additionally, Cypriot participants reported

significantly higher levels of chocolate, salty, and meat cravings compared to British participants. These findings suggest cultural variations in dietary patterns and nutrition between the two populations.

Furthermore, Study II elaborates on these cultural distinctions since it also unveiled noteworthy associations. While the analysis did not identify significant links between nationality and diet status or food craving frequency, it did expose substantial differences in preferred craved foods and activities associated with cravings. Moreover, the study highlighted significant disparities in specific dietary differences—lunch protein intake, dinner carbohydrate intake, dinner caloric intake, and total daily carbohydrate intake— which remained significant after multiple comparison adjustment. These findings could be reflective of deeper cultural eating habits and traditions which influence daily consumption and nutritional choices. Notably, such differences necessitate tailored public health initiatives and interventions that are sensitive to these cultural nuances, ensuring that they are relevant and effective in promoting healthier eating behaviors within specific national contexts.

2. Cultural Influences on Cravings - Interpretation:

The above findings suggest that cultural background shapes not only how people perceive cravings but also their underlying dietary patterns. This underscores the importance of culturally-tailored interventions. "One-size-fits-all" approaches are unlikely to be effective, and dietary recommendations should be adapted to accommodate the specific preferences and practices prevalent within different cultures.

The research suggests that cravings might be a culturally constructed phenomenon. British participants describing cravings as a "need" might reflect a cultural belief that cravings are uncontrollable urges. Conversely, Cypriots' diverse responses could indicate a more flexible cultural understanding of cravings, potentially influenced by cultural practices for managing them, especially considering the lack of an exact word describing food craving in Greek Cypriot dialect. Further, the markedly different food environments surrounding the two groups help contextualise these interpretations. British individuals are immersed in a food environment dominated by ultra-processed

foods (UPFs), which are engineered to be hyper-palatable and strongly associated with craving intensity (Monteiro et al., 2018; Hall et al., 2019). In contrast, Cypriots are embedded in a Mediterranean dietary culture where fresh, minimally processed foods and communal eating are central elements (Hadjimbei et al., 2020; UNESCO, 2010). Such environmental and cultural conditions may contribute to Cypriots conceptualising cravings as less urgent or pathological, and more as ordinary, socially contextualised food desires.

Moreover, the observed differences in craved foods (chocolate, salty snacks, meat) and dietary intake (macronutrients) between nationalities suggest a link between cultural background and dietary patterns. Culinary traditions, availability of specific foods, and societal attitudes towards certain food groups can all influence what people crave and ultimately consume. Cultural norms and values might shape schemas (mental frameworks) related to food choice (Sobal & Bisogni, 2009). These schemas could influence how individuals interpret cravings, respond to them, and what coping mechanisms they use to manage them. For example, the British reliance on convenience foods, flexible meal timing, and high snacking frequency may strengthen associative learning between environmental cues and cravings. Conversely, Cypriot traditions involving shared meze meals, later eating times, and strong social expectations around hospitality embed eating within community rituals, which may buffer against impulsive or reward-driven eating. Future research could explore how cultural schemas differ and how they influence craving experiences.

The framework model of food choice proposed by Chen & Antonelli, 2020, suggests that the factors determining food choice are categorized into food-internal factors (sensory and perceptual features), food-external factors (information, social environment, physical environment), personal-state factors (biological features, physiological needs, psychological components, habits, and experiences), cognitive factors (knowledge and skills, attitude, liking and preference, anticipated consequences, and personal identity), and sociocultural factors (culture, economic variables, political elements) (Chen & Antonelli, 2020). The research findings significantly reinforce the framework model by highlighting the critical role of social and cultural factors in shaping food preferences. By demonstrating how cultural background influences the perception, experience, and management of cravings, this

study underscores the importance of considering cultural context in understanding and addressing food-related behaviors.

The findings reveal that cravings are not solely individual experiences but are deeply embedded within social and cultural structures. This underscores the model's sociocultural factors, highlighting that food preferences are deeply rooted in cultural contexts and social environments. The contrast between the high-UPF British food environment and the Mediterranean-based Cypriot eating tradition exemplifies how sociocultural and environmental factors jointly shape craving patterns. British exposure to pervasive UPF marketing, particularly for confectionery, fast food, and packaged snacks (Boyland et al., 2016), likely reinforces cravings for energy-dense, highly palatable foods. Meanwhile, Cypriots encounter greater cultural visibility of fresh, traditional foods and less UPF-focused advertising (Filippou, 2018), which may shift craving patterns toward culturally meaningful and sensory-rich foods. For instance, the variation in food craving patterns between British and Greek-Cypriot populations suggests that cultural influences extend beyond mere preferences to affect the very nature of cravings themselves. These findings reinforce the importance of considering sociocultural elements when analyzing food choices, as they shape not only what foods are craved but also how these cravings manifest and are managed within different cultural settings.

In conclusion, the findings suggest that cultural background plays a significant role in shaping how individuals experience and manage food cravings as proposed by the majority of the cross cultural studies on the topic (Holtzman, 2019b; Hormes et al., 2014; Hormes & Niemiec, 2017; Hormes & Rozin, 2010; Komatsu, 2008b; Zellner et al., 1999). The integration of differences in UPF exposure, meal structures, advertising environments, and cultural eating traditions further strengthens this conclusion, demonstrating that craving experiences are not universal but are shaped by the broader cultural and environmental landscape in which individuals eat. This knowledge can be used to develop culturally sensitive public health interventions that promote healthier eating habits across diverse populations.

3. Gender and the Craving Experience - Results:

Both studies highlight clear gender differences in the frequency and type of food cravings which agrees with findings of other studies (Pelchat 1997; Zellner, Garriga-Trillo et al. 1999; Christensen and Pettijohn 2001; Lafay, Thomas et al. 2001; Osman and Sobal 2006).

The comparison between males and females in Study I, highlighted gender as a significant factor influencing food cravings. Women exhibited higher cravings for sweets, chocolate, and potentially salty snacks, while men showed more intense and frequent cravings for meat. These gender differences in food preferences underscore the complexity of how gender shapes individuals' craving experiences. However, no significant disparities were observed in cravings related to salty foods, fat, or carbs, indicating that gender may not play as prominent a role in shaping preferences for these types of foods. The findings seem to agree with Zellner et al, 1999 who suggested that women tend to crave sweet fat, while men crave mostly salty fat. Also, Wansink et al. (2003) found that males preferred warm, hearty, meal-related comfort foods (such as steak, casseroles, and soup), while females instead preferred comfort foods that were more snack related (such as chocolate and ice cream) (Wansink, Cheney et al. 2003).

In Study II, notable differences in food cravings based on gender were also identified. The two genders showed a significant association between diet and gender, indicating that women are more cautious about their dietary intake. Additionally, certain food preferences appeared to be shared across the two populations, while others were more pronounced in one group than the other, suggesting that both gender and cultural context shape the types of foods individuals are more likely to crave. Females reported a significantly higher frequency of food cravings, consistent with previous research indicating that women are twice as likely as men to experience food cravings (Polivy, Coleman et al. 2005). However, no significant associations were found between gender and activities linked to cravings or the actual response to cravings and mood. These findings contrast somewhat with Lafay et al. (2001), who noted

differences in mood and activities during craving episodes between genders. According to Lafay et al. (2001), women's food cravings were associated with negative moods and feelings of boredom, solitude, annoyance, or depression, while men tended to give in to cravings when feeling happy and relaxed, especially when indulging in them. The discrepancies between the findings of Study II and Lafay et al. (2001) suggest that the relationship between gender and food cravings is complex and may be influenced by various factors.

Also, Study II analysis revealed significant associations of gender with males exhibiting higher dinner caloric intake, and total daily protein intake. This could be interpreted through the lens of the homeostatic model of food craving (Weingarten and Elston 1990), suggesting men might be driven by a biological need to consume more calories and protein. However, the study doesn't directly assess nutrient deficiencies, and the influence of social and cultural factors also needs to be considered.

4. Gender and the Craving Experience - Interpretation:

While Study I highlighted gender differences in the types of foods craved, Study II adds another layer of complexity. The finding that women reported experiencing cravings more frequently aligns with the notion that biological factors such as hormonal fluctuations might play a role (Gendall et al, 1997, Pelchat, 1997, (Hormes & Niemiec, 2017; Souza et al., 2018)). Moreover, Study II revealed that men have a higher protein intake, particularly at lunchtime and dinner. This could be due to physiological differences or ingrained cultural norms around masculinity and food choices.

In addition to biological and sociocultural explanations, evolutionary and metabolic perspectives offer further insight into gender differences in food cravings and nutrient consumption. Sex differences in energy metabolism, fuel utilization, and hormonal regulation may shape distinct nutritional needs and preferences across men and women. For instance, women rely more heavily on lipid oxidation during rest and exercise, whereas men tend to utilize carbohydrate-based energy pathways to a greater extent, a pattern linked to evolutionary pressures and sex-specific reproductive demands (Mauvais-Jarvis, 2015; Quirke & others, 2021; Tarnopolsky, 2008). These metabolic distinctions are further influenced by hormonal factors such as estrogen and

testosterone, which modulate appetite, energy expenditure, and macronutrient selection (Asarian & Geary, 2013; Clegg, 2012).

Such biological differences may help explain why men typically consume more protein, especially at main meals, given their generally higher lean body mass, elevated energy turnover, and greater physiological demand for amino acids to support muscle maintenance and repair (Phillips, 2012; Westerterp, 2017). Conversely, women's metabolic reliance on fat oxidation and greater hormonal sensitivity to carbohydrate-rich foods may shape different craving patterns and nutrient preferences (Baker & Ranadive, 2020; Solomon & others, 2020). These evolutionary and metabolic frameworks complement sociocultural and psychological explanations, offering a more comprehensive understanding of sex-related differences in eating behaviour.

Moreover, the gender differences observed in the two studies could also be related to learned associations and emotional eating patterns (Benton 1990; Hetherington, 2002; Wise 2006). Women might be more likely to associate sweets or chocolates with comfort, while men might associate meat with feelings of strength or masculinity. Additionally, the perceived reward value of these different types of food may vary between genders. These learned associations and emotional cues could play a significant role in triggering cravings based on gender-specific preferences and perceptions.

In addition to learned associations, cultural and commercial factors may reinforce these tendencies. High-calorie, sweet foods (such as chocolate and cakes) are frequently marketed more heavily to female audiences (Blomquist, 2020; Castronuovo et al., 2021; Gálvez, 2021) This gender-targeted marketing could amplify cravings by repeatedly pairing certain foods with emotions, femininity, or comfort. Evidence suggests that exposure to food advertising can directly influence craving intensity and eating behavior (E. Boyland, 2024; E. J. Boyland et al., 2016; Filippone, 2022), and gendered advertising may therefore contribute to the craving patterns observed in the research.

The study also contributes to the Chen & Antonelli model by emphasizing the role of personal-state factors and particularly gender in shaping food preferences and

cravings. The findings underline the complex relationship between gender and its influence on food choices. By demonstrating how gender can impact craving experiences, the research highlights the importance of considering individual differences when developing interventions aimed at managing cravings and promoting healthier eating behaviors.

Understanding these gender-specific dietary needs and preferences is crucial for designing personalized dietary plans that promote satiety and discourage unhealthy cravings. Future research could explore the biological underpinnings of these differences to provide a more comprehensive understanding of the interplay between gender and food cravings.

5. The Emotional Underpinnings of Cravings - Results:

A particularly intriguing aspect of Study II is the exploration of the emotional dimension of food cravings. The study did not reveal any distinctions in age, BMI, or various meal-specific variables among participants reporting high and low food craving frequency. However, significant differences emerged in the preference for craved food and the experience of food cravings the previous day, as well as negative mood and snack intake.

High cravers were significantly more likely to have experienced food craving the previous day and they also differed from low cravers in the type of food they mostly crave. They also exhibited higher negative mood scores, suggesting a potential emotional component to their craving experiences. Understanding the connection between negative mood among high cravers is essential for developing effective strategies that address the emotional and dietary aspects associated with heightened food cravings.

The study also did not reveal significant differences in BMI, and various meal-specific variables between individuals who experienced or did not experience food cravings the previous day. However, individuals experiencing cravings exhibited significantly lower snack caloric and snack fat intake. These results provide valuable insights into the associations between experiencing food cravings, mood, and dietary patterns.

The impact of mood and the emotional dimension of food craving is accentuated in the comparison of Positive and Negative Affect Schedule (I-PANAS-SF) scores during craving versus general states among both cravers and non-cravers. Both groups shared a common experience of a decrease in positive mood during cravings, highlighting a universal aspect of mood change during these episodes. However, cravers demonstrated a marginal decrease in negative mood, indicating a more distinct emotional response compared to non-cravers. These findings underscore the relationship between cravings and mood changes, revealing potential distinctions between individuals who commonly experience cravings and those who do not. The different emotional state observed in cravers, including both positive and negative mood alterations, suggest a more complex interplay between mood and the occurrence of food cravings.

6. The Emotional Underpinnings of Cravings - Interpretation:

The emotional component of food cravings, as evidenced by the findings in Study II, provides a crucial insight into the behavioral aspects of cravings. Study II findings suggest a potential link between negative mood and cravings, as individuals experiencing cravings reported higher negative mood scores, implying that emotional state could be a trigger or consequence of cravings.

The observed decrease in positive mood during cravings across all groups, regardless of whether they experienced craving that day, suggests a universal aspect of mood change during these episodes. This aligns with the idea that cravings might be a form of emotional eating, where individuals seek comfort or pleasure through food (Wurtman 1988; Wurtman 1990; Hill, Weaver et al. 1991; Leibenluft, Fiero et al. 1993; Christensen and Pettijohn 2001; Ogden, 2003).

However, high cravers reported significantly higher general negative mood scores, highlighting a potential emotional distinction between high and low cravers. This pattern may reflect a self-medication effect, as suggested by Leibenluft, Fiero et al. (1993), whereby negative emotions trigger cravings for palatable foods as a means of improving mood through the release of opioid peptides. Craving-related food choices

may therefore offer temporary emotional relief for individuals who experience cravings more frequently.

The differences observed in snack intake between cravers and non-cravers can be interpreted within the framework of the opioid-palatability hypothesis (Yeomans & Gray, 2002; Drewnowski et al., 1992; Yamamoto, 2003). In this study, non-cravers consumed more snack calories and fat, indicating greater exposure to highly palatable, energy-dense foods that stimulate the endogenous opioid system. According to the opioid-palatability model, such foods—particularly those rich in fats and carbohydrates—enhance the release of endogenous opioid peptides, producing hedonic pleasure and reward (Nogueiras et al., 2012). Regular activation of this system may reduce the need for additional hedonic stimulation and thus lower the likelihood of experiencing distinct craving episodes.

In contrast, individuals who consume fewer palatable snacks may experience less opioid-mediated hedonic stimulation, and this pattern may suggest that inhibiting or restraining snack intake could itself contribute to the emergence of cravings, as the body seeks to restore hedonic balance. This interpretation aligns with evidence showing that highly palatable foods trigger the release of natural opioids (e.g., endorphins), generating pleasure and satiety and reducing craving tendencies (Massicotte et al., 2019a, 2019b; Nogueiras et al., 2012). Within this context, the higher snack caloric and fat intake observed among non-cravers may help explain their reduced susceptibility to cravings: ongoing opioid-mediated reward from regular palatable snack consumption may prevent the hedonic deficit that typically precipitates craving experiences.

The Study II findings underscore the importance of psychological states, such as mood and emotions, in influencing food desires. This extends the Chen & Antonelli model by highlighting the dynamic interplay between personal and external factors in determining what we eat. For example, Study II findings indicate that someone might crave highly palatable foods when feeling sad or stressed. By recognizing the relationship between these personal factors and external influences, we can gain a

more comprehensive understanding of food preferences and develop strategies to promote healthier eating habits.

7. Limitations and Future Directions:

While both studies provide valuable insights, limitations exist. The studies rely on self-reported data, susceptible to bias due to factors like social desirability or memory lapses. Future research could incorporate objective measures like ecological momentary assessment (EMA) with smartphone prompts for craving reports in real-time (as in (Reichenberger et al., 2021; Richard et al., 2017). Moreover, biological measures like hormonal levels or brain activity through functional magnetic resonance imaging (fMRI) (as in (Stopyra et al., 2021; Tang et al., 2012) could provide a more objective picture of physiological changes associated with cravings.

Additionally, the cultural groups studied are limited and the two studies might not fully capture the diverse experiences of different cultures. Future research should explore a wider range of nationalities to understand how cultural factors like food traditions, societal attitudes towards food, and availability of certain foods influence cravings. Further work in this area could explore how societal expectations and cultural practices influence food cravings. This could lead to a deeper understanding of the sociocultural determinants of food choices and potentially contribute to efforts to change societal norms around food consumption. It should also investigate how personality traits like impulsivity, conscientiousness, or emotional reactivity influence cravings and this could inform the development of interventions that address emotional regulation alongside managing cravings. Qualitative approaches, such as in-depth interviews or focus groups, as well as objective measures for dietary intake and cravings, could provide a more comprehensive picture.

Specifically, qualitative methods, including interviews and focus groups, can be used to uncover deeper layers of individual differences that quantitative surveys might overlook. These methods allow for the exploration of personal narratives, values, and beliefs surrounding food choices and cravings. For instance, qualitative research can reveal the significance of social rituals, personal histories, and emotional connections to specific foods, which are crucial for developing personalized interventions. By

focusing on individual stories, researchers can identify unique coping strategies, challenges, and motivations that are not captured by standardized questionnaires.

Research on substance addictions offers valuable frameworks and methodologies that can be applied to the study of food cravings. Specifically, the concept of "cue-reactivity," which refers to the heightened response to stimuli (i.e. sight or smell) associated with drug use, can be and has been analogously applied to food cravings but without actually measuring (Boswell & Kober, 2016a, 2016c; Brockmeyer et al., 2015; I. Fedoroff et al., 2003; I. C. Fedoroff et al., 1997; Folwarczny et al., 2022; Meule et al., 2014; Tang et al., 2012; Van Gucht et al., 2008). The use of neurobiological markers to measure cue-reactivity, such as changes in dopamine release in response to food cues, can provide objective measures of cravings, complementing self-reported data with more concrete evidence of physiological responses.

The concept of “withdrawal symptoms” could also be further explored as research has shown that even though selective food deprivation may indeed increase food cravings, long-term energy restriction seems to decrease food cravings, suggesting that food deprivation can also facilitate extinction of conditioned food craving (Meule, 2020; Polivy et al., 2005).

Also, as the opioid system, part of the brain's reward and motivation circuitry, seems to play a significant role in regulating both drug and food cravings (Berridge, 1996, 2009; Franken & Muris, 2005; Recio-Román et al., 2020; Sutton et al., 2022), further research in understanding how these reward pathways differ in individuals with strong cravings could pave the way for developing targeted interventions. This might involve investigating the role of hormones, neurotransmitters, and individual differences in reward processing to gain a deeper understanding of the biological and psychological factors at play.

Furthermore, the progress of the PhD study was frequently frozen for periods of time, which may have impacted the continuity and depth of the research. Leveraging both qualitative and quantitative methods can offer a richer, more holistic view of the complexities of food cravings. By combining objective measurements with in-depth explorations of individual experiences, researchers can develop a more nuanced

understanding of the multifaceted nature of food cravings. Furthermore, investigating the underlying mechanisms driving the observed associations between food cravings, nationality, gender, and mood could lead to the development of more effective strategies for managing cravings and promoting healthy eating habits across diverse populations.

8. Conclusion

By exploring the multifaceted nature of food cravings, these studies pave the way for a more nuanced understanding of this phenomenon. Recognizing the influence of cultural background, gender, and emotional state allows for the development of targeted interventions that cater to specific needs and preferences.

The results of this research indicate that current theories of food cravings might be incomplete. This research suggests a more nuanced understanding that considers cultural background, gender, and emotional state. Cultural food patterns may shape the types of food people crave. The findings suggest that cravings are influenced by cultural factors, which aligns with the framework model of food choice and that cravings are not purely biological but also socially constructed phenomena (Sclafani, 2001; Drewnowski, 1997; Chen & Antonelli, 2020). Understanding this can help in creating culturally sensitive dietary interventions.

The significant gender differences in the types of food craved and the frequency of cravings suggest that gender-specific factors, possibly including hormonal influences and socialization patterns, play a role in shaping craving experiences. This aligns with theories that emphasize the role of gender in eating behaviors and preferences (Cepeda-Benito et al., 2003; Chao et al., 2016; Hallam et al., 2016; Hormes et al., 2014; Klimesova et al., 2020).

The association between mood and craving frequencies supports the theory that food cravings may serve as a coping mechanism for emotional distress. This aligns with the emotional eating framework, where individuals use food to manage negative emotions (Alberts et al., 2010; Pannicke et al., 2021; Sobal & Bisogni, 2009; Ventura et al., 2014). This understanding can inform psychological and behavioral strategies to address cravings by targeting emotional regulation.

Overall, the above theoretical implications suggest a shift towards a more holistic understanding of food cravings, one that integrates biological, emotional, gendered, and cultural influences, with potential benefits for promoting healthier relationships with food and improving dietary interventions. Future research that builds upon these findings has the potential to significantly improve dietary interventions and promote healthier eating habits for all. This knowledge can empower individuals to make informed choices about their food intake and develop personalized strategies for managing cravings, ultimately fostering a healthier relationship with food.

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Appendix A - Ethical Approval of Research Project

Sheffield Hallam University

Our Ref AM/KW/D&S-170
2nd December 2015

Georgia Kleanthous
Sheffield Hallam University
Faculty of Development of Society
Department of Psychology, Sociology and Politics
Heart of the Campus
Collegiate Crescent
Howard Street
Sheffield
S1 1WB

Dear Georgia,

Request for Ethical Approval of Research Project

Your research project entitled "**Food Craving, Personality and Eating Behaviour**" has been submitted for ethical review to the Faculty's rapporteurs and I am pleased to confirm that they have approved your project as per your application submitted to The University of Nottingham and approved by them on 28 November 2008.

Please note: that any minor modifications to this project will need to be re-approved, as applicable.

I wish you every success with your research project.

Yours sincerely

Professor A Macaskill
Chair
Faculty Research Ethics Committee

Office address :
Business Support Team
Faculty of Development & Society
Sheffield Hallam University
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Appendix B - Study I Questionnaire

Sheffield Hallam University

Food Craving Research Study - Definition

This research is being carried out by Georgia Kleanthous, supervised by and Dr. Sue McHale and Dr. Antonia Ypsilanti (Sheffield Hallam University) and Dr. Nigel Hunt (University of Nottingham).

The purpose of this research is to assess the phenomenon of food craving and its possible correlation with bio-psychological elements of personality and eating behaviour. Results of this research will help the foundation of new methods in promoting healthy eating.

This questionnaire refers to your personal views, thoughts and habits. Please answer all the questions, even if you are not completely certain of your answers. Please be honest and frank; there are no right or wrong answers, just describe your opinion or behaviour. Any personal data used in the study from the completion of the questionnaire, will be anonymously and anything that could identify you, will be excluded.

A summary report will be available to you on request.

When you click on the 'next' button below, the questionnaire will automatically appear. It should take about 15 minutes to complete.

We hope you find this study interesting. If you would like to know more about it, or participate in the next stage of the research, or would like to request a summary of the results when available, please contact Georgia (Georgia.Kleanthous@student.shu.ac.uk).

By completing this questionnaire you are giving your consent for this data to be electronically and used solely for research purposes.

>>

Sheffield Hallam University

Sex

- ○ Male
- ○ Female

Age

Nationality

>>

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Sheffield Hallam University

What do you think is meant by the term craving?

What do you think food craving (λιγούρα) is?

Which food, or type of food, do you crave the most?

>>

Survey Powered By Qualtrics

Sheffield Hallam University

Please indicate the intensity (0 = weak, 5 = strong) and frequency (0 = never, 5 = all the time) of craving CHOCOLATE:

	0	1	2	3	4	5
Intensity	○	○	○	○	○	○
Frequency	○	○	○	○	○	○

Please indicate the intensity (0 = weak, 5 = strong) and frequency (0 = never, 5 = all the time) of craving SWEET FOOD (except chocolate):

	0	1	2	3	4	5
Intensity	○	○	○	○	○	○
Frequency	○	○	○	○	○	○

Please indicate the intensity (0 = weak, 5 = strong) and frequency (0 = never, 5 = all the time) of craving SALTY FOOD:

	0	1	2	3	4	5
Intensity	○	○	○	○	○	○
Frequency	○	○	○	○	○	○

Please indicate the intensity (0 = weak, 5 = strong) and frequency (0 = never, 5 = all the time) of craving FAT:

	0	1	2	3	4	5
Intensity	○	○	○	○	○	○
Frequency	○	○	○	○	○	○

Please indicate the intensity (0 = weak, 5 = strong) and frequency (0 = never, 5 = all the time) of craving MEAT:

	0	1	2	3	4	5
Intensity	○	○	○	○	○	○
Frequency	○	○	○	○	○	○

Please indicate the intensity (0 = weak, 5 = strong) and frequency (0 = never, 5 = all the time) of craving CARBOHYDRATES (e.g. pasta, rice, bread etc):

	0	1	2	3	4	5
Intensity	○	○	○	○	○	○
Frequency	○	○	○	○	○	○

>>

Sheffield Hallam University

Thank you for your help!

If you found this study interesting and would like to participate in the next stages of the research, please provide us with your contact details:

Name	
Email	

>>

Appendix C - Study I Non-Significant Results

STUDY I Non-Significant Results

1.1.1. Nationality vs Most Craved Food

Since the question “what food or type of food you crave the most” was an open ended question, a lot of people reported more than one type of food. For analysis purposes, it was hypothesized that the first food item reported was their most craved food. Responses were coded in 11 categories as shown in figure X. “Carbs” category includes responses such as “carbohydrates”, “rice” and “bread”; “Salty” includes “savoury foods” and “salty”, “Meat” includes “meat”, “chicken” and “kebab” and “Sweets” includes “biscuits”, “cake”, “sugary foods” and “sweets in general”. Food items not belonging to any of the above categories were categorized independently. In common with most studies, the most frequently reported food craved by all respondents was chocolate.

Both Chi-Square tests (χ^2) and Fisher's exact tests show no statistically significant relationships between nationality and the most craved food items ($p > 0.05$). This suggests that people of **both nationalities crave similar types of food**.

Contingency Tables

	CodedMostCraved											
Nationality	Chocolate	junk	Meat	sweets	salty	crisps	Pizza	carbs	cheese	pasta	other	Total
British	43	8	16	35	16	16	4	5	6	6	20	175
Cypriot	27	10	17	29	7	6	3	2	2	9	12	124
Total	70	18	33	64	23	22	7	7	8	15	32	299

χ^2 Tests

	Value	df	P
χ^2	10.2	10	0.426
Fisher's exact test			0.456 [a]

Contingency Tables

	CodedMostCraved											
Nationality	Chocolate	junk	Meat	sweets	salty	crisps	Pizza	carbs	cheese	pasta	other	Total
N		299										

[a] Monte Carlo simulation

Figure 4. x^2 test of associations between gender and most craved food is computed to be 10.2 with 10 degrees of freedom and the associated p-value=0.426. Fisher's exact test yielded p-value=0.456. Both tests indicate no statistical significance among the two genders in relation to craving definition.

1.2. Male vs Female Comparison of Nominal Variables (x^2 associations)

Using x^2 test of associations (contingency tables), male participants were compared with female participants in terms of how they define craving and food craving and what is their most craved food. This data analysis provided significant insights into how both genders perceive and experience food cravings. Specifically:

1.2.1. Gender vs Definition of Craving & Food Craving

The comparison of the responses to the questions “What do you think craving / food craving is?” indicated that both the majority of males and females described craving and food craving as either a “desire” or a “want”. The two populations differed in their third favorite description with males giving “other” responses and females reporting “need”. Both Chi-Square tests (χ^2) and Fisher's exact tests show no statistically significant relationships between sex and food cravings in either set of tables ($p > 0.05$ for all tests). This suggests that **men and women tend to describe their food cravings in similar ways**, regardless of the terminology used.

Contingency Tables

	CodedCraving					
Sex	want	Need	desire	urge	other	Total
Male	37	6	44	8	14	109
Female	77	21	63	9	19	189
Total	114	27	107	17	33	298

χ^2 Tests

	Value	df	P
χ^2	5.48	4	0.242
Fisher's exact test			0.236
N	298		

Figure 5. x^2 test of associations between gender and craving definition is computed to be 5.48 with 4 degrees of freedom and the associated p-value=0.242. Fisher's exact test yielded p-value=0.236. Both tests indicate no statistical significance among the two genders in relation to craving definition.

Contingency Tables

	CodedFoodCraving						
Sex	**want**	**Desire**	**need**	**urge**	**other**	**Hunger**	**Total**
Male	35	40	7	8	14	5	109
Female	67	60	24	7	27	4	189
Total	102	100	31	15	41	9	298

χ^2 Tests

	Value	**df**	**p**
χ^2	6.67	5	0.247
Fisher's exact test			0.242
N	298		

Figure 6. x^2 test of associations between gender and food craving definition is computed to be 6.67 with 5 degrees of freedom and the associated p-value=0.247. Fisher's exact test yielded p-value=0.242. Both tests indicate no statistical significance among the two genders in relation to craving definition.

Appendix D - Study II Questionnaire

Sheffield Hallam University

Food Craving Research Study - Part A

This research is being carried out by Georgia Kleanthous, supervised by and Dr. Sue McHale and Dr. Antonia Ypsilanti (Sheffield Hallam University) and Dr. Nigel Hunt (University of Nottingham).

The purpose of this research is to assess the phenomenon of food craving and its possible correlation with bio-psychological elements of personality and eating behaviour. Results of this research will help the foundation of new methods in promoting healthy eating.

This questionnaire refers to your personal views, thoughts and habits. Please answer all the questions, even if you are not completely certain of your answers. Please be honest and frank; there are no right or wrong answers, just describe your opinion or behaviour. Any personal data used in the study from the completion of the questionnaire, will be anonymously and anything that could identify you, will be excluded.

A summary report will be available to you on request.

When you click on the 'next' button below, the questionnaire will automatically appear. It should take about 15 minutes to complete.

We hope you find this study interesting. If you would like to know more about it, or participate in the next stage of the research, or would like to request a summary of the results when available, please contact Georgia (Georgia.Kleanthous@student.shu.ac.uk).

By completing this questionnaire you are giving your consent for this data to be electronically and used solely for research purposes.

0% 100%

>>

Sheffield Hallam University

Background Information

Sex

- ○ Male
- ○ Female

Age

Nationality

Home Country

Country of Residence

Height (cm)	
Weight (kg)	

0% 100%

Sheffield Hallam University

1. Please record all FOOD and DRINK that you consumed YESTERDAY for:
a) Breakfast
b) Lunch
c) Dinner, and
d) Snacks
Try to provide portion sizes wherever possible. If in doubt about the portion size, please use the following guidelines:

a) Breakfast
Examples:
i) 9.30 am 1 piece of brown toast and butter, 2 eggs scrambled, 1 cup of black coffee with 1 sugar
ii)8.15 am 1 cup of chocolate cereals with 1 cup of semi-skimmed milk, 250ml orange juice

b) Lunch
Examples:
i)12.30 pm 1 small plate of tomatoes, 1 small tin tuna in brine, 2 small potatoes - boiled, 1Tbs of salad dressing, and 1 can of Coke
ii)14.00 pm 1/4 roasted chicken, 1,5 cup of spaghetti with tomato sauce and 30gr of parmesan

c) Dinner
Examples:
i) 20.30 pm Beef chilli con carne with white rice (average portion). Cup of black coffee with one sugar
ii) 19.30 pm A large grilled pork steak with barbecue sauce, 1 cup of mash potatoes, 0,5 cup of lettuce & tomato salad with 1 Tbs olive oil, a glass of red wine

d) Snacks
Examples:
i)11.15 am 1 cup of tea with one sugar and two chocolate chip biscuits
ii)18.30 pm 1 small pack of classic crisps and a can of Coke

Was yesterday typical of your usual food intake?

- ○ Yes
- ○ No

If yesterday was not typical, please briefly explain why:

<< >>

Sheffield Hallam University

Food Craving is typically defined as an "intense desire to consume a specific food (or type of food), which is difficult to resist". How often do you experience food craving?

- ○ Almost Never
- ○ Rarely (Once a Month)
- ○ Often (Once a Week)
- ○ All the time (Almost Daily)

What food, or type of food (if any), do you crave more?

Are you currently on a diet?

- ○ Yes, I am currently on a diet trying to loose weight
- ○ No, I am not currently on a diet
- ○ I am currently watching my weight

4. Did you experience any food cravings yesterday?

- ○ Yes
- ○ No

0% 100%

<< >>

If yes in question 4:

Sheffield Hallam University

What food or type of food did u crave yesterday?

What were you doing at the time you experienced the craving? (e.g. watching TV, reading emails, came back from shopping etc)

How did you respond to your food craving?

- ○ Gave in
- ○ Resisted
- ○ Ate something else instead
- ○ Other (please specify)

If you chose to eat something else instead, what did you have?

0% 100%

<< >>

Sheffield Hallam University

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the column next to that word. Indicate to what extent you felt this way AT THE TIME YOU EXPERIENCED FOOD CRAVING.

	very slightly / not at all	a little	moderately	quite a bit	extremely
Upset	○	○	○	○	○
Hostile	○	○	○	○	○
Alert	○	○	○	○	○
Ashamed	○	○	○	○	○
Inspired	○	○	○	○	○
Nervous	○	○	○	○	○
Determined	○	○	○	○	○
Attentive	○	○	○	○	○
Afraid	○	○	○	○	○
Active	○	○	○	○	○

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the column next to that word. Indicate to what extent you feel this way IN GENERAL.

	very slightly / not at all	a little	moderately	quite a bit	extremely
Upset	○	○	○	○	○
Hostile	○	○	○	○	○
Alert	○	○	○	○	○
Ashamed	○	○	○	○	○
Inspired	○	○	○	○	○
Nervous	○	○	○	○	○
Determined	○	○	○	○	○
Attentive	○	○	○	○	○
Afraid	○	○	○	○	○
Active	○	○	○	○	○

If No in question 4:

Sheffield Hallam University

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the column next to that word. Indicate to what extent you feel this way IN GENERAL.

	very slightly / not at all	a little	moderately	quite a bit	extremely
Upset	○	○	○	○	○
Hostile	○	○	○	○	○
Alert	○	○	○	○	○
Ashamed	○	○	○	○	○
Inspired	○	○	○	○	○
Nervous	○	○	○	○	○
Determined	○	○	○	○	○
Attentive	○	○	○	○	○
Afraid	○	○	○	○	○
Active	○	○	○	○	○

0% 100%

<< >>

Survey Powered By Qualtrics

Sheffield Hallam University

Thank you for your help!

If you found this study interesting and would like to participate in the next stages of the research follow the below link or provide us with your contact details:

Part B:
https://shusls.eu.qualtrics.com/SE/?SID=SV_6WFPDHwD2m6vEWh

Name	
Email	

0% 100%

<< >>

Appendix E - Study II Descriptive Statistics and Shapiro–Wilk Tests & Non-Significant Results

STUDY II - Descriptive Statistics and Skewness

Table 23: Descriptive Statistics and Shapiro–Wilk Tests for British and Cypriot Participants

Variable	British N	Cypriot N	British Missing	Cypriot Missing	British Mean	Cypriot Mean	British Median	Cypriot Median	British SD	Cypriot SD	British Min	Cypriot Min	British Max	Cypriot Max	British Skew	Cypriot Skew	British Kurtosis	Cypriot Kurtosis	SW (British)	p	SW (Cypriot)	p
NegativeMood	148	55	102	51	9.26	9.31	8	9	3.76	3.03	5	5	20	16	0.905	0.257	0.156	-0.723	0.904	<.001	0.950	.023
PositiveMood	148	55	102	51	14.5	14.7	15	16	4.56	4.90	4	5	24	23	-0.449	-0.704	-0.454	-0.704	0.962	<.001	0.965	.106
breakcal	163	69	87	37	269	266	275	275	170	164	0	0	820	710	0.099	0.213	-0.403	-0.188	0.964	<.001	0.971	.109
GramProtBreak	166	73	84	33	6.41	7.52	5	8	5.67	5.38	0	0	31	20	1.34	0.153	2.43	-0.993	0.889	<.001	0.948	.004
GramCarbsBreak	166	73	84	33	40.1	32.7	40	34	25	21.8	0	0	110	90	-0.0003	0.234	-0.602	-0.569	0.963	<.001	0.964	.036
LunchCal	166	74	84	32	441	471	450	450	222	215	0	0	900	1200	-0.018	0.356	-0.326	1.92	0.958	<.001	0.937	.001
GramProtLunch	152	72	98	34	11.3	16.5	10	15	7.86	8.10	0	0	51	45	1.66	0.549	5.16	1.67	0.882	<.001	0.954	.010
GramCarbsLunch	154	72	96	34	53.5	44.5	50	40	24.7	26.8	0	0	120	120	0.076	0.697	-0.365	0.241	0.980	.022	0.947	.004
DinnerCal	166	74	84	32	617	511	600	500	291	262	0	0	2000	1200	1.09	0.204	4.11	-0.333	0.923	<.001	0.983	.419
GramProtDin	162	70	88	36	15.9	13.7	15	15	8.48	7.05	0.5	0	40	30	0.482	0.126	0.193	-0.713	0.919	<.001	0.937	.002
GramCarbsDin	161	70	89	36	47.9	38.7	50	40	19.8	18.7	5	0	100	100	0.392	0.515	0.252	0.515	0.957	<.001	0.950	.007
SnackCal	163	73	87	33	524	228	225	225	3515	185	0	0	45058	850	12.7	1.08	162	1.61	0.076	<.001	0.904	<.001
GramProtSnack	169	71	81	35	1.60	1.76	1	2	2.21	1.44	0	0	20	6	4.27	0.79	29.1	0.310	0.620	<.001	0.900	<.001
GramCarbsSnack	169	71	81	35	31.4	28.7	30	30	23.5	19.6	0	0	120	80	0.816	0.618	0.793	0.334	0.934	<.001	0.933	<.001
TotalCal	168	74	82	32	1814	1443	1545	1425	3454	430	0	0	45823	2454	12.5	-0.094	161	0.794	0.132	<.001	0.969	.062
TotalGramProt	248	106	2	0	22.6	26.6	23	31	19.6	21.1	0	0	80	78	0.391	0.028	-0.694	-1.16	0.908	<.001	0.900	<.001
TotalGramCarbs	250	106	0	0	112	97.5	120	111	90.1	75.0	0	0	315	265	0.044	-0.031	-1.22	-1.05	0.896	<.001	0.895	<.001

Table 24: Descriptive Statistics for Dietary Intake and Mood by Gender

Variable	*Male N*	*Female N*	*Male Mean*	*Female Mean*	*Male Median*	*Female Median*	*Male SD*	*Female SD*	*Male Skew*	*Female Skew*	*Male Kurtosis*	*Female Kurtosis*	*Male SW p*	*Female SW p*
NegativeMood	*43*	*160*	*8.30*	*9.54*	*8*	*9*	*3.21*	*3.62*	*1.13*	*0.733*	*0.979*	*0.00278*	*<.001*	*<.001*
PositiveMood	*43*	*160*	*15.7*	*14.3*	*17*	*15*	*3.78*	*4.81*	*-1.24*	*-0.210*	*1.44*	*-0.689*	*<.001*	*0.004*
breakcal	*50*	*182*	*271*	*267*	*263*	*275*	*200*	*159*	*0.517*	*-0.0818*	*-0.0864*	*-0.691*	*0.040*	*<.001*
GramProtBreak	*52*	*187*	*7.08*	*6.66*	*6*	*6*	*6.64*	*5.28*	*1.39*	*0.743*	*2.70*	*0.0940*	*<.001*	*<.001*
GramCarbsBreak	*52*	*187*	*35.1*	*38.6*	*34*	*40*	*24.9*	*24.1*	*0.228*	*0.0682*	*-0.567*	*-0.580*	*0.028*	*<.001*
LunchCal	*51*	*174*	*490*	*440*	*450*	*450*	*219*	*219*	*0.0264*	*0.0868*	*0.743*	*0.246*	*0.149*	*<.001*
GramProtLunch	*51*	*175*	*15.9*	*12.1*	*15*	*10*	*8.78*	*7.96*	*0.391*	*1.47*	*1.34*	*4.05*	*0.047*	*<.001*
GramCarbsLunch	*51*	*188*	*54.1*	*49.6*	*50*	*50*	*30.4*	*24.1*	*0.275*	*0.167*	*-0.228*	*-0.656*	*0.085*	*<.001*
DinnerCal	*52*	*180*	*683*	*561*	*700*	*600*	*309*	*272*	*1.54*	*0.639*	*5.23*	*2.28*	*<.001*	*<.001*
GramProtDin	*52*	*179*	*19.4*	*14.1*	*20*	*15*	*7.90*	*7.81*	*0.383*	*0.522*	*-0.268*	*0.494*	*0.008*	*<.001*
GramCarbsDin	*49*	*186*	*48.6*	*44.1*	*45*	*40*	*18.8*	*20.1*	*0.553*	*0.419*	*0.769*	*0.167*	*0.014*	*<.001*
SnackCal	*51*	*189*	*199*	*497*	*225*	*238*	*161*	*3291*	*0.699*	*13.6*	*0.377*	*185*	*0.002*	*<.001*
GramProtSnack	*51*	*189*	*2.03*	*1.54*	*1*	*1*	*3.23*	*1.53*	*3.76*	*1.88*	*19.0*	*5.70*	*<.001*	*<.001*
GramCarbsSnack	*51*	*189*	*26.6*	*31.7*	*25*	*30*	*25.6*	*21.4*	*1.46*	*0.594*	*3.14*	*0.00416*	*<.001*	*<.001*
TotalCal	*52*	*189*	*1594*	*1737*	*1485*	*1505*	*561*	*3257*	*0.565*	*13.3*	*0.517*	*181*	*0.296*	*<.001*
TotalGramProt	*77*	*266*	*29.6*	*23.1*	*35*	*25*	*24.0*	*18.4*	*0.105*	*0.152*	*-1.12*	*-1.04*	*<.001*	*<.001*
TotalGramCarbs	*77*	*268*	*110*	*111*	*120*	*122*	*89.7*	*84.1*	*0.182*	*-0.0456*	*-1.05*	*-1.10*	*<.001*	*<.001*

STUDY II Non-Significant Results

1.1. British vs Cypriots Comparison of Nominal Variables (x^2 associations)

Using x^2 test of associations (contingency tables), participants from the two nationalities were compared in terms of self-declared diet status, food craving frequency, most craved food, whether they experienced food craving the previous day, the food that was craved, how they responded to the food craving and what type of activity they were engaged in while experiencing the phenomenon.

The data analysis offered valuable insights into the dietary behaviors and experiences related to food cravings of individuals in the UK (British) and Cyprus (Cypriot). More specifically:

1.1.1. Nationality vs Diet

The comparison of the responses to the question “Are you currently on a Diet?” showed that in the "British" subsample, 10 participants reported to be currently on a diet, 49 participants were not on a diet, and 39 were watching their weight. Among the "Cypriot" subsample, 15 participants reported to be currently on a diet, 27 were not on a diet, and 32 were watching their weight. The analysis revealed that with a p-value of 0.091 on the chi-squared test and with a p-value of 0.093 on the Fisher's exact test, there was no strong evidence to suggest a significant association between diet and nationality among the participants in the sample.

Contingency Tables

	Diet			
Nationality	**Yes**	**No**	**Watching Weight**	**Total**
British	10	49	39	98
Cypriot	15	27	32	74
Total	25	76	71	172

χ^2 Tests

	Value	**df**	**P**
χ^2	4.80	2	0.091
Fisher's exact test			0.093
N	172		

Figure 7. x^2 test of associations between nationality and diet status is computed to be 4.80 with 2 degrees of freedom and the associated p-value=0.091. Fisher’s exact test yielded p-value=0.093. Both tests indicate no statistical significance among the two nationalities in relation to diet status.

1.1.2. Nationality vs Food Craving Frequency

The analysis of the responses to the question “how often do you experience food craving?”, indicated that among the "British" subsample, 4 of them reported "Almost Never" craving food, 17

reported "Rarely" craving food, 47 reported "Often" craving food, and 30 reported craving food "All the time." As for the "Cypriot" participants, similarly 4 reported "Almost Never" craving food, 18 reported "Rarely" craving food, 34 reported "Often" craving food, and 18 reported craving food "All the time." The associated p-value for the chi-squared test is 0.615 and the Fisher's exact test yielded a p-value of 0.592. These results suggest that the frequency of experiencing food cravings (when the definition of food craving is given) is relatively similar between the UK and Cyprus.

Contingency Tables

	FCFreq				
Nationality	**Almost Never**	**Rarely**	**Often**	**All the time**	**Total**
British	4	17	47	30	98
Cypriot	4	18	34	18	74
Total	8	35	81	48	172

χ^2 Tests

	Value	**Df**	**P**
χ^2	1.80	3	0.615
Fisher's exact test			0.592
N	172		

Figure 8. x^2 test of associations between nationality and food craving frequency is computed to be 1.80 with 3 degrees of freedom and the associated p-value=0.615. Fisher's exact test yielded p-value=0.592. Both tests indicate no statistical significance among the two nationalities in relation to food craving frequency.

1.1.3. Nationality vs Experiencing Food Craving Yesterday

The comparison of the responses to the question "Did you experience food craving yesterday?", indicated that in the subsample of "British" participants, 47 of them experienced food cravings yesterday (Yes), while 51 did not (No). Amongst "Cypriot" participants, 31 experienced food cravings yesterday (Yes), and 42 did not (No). The associated p-value for the chi-squared test was 0.476 and Fisher's exact test yielded a p-value of 0.536. These results indicate that there is no strong statistical evidence to conclude that there is a significant association between experiencing food cravings the day before and nationality among the participants in the sample. The percentage of individuals reporting cravings was relatively similar between the UK and Cyprus.

Contingency Tables

	CraveYesterday		
nationality	**Yes**	**No**	**Total**
British	47	51	98
Cypriot	31	42	73

Contingency Tables

	CraveYesterday		
nationality	**Yes**	**No**	**Total**
Total	78	93	171

χ^2 Tests

	Value	df	P
χ^2	0.509	1	0.476
Fisher's exact test			0.536
N	171		

Figure 9. x^2 test of associations between nationality and experiencing food craving yesterday is computed to be 0.509 with 1 degree of freedom and the associated p-value=0.476. Fisher's exact test yielded p-value=0.536. Both tests indicate no statistical significance.

1.1.4. Nationality vs Food Craved Yesterday

Participants that reported craving the previous day were subsequently asked "What food did you crave yesterday?". The comparison of their responses between the two nationalities showed that while there may be differences in the specific food cravings, there are also some shared preferences. The types of food craved the most per subsample is indicated below in Figure 10. The Figure displays the distribution of the two nationalities across different categories based on their most craved food categories (e.g., Chocolate, Sweet, Meat, etc.). According to the data analysis conducted, the chi-squared test yielded a p-value of 0.192, while the Fisher's exact test produced a p-value of 0.185. Therefore, there is insufficient statistical evidence to support the idea that the exact food craved is significantly related to nationality.

Contingency Tables

	FoodCravedCoded												
Nationality	**Chocolate**	**Sweet**	**Meat**	**Fast Food**	**Sweets**	**Other**	**Bread**	**Crisps**	**Carbs**	**Fruits & Vegetable**	**Savoury**	**Salty**	**Total**
British	**11**	**11**	**4**		1	**5**	**4**	**5**	1	0	1	0	45
Cypriot	9	9	1		0	1	0	1	**3**	1	0	1	30
Total	20	20	5		1	6	4	6	4	1	1	1	75

χ^2 Tests

	Value	df	P
χ^2	14.8	11	0.192
Fisher's exact test			0.185
N	75		

Figure 11. x^2 test of associations between nationality and reported food craved is computed to be 14.8 with 11 degrees of freedom and the associated p-value=0.192. Fisher's exact test yielded p-value=0.18. Both tests indicate no statistical significance.

1.1.5. Nationality vs Response to Food Craving

As in the case of the previous variable, participants that reported experiencing food craving the previous day were subsequently asked “How did you respond to the craving?”. The comparison of their responses revealed that in the “British” subsample, 28 participants “Gave in” to the craving, 4 “Resisted”, 3 “Ate something else” and 10 provided “Other” responses. Similarly, in the Cypriot subsample, 22 participants “Gave in” to the craving, 2 “Resisted”, 3 “Ate something else” and 3 provided “Other” responses. The chi-squared test yielded a p-value of 0.523 and the Fisher's exact test produced a p-value of 0.581. These results suggest that there is no strong statistical evidence to conclude that there is a significant association between the response to food cravings and nationality among the participants in the sample.

Contingency Tables

	CravingRespond				
Nationality	**Gave in**	**Resisted**	**Ate something else**	**Other**	**Total**
British	28	4	3	10	45
Cypriot	22	2	3	3	30
Total	50	6	6	13	75

χ^2 Tests

	Value	**Df**	**P**
χ^2	2.25	3	0.523
Fisher's exact test			0.581
N	75		

Figure 12 x^2 test of associations between nationality and response to experienced food craving is computed to be 2.25 with 3 degrees of freedom and the associated p-value=0.523. Fisher’s exact test yielded p-value=0.581. Both tests indicate no statistical significance among the two nationalities in relation to food craving response.

1.1.6. Nationality vs Activity while Craving

Along the same line, participants that reported experiencing food craving the previous day were subsequently asked “What were you doing at the time you experienced food craving”. By comparing the responses of the two nationalities, it seems that though there may be some shared experiences, differences exist as well. The different types of activities per nationality are presented below in Figure 13. According to the data analysis, the chi-squared test produced a p-value of 0.047, while the Fisher's exact test yielded a p-value of 0.025. This suggests that **the choice of activity during food cravings may be related to an individual's nationality** in this sample.

Contingency Tables

	CodedActivityCraving					
Nationality	**Studying**	**Relaxing**	**Working**	**Social**	**Other**	**Total**
British	**14**	16	4	2	9	45
Cypriot	1	17	3	3	7	31
Total	15	33	7	5	16	76

χ^2 Tests

	Value	**Df**	**P**
χ^2	9.64	4	**0.047**
Fisher's exact test			**0.025**
N	76		

Figure 14. x^2 test of associations between nationality and activity while craving is computed to be 9.64 with 4 degrees of freedom and the associated p-value=0.047. Fisher's exact test yielded p-value=0.02. Both tests indicate statistical significance among the two nationalities in relation to type of activity while craving.

1.1.7. Summary of Nationality Associations with Food Craving nominal variables

In summary, while most of the contingency tables above did not demonstrate significant relationships between diet status, food craving frequency, or responses to food craving, the preference of craved food and the type of activity linked with food craving appear to be associated with nationality. Further research is needed to understand the factors and dynamics underlying this association and to gain a more comprehensive understanding of the influence of nationality on food-craving.

1.2. British vs Cypriots Comparison of Ordinal / Continues Variables (Kruskal-Wallis non parametric test)

The effect of Nationality was examined against continues and ordinal variables of the questionnaire. Hence, the British group was compared with the Cypriot group in terms of BMI, General Mood and dietary consumption.

Using a Kruskal–Wallis test, initial analyses indicated significant differences between British and Cypriot participants in BMI, several meal-specific macronutrient measures, and total daily intake. After applying a Holm–Bonferroni correction across 23 comparisons, only three variables remained statistically significant: protein intake at lunch ($p = .023$), dinner caloric intake ($p = .023$), and total daily carbohydrate intake ($p = .023$). Carbohydrate intake at dinner approached significance (adjusted $p = .044$), while all other effects were no longer significant after correction.

Variable	χ^2	df	Raw p	Holm–Corrected p
Lunch Protein	12.11	1	< .001	**.023**
Dinner Calories	11.15	1	< .001	**.023**
Total Carbohydrates	14.81	1	< .001	**.023**
Dinner Carbohydrates	10.03	1	.002	**.044**
Lunch Carbohydrates	7.58	1	.006	.120
BMI	5.85	1	.016	.352
Total Calories	5.62	1	.018	.396
Dinner Protein	5.29	1	.021	.441
Breakfast Carbohydrates	3.97	1	.046	1.000
Dinner Fat	3.78	1	.052	1.000
Negative Mood	2.76	1	.097	1.000
Breakfast Protein	1.89	1	.169	1.000
Lunch Fat	1.64	1	.200	1.000
Snack Protein	1.39	1	.238	1.000
Total Protein	1.24	1	.266	1.000
Breakfast Fat	0.69	1	.407	1.000
Breakfast Calories	0.71	1	.399	1.000
Total Fat	0.42	1	.519	1.000
Snack Calories	0.36	1	.551	1.000
Positive Mood	0.19	1	.663	1.000
Snack Fat	0.10	1	.754	1.000
Lunch Calories	0.02	1	.886	1.000
Snack Carbohydrates	0.01	1	.918	1.000

After applying the Holm–Bonferroni correction the following variables showed no significant differences between British and Cypriot participants (all corrected p-values = 1.000 unless otherwise noted):

- BMI ($\chi^2 = 5.85$, $p = .352$)
- Negative Mood ($\chi^2 = 2.76$, $p = .097$)
- Positive Mood ($\chi^2 = 0.19$, $p = .663$)
- Breakfast Calories ($\chi^2 = 0.71$, $p = .399$)
- Breakfast Protein ($\chi^2 = 1.89$, $p = .169$)
- Breakfast Carbohydrates ($\chi^2 = 3.97$, $p = .046$; corrected $p = 1.000$)
- Breakfast Fat ($\chi^2 = 0.69$, $p = .407$)
- Lunch Calories ($\chi^2 = 0.02$, $p = .886$)
- Lunch Fat ($\chi^2 = 1.64$, $p = .200$)

- Dinner Fat ($\chi^2 = 3.78$, $p = .052$)
- Snack Calories ($\chi^2 = 0.36$, $p = .551$)
- Snack Protein ($\chi^2 = 1.39$, $p = .238$)
- Snack Carbohydrates ($\chi^2 = 0.01$, $p = .918$)
- Snack Fat ($\chi^2 = 0.10$, $p = .754$)
- Total Protein ($\chi^2 = 1.24$, $p = .266$)
- Total Fat ($\chi^2 = 0.42$, $p = .519$)

These results indicate that after correcting for multiple comparisons, BMI, mood variables, snack composition, and most meal-specific and total macronutrient intakes did not differ significantly between British and Cypriot participants.

1.3. Males vs Females Comparison of Nominal Variables (x^2 associations)

Using χ^2 tests of association (and Fisher's exact tests when appropriate), the relationship between sex and several nominal variables related to food cravings was examined. The following variables showed **no statistically significant association** with sex.

1.3.1. Sex vs Food Craved Yesterday

Participants who reported experiencing a craving the previous day were asked, *"What food did you crave yesterday?"* Among males, 11 participants reported specific cravings, while 64 females did so. Although there were differences in frequencies across food categories, statistical analysis demonstrated no significant association.

Table 25: Contingency Table – Food Craved Yesterday

Sex	Chocolate	Sweet	Meat	Fast Food	Sweets	Other	Bread	Crisps	Carbs	Fruits & Vegetables	Savoury	Salty	Total
Male	2	2	1	2	0	1	0	2	1	0	0	0	11
Female	18	18	4	4	1	5	4	4	3	1	1	1	64
Total	20	20	5	6	1	6	4	6	4	1	1	1	75

Tests

- $\chi^2(11) = 5.89$, **p = .881**
- Fisher's exact test: **p = .725**

These results indicate that the distribution of food types craved the previous day did not differ between males and females.

1.3.2. Sex vs Response to Food Craving

Participants who reported cravings were also asked, *"How did you respond to the craving?"* Among males (n = 11), 5 gave in, 2 resisted, and 4 reported other responses. Among females (n = 64), 45 gave in, 4 resisted, 6 ate something else, and 9 reported other responses.

Table 26: Contingency Table – Response to Food Craving

Sex	Other	Gave in	Resisted	Ate Something Else	Total
Male	4	5	2	0	11
Female	9	45	4	6	64
Total	13	50	6	6	75

Tests

- $\chi^2(3) = 6.27$, **p = .099**
- Fisher's exact test: **p = .086**

Thus, males and females did not differ significantly in how they responded to cravings.

1.3.3. Sex vs Activity While Craving

Participants who reported cravings were asked what activity they were engaged in at the time. Among males (n = 11), activities included studying, relaxing, working, and other activities. In the female subsample (n = 65), activities were more evenly distributed across the categories.

Table 27: Contingency Table – Activity While Craving

Sex	Studying	Relaxing	Working	Social	Other	Total
Male	4	3	1	0	3	11
Female	11	30	6	5	13	65
Total	15	33	7	5	16	76

Tests

- $\chi^2(4) = 3.66$, **p = .454**
- Fisher's exact test: **p = .432**

These results suggest that the type of activity during episodes of craving does not differ significantly between sexes.

1.4. Male vs Female Comparison of Ordinal / Continues Variables (Kruskal-Wallis non parametric test)

Males and females were compared on BMI, general mood (positive and negative), and dietary intake. Using the One-way ANOVA (Kruskal–Wallis) test, most variables showed no significant

gender differences. Non-significant results included positive and negative mood, caloric intake at breakfast, lunch, and snacks, most macronutrient intakes across meals, snack macronutrients, and total daily fat intake. After applying a Holm–Bonferroni correction for 23 tests, only two variables remained significant: protein intake at dinner (GramProtDin) and total daily protein intake (TotalGramProt). All other initially significant results became non-significant, indicating that gender-related differences were minimal overall.

Variable	χ^2	df	Raw p	Holm-Corrected p
GramProtDin	**18.4267**	**1**	**< .001**	**0.023**
TotalGramProt	**14.1390**	**1**	**< .001**	**0.023**
GramProtLunch	5.3540	1	0.021	0.230
DinnerCal	5.1379	1	0.023	0.253
BMI	4.0663	1	0.044	0.484
NegativeMood	1.3345	1	0.248	1.000
PositiveMood	2.5276	1	0.112	1.000
Breakcal	0.0227	1	0.880	1.000
GramProtBreak	0.1656	1	0.684	1.000
GramCarbsBreak	0.3920	1	0.531	1.000
GramFatBreak	0.1834	1	0.668	1.000
LunchCal	0.3280	1	0.567	1.000
GramCarbsLunch	0.4920	1	0.483	1.000
GramFatLunch	0.8389	1	0.360	1.000
GramCarbsDin	2.8519	1	0.091	1.000
GramFatDin	1.1392	1	0.286	1.000
SnackCal	3.3350	1	0.068	1.000
GramProtSnack	0.0467	1	0.829	1.000
GramCarbsSnack	3.6823	1	0.055	1.000
GramFatSnack	2.4884	1	0.115	1.000
TotalCal	0.3503	1	0.554	1.000
TotalGramCarbs	0.1523	1	0.696	1.000
TotalGramFat	0.2222	1	0.637	1.000

After applying the Holm–Bonferroni correction, all initially observed differences—except for dinner protein intake (GramProtDin) and total daily protein intake (TotalGramProt)—were no longer statistically significant. Thus, the initial group differences did not remain significant after controlling for multiple comparisons.

The following variables showed no significant differences between male and female participants (all corrected p-values = 1.000 unless otherwise noted):

- Negative Mood ($\chi^2 = 1.33$, $p = .248$)
  Positive Mood ($\chi^2 = 2.53$, $p = .112$)

- Breakfast Calories ($\chi^2 = 0.02$, $p = .880$)
  Breakfast Protein ($\chi^2 = 0.17$, $p = .684$)
  Breakfast Carbohydrates ($\chi^2 = 0.39$, $p = .531$)
  Breakfast Fat ($\chi^2 = 0.18$, $p = .668$)
- Lunch Calories ($\chi^2 = 0.33$, $p = .567$)
  Lunch Protein ($\chi^2 = 5.35$, $p = .021$; corrected $p = 1.000$)
  Lunch Carbohydrates ($\chi^2 = 0.49$, $p = .483$)
  Lunch Fat ($\chi^2 = 0.84$, $p = .360$)
- Dinner Calories ($\chi^2 = 5.14$, $p = .023$; corrected $p = 1.000$)
  Dinner Carbohydrates ($\chi^2 = 2.85$, $p = .091$)
  Dinner Fat ($\chi^2 = 1.14$, $p = .286$)
- Snack Calories ($\chi^2 = 3.34$, $p = .068$)
  Snack Protein ($\chi^2 = 0.05$, $p = .829$)
  Snack Carbohydrates ($\chi^2 = 3.68$, $p = .055$)
  Snack Fat ($\chi^2 = 2.49$, $p = .115$)
- Total Daily Calories ($\chi^2 = 0.35$, $p = .554$)
  Total Carbohydrates ($\chi^2 = 0.15$, $p = .696$)
  Total Fat ($\chi^2 = 0.22$, $p = .637$)

These results indicate that after correcting for multiple comparisons, mood measures, meal-specific caloric and macronutrient intake (with the exception of dinner protein), snack composition, and total macronutrient intake (aside from total protein) did not differ significantly between male and female participants.

1.5. Cravers vs non Cravers Comparison of Nominal Variables (x^2 associations)

Participants were categorized into two groups, low cravers and high cravers, based on their responses to the food craving frequency question. The following analyses examined whether low and high cravers differed across several nominal variables. Chi-squared tests and Fisher's exact tests were conducted for each association. Across most variables, no statistically significant associations were found, indicating that craving frequency was not meaningfully related to participants' diet status, food craved yesterday, response to craving, or activity during a craving episode.

1.5.1. Craving Frequency vs Weight-Loss Diet

The analysis showed no significant association between craving frequency and current diet status. Low cravers included 6 participants on a diet, 25 not on a diet, and 12 watching their weight; high cravers included 19 on a diet, 51 not on a diet, and 59 watching their weight.

Table 28: Contingency Table Craving Frequency vs Weight-Loss Diet

Diet	Yes	No	Watching Weight	Total
Low	6	25	12	43
High	19	51	59	129
Total	25	76	71	172

χ^2 Tests

Test	Value	df	p
χ^2	5.02	2	0.081
Fisher's exact	—	—	0.079

These values indicate **no statistically significant association**.

1.5.2. Craving Frequency vs Food Craved Yesterday

Among those who experienced cravings yesterday, the distribution of foods craved did not differ significantly between low and high cravers.

Table 29: Contingency Table Craving Frequency vs Food Craved Yesterday

Food Craved	Chocolate	Sweet	Meat	Fast Food	Sweets	Other	Bread	Crisps	Carbs	Fruits & Vegetables	Savoury	Salty	Total
Low	1	3	0	0	0	0	1	1	0	0	0	0	6
High	19	17	5	6	1	6	3	5	4	1	1	1	69
Total	20	20	5	6	1	6	4	6	4	1	1	1	75

χ^2 Tests

Test	Value	df	p
χ^2	5.93	11	0.878
Fisher's exact	—	—	0.756

The very high p-values indicate **no significant association**.

1.5.3. Craving Frequency vs Response to Food Craving

Participants' behavioural responses to cravings did not differ meaningfully between low and high cravers.

Table 30: Contingency Table Craving Frequency vs Response to Food Craving

Response	Other	Gave in	Resisted	Ate something else	Total

Low	1	3	2	0	6
High	12	47	4	6	69
Total	13	50	6	6	75

χ^2 Tests

Test	Value	df	p
χ^2	6.03	3	0.110
Fisher's exact	—	—	0.185

These results confirm **no statistically significant relationship**.

1.5.4. Craving Frequency vs Activity While Craving

The type of activity performed during a craving episode showed no significant differences between low and high cravers.

Table 31:Contingency Table Craving Frequency vs Activity While Craving

Activity	Studying	Relaxing	Working	Social	Other	Total
Low	0	4	0	1	2	7
High	15	29	7	4	14	69
Total	15	33	7	5	16	76

χ^2 Tests

Test	Value	df	p
χ^2	3.47	4	0.483
Fisher's exact	—	—	0.449

Both tests show **no significant association**.

1.6. Craving Frequency Comparison of Ordinal / Continues Variables (Kruskal-Wallis non parametric test)

Using One-way Anova (Kruskal-Wallis) non parametric test, high and low cravers were compared in terms of BMI, General Mood (Positive Mood and Negative Mood) and dietary consumption.

The analysis identified a few significant differences between high and low cravers. Initially, the Kruskal–Wallis test showed group differences in Negative Mood and snack-related nutritional variables (SnackCal, GramCarbsSnack, and GramFatSnack). All other variables, including age, BMI, and most dietary measures, showed no significant differences. After applying a Holm–Bonferroni correction for 24 tests, only Negative Mood remained statistically significant (adjusted p = .024). Snack calorie intake (adjusted p = .069) and snack fat intake (adjusted p = .110) were

marginal but non-significant after correction. All other variables remained non-significant following adjustment.

Variable	χ^2	df	Raw p	Holm-corrected p
NegativeMood	11.0047	1	< .001	0.024
SnackCal	9.1036	1	0.003	0.069
GramFatSnack	7.7270	1	0.005	0.110
GramCarbsSnack	4.6347	1	0.031	0.713
GramCarbsLunch	1.0714	1	0.301	1.000
GramProtSnack	1.9413	1	0.164	1.000
BMI	1.3537	1	0.245	1.000
GramProtBreak	1.2918	1	0.256	1.000
PositiveMood	0.9683	1	0.325	1.000
LunchCal	0.7548	1	0.385	1.000
GramFatBreak	0.6609	1	0.416	1.000
GramFatDin	0.6212	1	0.431	1.000
TotalGramCarbs	0.5858	1	0.444	1.000
GramProtLunch	0.5688	1	0.451	1.000
TotalGramFat	0.5701	1	0.450	1.000
breakcal	0.4896	1	0.484	1.000
DinnerCal	0.3166	1	0.574	1.000
TotalCal	2.6236	1	0.105	1.000
TotalGramProt	0.2332	1	0.629	1.000
Age	0.2137	1	0.644	1.000
GramProtDin	0.0681	1	0.794	1.000
GramFatLunch	0.0553	1	0.814	1.000
GramCarbsBreak	0.0170	1	0.896	1.000
GramCarbsDin	0.0354	1	0.851	1.000

The following variables showed no significant differences between high and low cravers (all corrected p-values = 1.000 unless otherwise noted):

Demographics

- BMI ($\chi^2 = 1.35$, $p = .245$)
- Positive Mood ($\chi^2 = 0.97$, $p = .325$)
- Breakfast Calories ($\chi^2 = 0.49$, $p = .484$)
- Breakfast Protein (GramProtBreak) ($\chi^2 = 1.29$, $p = .256$)
- Breakfast Carbohydrates (GramCarbsBreak) ($\chi^2 = 0.02$, $p = .896$)
- Breakfast Fat (GramFatBreak) ($\chi^2 = 0.66$, $p = .416$)
- Lunch Calories ($\chi^2 = 0.75$, $p = .385$)
- Lunch Protein (GramProtLunch) ($\chi^2 = 0.57$, $p = .451$)
- Lunch Carbohydrates (GramCarbsLunch) ($\chi^2 = 1.07$, $p = .301$)

- Lunch Fat (GramFatLunch) ($\chi^2 = 0.06$, $p = .814$)
- Dinner Calories ($\chi^2 = 0.32$, $p = .574$)
- Dinner Protein (GramProtDin) ($\chi^2 = 0.07$, $p = .794$)
- Dinner Carbohydrates (GramCarbsDin) ($\chi^2 = 0.04$, $p = .851$)
- Dinner Fat (GramFatDin) ($\chi^2 = 0.62$, $p = .431$)
- Snack Protein (GramProtSnack) ($\chi^2 = 1.94$, $p = .164$)

  Note: Snack calories, snack carbohydrates, and snack fat were initially significant but became non-significant after correction (corrected p = .069–.110).
- Total Daily Calories (TotalCal) ($\chi^2 = 2.62$, $p = .105$)
- Total Protein (TotalGramProt) ($\chi^2 = 0.23$, $p = .629$)
- Total Carbohydrates (TotalGramCarbs) ($\chi^2 = 0.59$, $p = .444$)
- Total Fat (TotalGramFat) ($\chi^2 = 0.57$, $p = .450$)

These results indicate that after correcting for multiple comparisons, age, BMI, positive mood, meal-specific calories, most macronutrient intakes, snack protein, and all total daily macronutrients showed no meaningful differences between high and low cravers. Only Negative Mood remained statistically significant after correction.

1.7. Experiencing Food Craving Yesterday Comparison of Ordinal / Continues Variables (Kruskal-Wallis non parametric test)

Using One-way Anova (Kruskal-Wallis) non parametric test, participants were compared based on whether they experienced food cravings or did not experience food cravings on the previous day in terms BMI, General Mood and dietary consumption.

The data analysis showed that there were a few significant differences between participants who experienced food cravings and those who did not. The Kruskal–Wallis test identified differences in Negative Mood scores, lunch fat intake (GramFatLunch), snack caloric and macronutrient intake (SnackCal, GramProtSnack, GramCarbsSnack, GramFatSnack), and total daily calories and fat intake. Other variables, such as age, BMI, and most nutritional measures, showed no significant differences. After applying a Holm–Bonferroni correction across 24 tests, only snack calorie intake (adjusted p = .024) and snack fat intake (adjusted p = .048) remained statistically significant. All other variables—including Negative Mood, snack protein, total calories, and total fat—did not survive correction, although several had small unadjusted p-values. The statistical analysis of each of the above-mentioned variables is presented below.

Variable	χ^2	df	Raw p	Holm-corrected p
SnackCal	**15.525**	1	**< .001**	**0.024**
GramFatSnack	**16.875**	1	**< .001**	**0.048**
GramProtSnack	7.261	1	0.007	0.147

TotalCal	5.469	1	0.019	0.399
TotalGramFat	4.603	1	0.032	0.672
NegativeMood	4.472	1	0.034	0.714
GramFatLunch	4.360	1	0.037	0.777
GramCarbsSnack	4.179	1	0.041	0.861
LunchCal	2.021	1	0.155	1.000
PositiveMood	0.737	1	0.391	1.000
GramCarbsLunch	0.701	1	0.402	1.000
TotalGramProt	0.632	1	0.427	1.000
DinnerCal	0.332	1	0.565	1.000
GramFatBreak	0.370	1	0.543	1.000
GramFatDin	0.244	1	0.621	1.000
BMI	0.171	1	0.679	1.000
GramProtBreak	0.148	1	0.701	1.000
age	0.123	1	0.726	1.000
TotalGramCarbs	0.129	1	0.719	1.000
GramProtDin	0.476	1	0.490	1.000
breakcal	0.063	1	0.803	1.000
GramProtLunch	0.030	1	0.863	1.000
GramCarbsDin	0.047	1	0.829	1.000
GramCarbsBreak	0.007	1	0.933	1.000

After applying the Holm–Bonferroni correction across 24 Kruskal–Wallis tests, the following variables did not show statistically significant differences between individuals who experienced food cravings and those who did not:

Demographics

- BMI did not differ significantly ($\chi^2 = 0.171$, $p = .679$, adj. $p = 1.000$).

Mood Measures

- Negative Mood was not significant after correction ($\chi^2 = 4.472$, $p = .034$, adj. $p = .714$).
- Positive Mood showed no significant group difference ($\chi^2 = 0.737$, $p = .391$, adj. $p = 1.000$).

Breakfast Intake

- Breakfast calories (breakcal) were not significantly different ($\chi^2 = 0.063$, $p = .803$, adj. $p = 1.000$).
- Breakfast macronutrients were also non-significant:
    - Protein: $\chi^2 = 0.148$, $p = .701$, adj. $p = 1.000$
    - Carbohydrates: $\chi^2 = 0.007$, $p = .933$, adj. $p = 1.000$
    - Fat: $\chi^2 = 0.370$, $p = .543$, adj. $p = 1.000$

Lunch Intake

- Lunch calories showed no difference ($\chi^2 = 2.021$, $p = .155$, adj. $p = 1.000$).
- Lunch macronutrients were non-significant:
    - Protein: $\chi^2 = 0.030$, $p = .863$, adj. $p = 1.000$
    - Carbohydrates: $\chi^2 = 0.701$, $p = .402$, adj. $p = 1.000$
    - Fat: $\chi^2 = 4.360$, $p = .037$, but non-significant after correction (adj. $p = .777$)

Dinner Intake

- Dinner calories were not significantly different ($\chi^2 = 0.332$, $p = .565$, adj. $p = 1.000$).
- Dinner macronutrients were all non-significant:
  - Protein: $\chi^2 = 0.476$, $p = .490$, adj. $p = 1.000$
  - Carbohydrates: $\chi^2 = 0.047$, $p = .829$, adj. $p = 1.000$
  - Fat: $\chi^2 = 0.244$, $p = .621$, adj. $p = 1.000$

Snack Intake

(Note: SnackCal and GramFatSnack are excluded here because they remained significant.) The following snack variables did not remain significant after correction:

- Protein: $\chi^2 = 7.261$, $p = .007$, adj. $p = .147$
- Carbohydrates: $\chi^2 = 4.179$, $p = .041$, adj. $p = .861$

Total Daily Intake

- Total calories were not significant after correction ($\chi^2 = 5.469$, $p = .019$, adj. $p = .399$).
- Total macronutrients also showed no significant effects:
  - Protein: $\chi^2 = 0.632$, $p = .427$, adj. $p = 1.000$
  - Carbohydrates: $\chi^2 = 0.129$, $p = .719$, adj. $p = 1.000$
  - Fat: $\chi^2 = 4.603$, $p = .032$, adj. $p = .672$

1.8. Mood of Cravers and Non Cravers while craving vs Mood in general (paired samples t-test)

Using paired samples t-test, the participants' responses on the Positive and Negative Affect Schedule (I-PANAS-SF) were compared for how they feel when experiencing food craving and how they feel in general, depending on whether they experienced food craving yesterday. Participants are categorized below as "cravers" if they experienced food cravings and as "non-cravers" if they did not experience food cravings yesterday. More specifically the following comparisons were made:

- Cravers Negative Mood while craving vs Cravers Negative Mood in general
- Cravers Positive Mood while craving vs Cravers Positive Mood in general
- Non-Cravers Negative Mood while craving vs Non-Cravers Negative Mood in general
- Non-Cravers Positive Mood while craving vs Non-Cravers Positive Mood in general

The data analysis indicated interesting and statistically significant differences in mood changes among cravers and non-cravers while craving versus in general. After applying the Holm–Bonferroni correction across the four paired-samples t-tests, neither of the negative mood comparisons remained statistically significant. Only these non-significant outcomes are described below.

Cravers: Negative Mood

For individuals who reported experiencing cravings, the paired-samples t-test showed no significant change in negative mood when comparing their general state to their mood during craving (raw p = .057; Holm-adjusted p = .171).

Descriptive statistics indicate a slight decrease in negative mood from M = 9.60 (general) to M = 8.68 (during craving), but this difference did not reach statistical significance.

Non-Cravers: Negative Mood

For individuals who did not report craving, negative mood also showed no significant change (raw p = .633; Holm-adjusted p = .633).

Descriptive statistics similarly show only a minimal shift from M = 8.39 (general) to M = 8.17 (during the craving-related moment), confirming the absence of a meaningful effect.