Mediterranean Journal of Clinical Psychology

ISSN 2282-1619

MJCP

Volume 12, n 3, 2024

Health Psychology

Emotion and Stress Related Eating and Personality Dimensions Predict Food Addiction: Implications for Personalized Weight Management and Primary Prevention

*Eva Klanduchová [1] *, Lucia Adamovská [2]*

Abstract

Background: Food addiction constitutes a novel health concern with potential consequences for both psychological and physical well-being. While the etiology of Food addiction is likely multifactorial, additional factors beyond obesogenic environments need to be explored. Therefore, we sought to examine the relationships between five-factor personality domains, Food addiction and coping styles related to eating (Emotion and stress related eating) starting from the hypothesis that Food addiction may be determined by coping styles related to eating (based on a Transactional Model of Stress and Coping) as well as specific personality traits

Methods and Material: A correlational, quantitative, non-experimental design was employed. A self-report assessment battery was used to evaluate participants' demographics, Food addiction (the Yale Food Addiction Scale), Emotion and stress related eating (the Eating and Appraisal Due to Emotions and Stress Questionnaire), personality dimensions (the Mini-IPIP) and BMI.

Results: The research sample comprised 114 participants aged 18-72 years (M_{age} = 42.7 years). The sample was predominantly female (71.9%). Additionally, 26.3% of participants were overweight, and 22.9% were obese. We found a strong relationship between Neuroticism and Emotion and stress related eating (Ability and Resources to Cope), with Neuroticism explaining 35.6% of the variance in impaired Ability and Resources to Cope. Neuroticism and Conscientiousness (inverse) were identified as moderate predictors of Emotion and Stress-Related Eating. These personality domains explain 21.5% of the variance in Emotion and Stress-Related Eating. Neuroticism and Conscientiousness (inverse) were also significantly related to Food addiction. Neuroticism emerged as a moderate predictor of Food addiction. Moderate relationships were identified between Food addiction, Emotion and Stress-Related Eating and Ability and Resources to Cope. Emotion and Stress-Related Eating emerged as a strong predictor of Food addiction, accounting for 29.4% of its variance.

Conclusions: These findings highlight the significance of personality domains (Neuroticism and Conscientiousness) and coping styles related to eating (Ability and Resources to Cope and Emotion and Stress-Related Eating) in understanding risk and protective factors for Food addiction. Such insights can inform the diagnostic process and development of personalized and targeted therapeutic interventions.

[1] Department of General Psychology, Faculty of Psychology, Pan-European University, Bratislava, Slovak Republic

[2] Faculty of Psychology, Pan-European University, Bratislava, Slovak Republic

E-mail corresponding author: eva.klanduchova@paneurouni.com

Keywords:

Clinical Psychology; Coping; Emotional eating; Food addiction; Neuroticism; Personality.

Received: 9 September 2024

Accepted: 21 December 2024

Published: 30 April 2025

Citation: Klanduchová, E., & Adamovská, L. (2024). Emotion and Stress Related Eating and Personality Dimensions Predict Food Addiction: Implications for Personalized Weight Management and Primary Prevention. *Mediterranean Journal of Clinical Psychology 12*(3). https://doi.org/10.13129/2282-1619/mjcp-4328

1. Introduction

Food addiction (FA) represents a significant concern for certain populations, with potential consequences for both psychological and physical well-being. Recent meta-analysis (Praxedes et al., 2022; Yekaninejad et al., 2021) found a 14% prevalence of FA in adults and 12% in children. FA has been identified in 32% of individuals with obesity undergoing bariatric surgery and in over 50% of people with binge eating disorder (Praxedes et al., 2023). These findings suggest a plausible link between FA, eating disorders and obesity. Considering these findings, a critical re-evaluation of current treatment approaches for eating disorders and obesity is necessary, incorporating the latest advancements in addiction science.

The widespread availability of hyper-palatable foods (HF, ultra-processed foods high in refined carbohydrates and added fats) represents a major risk factor for public health. These foods can be highly addictive and lead to compulsive overconsumption, resulting in a range of deleterious health outcomes including obesity, type II diabetes, cardiovascular diseases, eating disorders or FA. While the etiology of FA is likely multifactorial, potential contributing factors beyond obesogenic environments need to be explored.

1.1 Food Addiction

Food is one of the most universal and accessible substances inducing pleasure (Kringelbach, 2005) and stimulating hedonic hunger (consumption of food for pleasure) (Monteleone et al., 2012). There is growing evidence that ultra-processed and HF may trigger addictive like eating behavior in some individuals (Nolan & Jenkins, 2019; Volkow et al., 2005). Scientific research supports the idea that frequent consumption of HF stimulates changes in brain's reward pathways (dopaminergic, GABAergic, opioid etc.) similarly to addictive drugs as well as changes in individual's hormonal profile (Monteleone et al., 2012). These neural circuits create feelings of pleasure or hedonic 'liking' in response to rewarding stimuli. Recent studies point to similarities between substance dependence and excessive food intake (Granero, et al., 2014; Nolan & Jenkins, 2019; Volkow et al., 2005). This similarity is also supported by the fact that people continue to overeat despite negative consequences (cravings, loss of control overeating, weight gain or serious health issues) (Oliveira et al., 2021).

According to Volkow et al. (2002) rewarding properties of the food or drug correlate with the release of extracellular dopamine in the nucleus accumbens. Avena & Hoebel (2003) discovered that lesions of the dopaminergic system or pharmacological blockade of dopamine receptors reduce the reward value of food and drugs of abuse. Excessive sugar consumption alters binding to dopamine and opioid receptors and causes endogenous opioid dependence (Colantuoni et al., 2001). According to O'Malley et al. (2002), opiate antagonists (e.g. naloxone, naltrexone) can reduce alcohol cravings in dependent participants. Naloxone also decreases preference and

intake of HF in people with binge eating disorder (Drewnowski et al., 1995). Patients with bulimia treated with opioid antagonists showed a reduction in the frequency of binge episodes following naltrexone administration (Nogueiras et al., 2012).

Food activates brain reward pathways through taste and by rising the concentration of glucose and insulin in the blood, which increases dopamine activity, while drugs activate the same neural circuits through their direct pharmacological effects (Volkow et al., 2003). Regardless of the differences, similar neurobiological processes resulting from HF and drug intake provide substantive empirical support for the concept of FA. In addition, several experimental studies brought supporting evidence that sugar and HF may be highly addictive (Avena et al., 2008; Avena & Gold, 2011; Gosnell & Levine, 2009; Leigh et al., 2018; Wideman et al., 2005). Sugar activates production of endogenous opiates and cannabinoids, followed by intense dopamine release. These chemical processes may lead to reinforcement and compulsive behavior (Avena & Gold, 2011; Volkow et al., 2008). Stice et al. (2010) found that sugar activates the same centers in the brain as cocaine in mice and rats. They also discovered that people who consume high amounts of sugar develop a tolerance over time and need more to feel the same effect. The same mechanism is present in other substance addictions. A decrease in perceived pleasure, along with an increase in tolerance, craving, withdrawal symptoms, dysphoria, and other emotional and behavioral difficulties, result in a compensatory mechanism in which the consumption of HF increases to ensure the previous level of perceived reward and pleasure, thus creating a cycle of addictive behavior (Figure 1.) (Adams et al., 2019).

In addition to impaired reward sensitivity, reduced D2 receptor density is associated with impaired ability to regulate impulsive behavior (Adams et al., 2019). According to Volkow and colleagues (2008), addiction to drugs, alcohol or food may represent a consequence of conditioning and resetting of reward thresholds, due to repeated stimulation by drugs or food in vulnerable individuals. The expected reward over activates the reward and motivation circuits while inhibiting the cognitive control system, resulting in an inability to inhibit the urge to consume the drug or food despite attempts to do so. FA has showed alterations in brain regions involved in reward processing, homeostatic regulation, emotional reactivity, and executive control (Gearhardt et al., 2014). In certain populations, overconsumption of HF may lead to downregulation of the reward circuits, and deficiencies in cortical top-down regulation of eating behavior (Volkow et al., 2012).

The term food addiction (FA) was introduced in 1956 by Theron Randolph, who described it as "a specific adaptation of one or more foods regularly consumed, which in a very sensitive person, produce a pattern of symptoms similar to other addictive processes" (1956, p. 221) but only recently researchers began to examine and conceptualize this construct (Gearhardt et al., 2012).

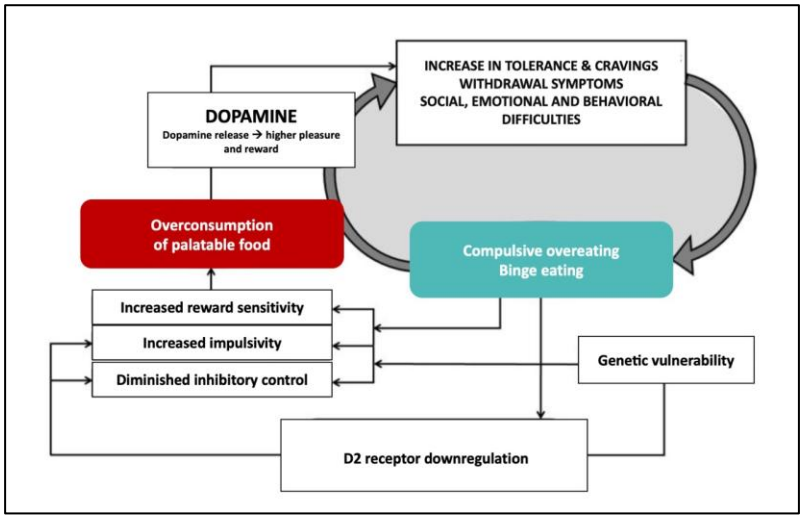

Figure 1. Food Addiction Cycle, adapted according to Adams and colleagues (2019)

Gearhardt et al. (2009) operationalized the concept of FA and developed a self-report questionnaire to identify individuals experiencing addictive symptoms to specific foods (foods high in sugar, fat and/or salt). *The Yale Food Addiction Scale* (YFAS) is based on DSM-IV diagnostic criteria for substance use addiction (e.g., abstinence, development of tolerance to food, loss of control over consumption, continued consumption despite problems and desire to do so, vulnerability in social activities) (Lin & Li, 2021). YFAS is a 25-item instrument based on the substance dependence criteria of the DSM-IV, most recently it has been updated according to DSM-5 (YFAS Version 2.0.) (Gearhardt et al., 2016).

1.2 Emotional and stress-related eating

Although emotional eating (EE) is not a diagnostic category according to the international classification systems, it represents an important psychological determinant of food intake regulation. Some individuals tend to regulate their affective states, especially negative emotions, or emotional discomfort, through food consumption. The „stress-eating-obesity model" recognizes emotional eating as a maladaptive response to experienced stressors (Talbot et al., 2013). EE refers to the tendency to eat in response to negative emotions (sadness, depression, disappointment, tension, anxiety or stress), whereby individuals mainly consume high-calorie foods (Konttinen et al., 2010). EE is primarily a response to feelings and experienced emotions instead of physiological hunger and represents a maladaptive coping mechanism (Spoor et al., 2007) aimed to achieve pleasant emotions and displace or eliminate of negative ones through consumption of food (Evers et al., 2010). According to Echeverri-Alvarado et al. (2020) emotional overeating occurs as a result of a problematic management of negative emotions. Sultson et al., (2017) distinguish the negative and positive emotional eating. They describe negative EE as a tendency to overeat, which is an individual's response to experiencing negative emotions. Positive EE, on the other hand, is a consequence of experiencing positive emotions.

The authors report that negative EE has a greater impact on overeating compared to positive emotional eating (Sultson et al., 2017).

EE is related to depressive symptomatology. The intensity and frequency of binge eating is directly related to the identified degree of depression (Telch & Agras, 1994). Dingemans and colleagues (2007) found that depressive disorder was the most common diagnosis among binge eaters. Positive association between sudden negative affectivity, depression and overeating was also found by Dingemans et al. (2009). Higher incidence of EE has been observed in people who had experienced traumatic events or maltreatment in childhood (Evers et al., 2010). The severity of PTSD is negatively correlated with emotion management and leads to emotional overeating (Talbot et al., 2013). Oliver et al. (2000) suggested that emotional overeating in response to negative affect is a learned mechanism aimed to relieve unpleasant mood states. Heatherton and Baumeister (1991, p. 88) proposed the *Escape Theory*, in which "overeating in response to negative emotions results from an attempt to escape or shift attention away from an ego-threatening stimulus that causes aversive self-awareness. In an attempt to reduce these negative emotions, overeating may then occur to temporarily provide comfort and distraction from aversive emotions." EE has been related to individual differences in physiological arousal. Iasonidou et al. (2023) found that high-risk participants for eating disorders exhibited greater physiological arousal (heart rate response) in response to physical and cognitive stress compared to low-risk participants.

Ozier et al. (2007) developed *the Eating and Appraisal Due to Emotions and Stress Questionnaire* (EADES) to measure how individuals use food to cope with emotions and stress. Theory behind the EADES is based on the Lazarus and Folkman's *Transactional Model of Stress and Coping* (TMSC), a framework explaining interindividual differences in responding to stressful events and evaluating modes of coping with emotions and stress. Major differences have been found in the degree and type of reaction on perceived stimuli due to variability in sensitivity, vulnerability, and cognitive interpretation among individuals. Reactivity and cognitive interpretation (appraisal) determine the use of effective or ineffective coping responses related to food. According to authors TMSC is well suited for determining if stress, along with appraisal and coping, has an influence on an individual's relationship with food.

EADES was designed to be used by health, food and nutrition professionals to measure individuals' use of food to cope with stress and emotions. The questionnaire has a three-factor structure: 1. Emotion and Stress Related Eating, 2. Appraisal of Ability and Resources to Cope, 3. Appraisal of Outside Stressors and Influences.

1.3 Personality

Personality and its relationship to eating behaviors and styles, eating pathology and emotional eating has been well-documented. Personality not only influences eating styles but also

determines food choices (Keller & Siegrist, 2015). Currently, the most influential personality model used in research is the five-factor model (FFM). It describes individuals in terms of temporally stable and universal patterns of thinking, feeling, and behaving in five global domains: Extraversion, Neuroticism, Conscientiousness, Agreeableness and Openness to experience (Costa & McCrae, 1992). Dimension of the FFM have been identified as either risk factors for disordered eating, unfavorable food choices, emotional eating and overeating (neuroticism/low emotional stability) or protective factors (conscientiousness, self-control, low impulsivity), which showed ability to prevent unfavorable food choices by reducing overeating (Elfhag & Morey, 2008; Groesz et al., 2012; Heaven et al., 2001; Keller & Siegrist, 2015). Heaven et al. (2001) reported negative relationship between conscientiousness and emotional and external eating, while neuroticism was positively associated with both.

Brunault et al. (2018) investigated association of personality traits using the Big Five model and FA measured by YFAS in bariatric patients. 16.5% of participants met criteria for FA and were lower in conscientiousness and extraversion and higher in neuroticism. Tang et al. (2021) discovered positive association between food addiction and impulsivity, extraversion, and low level of agreeableness. Elfhag and Morey (2008) sought to understand the role of personality traits in relation to eating habits in participants with obesity using the Dutch Eating Behavior Questionnaire (DEBQ) and the NEO-PI-R. Low levels of self-control (high impulsivity and low self-discipline) were closely related to overeating due to experiencing negative emotions. Heaven et al. (2001) used International Personality Item Pool and DEBQ and identified a significant relationship between BMI and emotional eating. Eating behavior (external, emotional, and restrained eating) showed strong relationship with neuroticism and modest inverse relationship with conscientiousness. Davis et al. (2011) analyzed adults with obesity using the YFAS and DEBQ questionnaires. Participants with obesity who also met criteria for FA showed higher levels of depression, higher impulsivity and higher levels of emotional reactivity compared to control group (participants without food addiction). Keller and Siegrist (2015) analyzed relationship between personality dimensions and preferred types of food and emotional eating (N = 951). Participants with high conscientiousness had a higher tendency to eat healthy food, they also tended to resist eating foods high in sugar and salt and showed lower tendency to emotional eating. Participants high in neuroticism showed increased consumption of sugary and salty foods through increased tendency for emotional and external eating. According to Groesz et al. (2012) neuroticism seems to impair self-control to resist tempting food and facilitates coping with negative emotions and stress by eating sweet, calorie-dense, and fatty foods.

1.4 Aim of the Work

Given the novelty of FA concept, there is a scarcity of research exploring the personality traits associated with it. Therefore, this study aimed to explore the psychological underpinnings of FA (using the Yale Food Addiction Scale, Gearhardt et al., 2012), to examine the relationships between FA and the five-factor model of personality (mini-IPIP, Donnellan et al., 2006) and to investigate associations between FA and emotion and stress-related eating behaviors (EE, using the Eating and Appraisal Due to Emotions and Stress Questionnaire, Ozier et al., 2007). By examining these potential correlates, we aim to enhance our understanding of the multifaceted nature of FA.

2. Material and Methods

The study employed a correlational, quantitative, non-experimental design. 155 people participated in the research study. 41 were excluded due to submitting incomplete questionnaires. The final research sample consisted of 114 participants. Convenience sampling was used to obtain the sample. Data was collected online through Google Forms from February 20 till March 11, 2022. Inclusion criteria for all participants was the minimum age of 18 years. A self-report assessment battery was used to evaluate participants' demographics, food addiction, emotion related and stress eating, personality dimensions and BMI. The study was approved by the Department of Clinical Psychology, Faculty of Psychology at the Pan-European University. All participants provided written informed consent prior to study participation. The survey was completely anonymous, and participants were treated according to the ethical standards and the Declaration of Helsinki.

2.1 International Personality Item Pool

The Mini-IPIP (Donnellan et al., 2006) is a short 20-item open-source measure of the Big Five factors of personality. It consists of five scales: extraversion, agreeableness, conscientiousness, neuroticism, and openness. Participants respond on a 5-point Likert type scale ranging from 1 (strongly agree) to 5 (strongly disagree). In our research, the scale had coefficient alphas ranging from 0.61 to 0.74 (Openness, α= 0.63; Conscientiousness, α=0.61; Extraversion, α= 0.74; Agreeableness, α= 0.70; and Neuroticism, α= 0.70). The measure has adequate construct and criterion validities and reliability (Donnellan et al., 2006).

2.3 The Yale Food Addiction Scale

The YFAS (Gearhardt et al., 2009) is the first measure designed to assess addictive-like eating behavior according to the diagnostic criteria for substance dependence as described in DSM-IV (American Psychiatric Association, 2000). The YFAS relates to the consumption of calorie-dense (hyperpalatable) foods. The measure consists of 25 items assessing specific symptoms or eating patterns in the past 12 months. The scale questions fall under following categories: 1. Substance taken in larger amount and for longer period than intended; 2. Persistent desire or

repeated unsuccessful attempt to quit; 3. Much time/activity to obtain, use and recover; 4. Important social, occupational, or recreational activities given up or reduced; 5. Use continues despite knowledge of adverse consequences; 6. Tolerance (increase in amount or decrease in effect), 7. Characteristic withdrawal symptoms; substance taken to relieve withdrawal; 8. Use causes clinically significant impairment. The scoring offers two options: 1. a continous symptom count (ranging from 0 to 7 that reflects the number of addiction-like criteria endorsed) and 2. a dichotomous "diagnostic" count (indicating whether a threshold of three or more symptoms plus clinically significant impairment or distress has been met). The YFAS has been psychometrically tested in clinical and non-clinical populations and has good internal consistency, as well as convergent, discriminant, and incremental validity (Davis et al., 2011; Gearhardt et al., 2009, 2012, 2014). In our research sample the Cronbach's alpha showed good internal consistency (α= 0.89).

2.4 The Eating and Appraisal Due to Emotions and Stress Questionnaire

The EADES (Ozier et al., 2007) is a self-report instrument that measures the constructs of emotional and stress-related eating (Table 1). The measure has three factor structure: Factor 1. is assessed by 24 items measuring Emotion and Stress Related Eating (lower scores represent greater emotional and stress-related eating); Factor 2. Appraisal of Ability and Resources to Cope (20 items), which evaluate one's perception of personal well-being and resources, including skills to cope with stress and emotions (lower scores mean fewer skills and resources to cope); Factor 3. Appraisal of Outside Stressors and Influences (5 items), this scale assesses the ability to cope with external stressors (lower scores mean worse ability to cope with external stressors).

Table 1. The Eating and Appraisal Due to Emotions and Stress Questionnaire factor structure

Factor	No. of Items	Main constructs
Emotion and Stress Related Eating	24	• assessment of coping potential • self-efficacy toward control of EE • confidence to use adaptive coping mechanisms when emotional
Appraisal of Ability and Resources to Cope	20	• ability to change situation • managing emotional reactions • perceptions of social support coping resources and effective coping
Appraisal of Outside Stressors and Influences	5	• ability to cope with external stressors

Ozier et al. (2007) reported high values of Cronbach's alpha for the whole measure (α= 0.94). In our study Cronbach's alpha for the whole measure was 0.94. Factor 1. (α= 0.95), Factor 2. (α= 0.84), Factor 3. (α= 0.37).

2.5 Data Analysis

Data was analyzed using JASP (version 0.17.3). Self-reported height and weight were used to calculate BMI (BMI = kg/m^2). Descriptive statistics were calculated for sociodemographic and anthropometric variables and for scores of personality dimensions, EE and FA. Distribution of examined variables was assessed with Shapiro-Wilkov test. Spearman correlation was used to measure the strength and direction of associations between variables. Linear regression analyses were conducted via stepwise method. Based on G*power analysis the minimum number of participants was set to 79 for multiple regression analysis (a _= 0.05, R^2 = 0.2, power = 0.95) and 124 participants for bivariate correlation (a = 0.05, power= 0.95, r > 0.316).

3. Results

The final research sample consisted of 114 participants aged 18-72 years with median age 42 (IQR= 13.75), 71.9 % were women. Mean score of the BMI index was 26.24 (min. 16.7 and max. 41.9), 26.3% of participants were overweight, 22.9 % obese and 2.6% underweight. Descriptive statistics of the research sample and examined variables are displayed in Table 2 - Table 4. Following variables demonstrated gaussian distribution: Age and Weight in men, Height in men and women, Extraversion, Neuroticism, Emotion and Stress Related Eating, Outside Stressors and Influences.

Table 2. Descriptive Statistics for the research sample

	Age		**Weight (kg)**		**Height (cm)**		**BMI**	
	Men	Women	Men	Women	Men	Women	Men	Women
Valid	32	82	32	82	32	82	32	82
Median	50.000	41.000	89.000	65.500	180.000	165.500	26.695	24.354
Mean	45.688	41.634	92.313	71.037	182.344	166.354	27.803	25.641
IQR	16.750	9.750	25.500	19.250	8.250	7.000	7.788	6.228
Skewness	-0.133	0.494	0.600	1.033	0.562	0.233	0.597	1.000
Kurtosis	-0.617	1.403	-0.507	0.504	-0.110	-0.193	-0.679	0.620
P-value of Shapiro-Wilk	0.055	0.034	0.065	< .001	0.156	0.566	0.047	< .001

Our research sample scored highest in Agreeableness and lowest in Neuroticism. Significant difference was found between men and women in Agreeableness (η = 0. 29) and Neuroticism (η = 0.21), women scored higher in both. Emotional and stress-related eating was assessed using the EADES questionnaire. 18.4 % of participants reported to use food to cope with their emotions, 17.5 % eat when feeling frustrated, 22.8 % eat when feeling anxious. Having weak control over their emotions was expressed by 14% of participants, 14.9 % is unable to control

their eating when feeling happy, 23.7 % eat when stressed, 26.3% cannot control their eating when feeling tired, for 17.5% it is hard to stop eating when feeling full and 7% do not have control over how much they eat.

FA scores displayed non-gaussian distribution. FA mean score was 1.667 (IQR= 1, min. 0, max. 7). Frequency analysis revealed that 19.3 % of participants end up eating much more than planned when they eat certain foods (2-3 times a week or more) and that food consumption caused significant physical problems or made a physical problem worse to 19.3 % of participants.

Table 3. Descriptive Statistics for study variables

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Median	12.000	17.000	15.000	10.000	15.500	90.000	78.000	15.000	1.000
Mean	12.684	16.596	14.930	10.456	15.246	88.772	76.807	15.105	1.667
IQR	4.000	3.000	3.000	4.000	4.000	24.500	8.000	3.750	1.000
Skewness	0.164	-0.198	-0.510	0.205	-0.384	-0.144	-0.512	-0.051	1.564
Kurtosis	-0.242	-0.847	0.136	0.017	-0.247	-0.498	0.540	-0.242	2.495
P-value of Shapiro-Wilk	0.053	< .001	0.002	0.161	0.016	0.200	0.037	0.057	< .001

Note. (N=114). 1= Extraversion 2=Agreeableness 3= Conscientiousness 4= Neuroticism 5= Openness 6= Emotion and Stress Related Eating (ESRE) 7= Ability and Resources to Cope (ARC) 8= Outside Stressors and Influences (OSI) 9= Food Addiction (FA).

Despite that, 16.7 % kept consuming the same types of food or the same amount of food even though they were having emotional and/or physical problems, 74.6 % tried to cut down or stop eating certain kinds of food. No significant difference was found between men and women in FA scores.

Table 4. Bivariate correlation analysis

	1	2	3	4	5	6	7	8	9
1. Extraversion	—								
2. Agreeableness	0.311***	—							
3. Conscientiousness	-0.102	0.059	—						
4. Neuroticism	-0.123	-0.108	-0.148	—					
5. Openness	0.199*	0.183	-0.111	-0.172	—				
6. EADES (ESRE)	-0.002	0.140	0.351***	-0.410***	0.141	—			
7. EADES (ARC)	0.321***	0.360***	0.178	-0.578***	0.252**	0.521***	—		
8. EADES (OSI)	0.231*	0.036	-0.015	-0.461***	0.067	0.375***	0.401***	—	
9. Food addiction	-0.009	-0.101	-0.228*	0.363***	-0.066	-0.472***	-0.383***	-0.222[a]	—

Note. ESRE = Emotion and Stress Related Eating, ARC = Ability and Resources to Cope, OSI= Outside Stressors and Influences * p < .05, ** p < .01, *** p < .001.

Major relationship (Table 4) was discovered between ARC and Neuroticism (r_s = - 0.578, p < .001). Inverse association means that the higher Neuroticism the fewer skills and resources to cope with EE an individual has. Agreeableness and Extraversion correlated moderately with ARC. Moderate relationships were also found between ESRE, Neuroticism (r_s = - 0.410, p < .001) and Conscientiousness (r_s = 0.351, p < .001). Higher Neuroticism relates to lower and Conscientiousness to higher ability to control ESRE. Neuroticism also correlated moderately with OSI (r_s = - 0.461, p < .001). FA showed moderate association with ESRE (r_s = - 0.472, p < .001) and ARC (r_s = - 0.383, p < .001). Relationships between ESRE (r_s = - 0.278, p < .01), FA (r_s = 0.242, p < .01) and BMI were modest.

Table 5. Stepwise regression analysis predicting BMI

Model		Unstandardized	Standard Error	Standardized	t	*p*
1	(Intercept)	26.248	0.532		49.347	< .001
2	(Intercept)	23.841	0.797		29.899	< .001
	Food addiction	1.444	0.372	0.344	3.883	< .001

Note. The following covariates were considered but not included: EADES (ESRE), EADES (ARC), EADES (OSI).

Linear regression model (Table 5) using the stepwise method identified FA as a moderate predictor (β = 0.344, p < .001) of BMI. The proposed model fits the data [F(1, 112) = 15.079; p = < .001] explaining 11.9 % (R^2 = 0.119) of the variance of BMI.

Using the same method, we identified Neuroticism as a moderate inverse (β = - 0.337, p < .001) and Conscientiousness as a modest (β = 0.289, p < .001) predictor of ability to control ESRE (Table 6). The proposed model fits the data [F(2, 111) = 15.157; p = < .001] explaining 21.5 % (R^2 = 0.215) of the variance of ESRE as a dependent variable.

Table 6. Stepwise regression analysis predicting Emotion and Stress Related Eating (EADES)

Model		Unstandardized	Standard Error	Standardized	t	*p*
1	(Intercept)	88.772	1.571		56.515	< .001
2	(Intercept)	109.873	5.325		20.632	< .001
	Neuroticism	-2.018	0.490	-0.363	-4.123	< .001
3	(Intercept)	80.051	10.096		7.929	< .001
	Neuroticism	-1.874	0.470	-0.337	-3.990	< .001
	Conscientiousness	1.896	0.555	0.289	3.420	< .001

ARC is highly predictable by neuroticism (β = - 0.596, p < .001), the proposed regression model (Table 7) fits the data [F(1, 112) = 61.795; p = < .001] explaining 35.6 % (R^2 = 0.356) of the variance of the dependent variable.

Table 7. Stepwise regression analysis predicting Ability and Resources to Cope (EADES)

Model		Unstandardized	Standard Error	Standardized	t	*p*
1	(Intercept)	76.807	0.743		103.343	< .001
2	(Intercept)	93.209	2.171		42.937	< .001
	Neuroticism	-1.569	0.200	-0.596	-7.861	< .001
3	(Intercept)	76.187	4.755		16.021	< .001
	Neuroticism	-1.475	0.189	-0.561	-7.804	< .001
	Agreeableness	0.967	0.244	0.285	3.963	< .001
4	(Intercept)	73.056	4.860		15.032	< .001
	Neuroticism	-1.415	0.187	-0.538	-7.556	< .001
	Agreeableness	0.798	0.250	0.235	3.187	0.002
	Extraversion	0.418	0.182	0.171	2.303	0.023

Note. The following covariates were considered but not included: Conscientiousness, Openness.

Low ability to cope with Emotion and Stress Related Eating (ESRE) has been identified as a strong (β = - 0.543, p < .001) predictor of FA, explaining 29.4 % (R^2 = 0.294) of the variance of FA [F(1, 112) = 46.712; p = < .001] (Table 8).

Table 8. Stepwise regression analysis predicting Food addiction (YFAS)

Model		Unstandardized	Standard Error	Standardized	t	*p*
1	(Intercept)	1.667	0.127		13.137	< .001
2	(Intercept)	5.556	0.579		9.595	< .001
	EADES (ESRE)	-0.044	0.006	-0.543	-6.835	< .001

Note. The following covariates were considered but not included: EADES (ARC), EADES (OCI)

4. Discussion

Personality and its relationship with eating behaviors has been well-documented (Elfhag & Morey, 2008; Groesz et al., 2012; Heaven et al., 2001; Keller & Siegrist). Our study brings supporting empirical evidence to this area of research. In line with Brunault et al. (2018), we discovered moderate relationship between Neuroticism and Food addiction (FA). This suggests that individuals high in Neuroticism may be more susceptible to FA, potentially due to heightened emotional reactivity or difficulty regulating negative emotions (Davis et al., 2011). According to Groesz et al. (2012) Neuroticism seems to impair self-control to resist tempting food and facilitates coping with negative emotions and stress by eating sweet, calorie-dense, and

fatty foods. Conversely, the inverse relationship between Conscientiousness and FA is consistent with findings of Brunault et al. (2018) as well. This suggests that conscientious individuals, characterized by self-control and goal-directed behavior, may be less prone to FA. Moreover, participants with high Conscientiousness may have better capacity to resist eating hyperpalatable foods (high in sugar and salt) and along with a lower tendency to engage in emotional eating (Keller & Siegrist, 2015).

Further, we explored interindividual differences in responding to stressful events and evaluating modes of coping with emotions and stress using the EADES instrument (Ozier et al., 2007), measuring the degree and type of reaction on perceived stimuli concerning sensitivity, vulnerability, and cognitive interpretation among individuals. Reactivity and cognitive interpretation determine the use of effective or ineffective coping modes related to food consumption. In line with Elfhag and Morey (2008) and Heaven et al. (2001), Neuroticism exhibited significant inverse relationship with all EADES factors. A major relationship was discovered between Neuroticism and Ability and Resources to Cope (ARC). Inverse association means that the higher the Neuroticism the fewer skills and resources to cope with emotional eating an individual has. We tested Neuroticism (inverse) as a potential predictor of ARC using the stepwise regression analysis. We discovered that Neuroticism is a strong predictor of ARC explaining 35.6 % of the variance of the ability to engage in effective coping and managing emotional reactions. Agreeableness and Extraversion correlated moderately with ARC, indicating that extroverted and agreeable individuals might possess better coping strategies that help them manage stress and control emotional eating.

Neuroticism showed moderate inverse association with Emotion and Stress Related Eating (ESRE) and Outside Stressors and Influences (OSI), indicating that individuals high in Neuroticism may have lower self-efficacy toward control of emotional eating and lower ability to cope with external stressors. As a result, they are more likely to engage in emotional eating, particularly when stressed or experiencing negative emotions. These findings suggest that emotional dysregulation associated with Neuroticism may contribute to using food as a coping mechanism. Targeted weight management interventions for individuals high in neuroticism should prioritize strategies that address emotional regulation skills, stress management, and self-efficacy for managing emotional eating. By addressing the underlying emotional vulnerabilities associated with neuroticism, these interventions may have the potential to reach more sustainable long-term weight management success in this population.

Conscientiousness was moderately related to the ability to control Emotion and Stress Related Eating (ESRE), which is in line with Heaven et al. (2001), who reported negative relationship between Conscientiousness and emotional and external eating. We identified Neuroticism as

a moderate (inverse) and Conscientiousness as a modest predictor of ability to control Emotion and Stress Related Eating (ESRE), the proposed regression model explains 21.5 % of the variance of the dependent variable ESRE. These findings suggest that weight management interventions should prioritize addressing emotional regulation skills and stress management techniques, particularly for individuals high in Neuroticism**.** Additionally, integrating personality screening into the design of personalized interventions may significantly enhance their effectiveness.

Consistent with Manzoni et al. (2020), FA showed inverse relationship with all EADES factors, with the strongest moderate relationships observed for ESRE and ARC. The lower the ability to control emotion and stress and the fewer skills and resources to cope with emotional eating an individual has, the higher the chance of developing FA symptomatology. We further tested these associations with a regression analysis. Low ability to cope with Emotion and Stress Related Eating (ESRE) has been identified as a strong predictor of FA, explaining 29.4 % of the variance of FA. This finding highlights the importance of addressing emotional regulation and coping skills in weight management programs. Since individuals with low ARC are more likely to exhibit food addiction behaviors, interventions that help them develop healthier coping mechanisms need to be implemented in weight management programs. The development of targeted interventions that specifically address the needs of individuals with low ARC may have greater potential to achieve more sustainable treatment outcomes.

Relationships between ESRE, FA and BMI were significant and modest. To test the predictors of BMI, we conducted a regression analysis using the stepwise method. This analysis identified FA as a moderate predictor of BMI, explaining 11.9 % of the variance of BMI. These results are in line with several other studies (Minhas et al., 2021; Murphy et al., 2014; VanderBroek-Stice et al., 2017).

Our findings extend beyond treatment implications. They highlight the importance of primary prevention for obesity by promoting healthy coping skills and emotional regulation from a young age. Equipping individuals with the tools they need to manage stress and difficult emotions effectively may help reduce the risk of developing unhealthy eating patterns later in life.

5. Conclusions

This study underscores the potential value of investigating personality trait configurations for understanding the complex interplay between emotional coping, eating behaviors, and food addiction. By moving beyond individual personality traits, we can gain a more nuanced understanding of how different personality combinations contribute to risk and protective

factors. For instance, exploring the interaction between high neuroticism (associated with emotional reactivity) and low conscientiousness (impacting self-control) could provide deeper insights into vulnerability to emotional eating and Food addiction. These deeper insights can inform the development of personalized therapeutic interventions. By tailoring interventions to address the specific personality profiles of individuals, we can create targeted strategies to improve emotional regulation, stress management, and healthy coping mechanisms.

6. Limitations

Limitations of the current study include the use of correlational design which cannot explain causal relationships between variables. Secondly, this study used self-reported height and weight to calculate BMI, which could lead to underreporting of weight status and misclassification of OW/OB. Self-report measures used in the study are prone to various types of biases, which constitutes another limit. Additionally, the sample size and gender disproportions limit the generalizability of our findings.

Ethical approval

The study was approved by the Department of Clinical Psychology, Faculty of Psychology at the Pan-European University. Ethical Committee approval number FPS-100892-15476 (March 1, 2021). All participants provided written informed consent prior to study participation. The survey was completely anonymous, and participants were treated according to the ethical standards and the Declaration of Helsinki.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study. Participants agreed that the data may be further used for research and academic purposes.

Data Availability Statement

Data are available upon request, by sending an email to the corresponding author. Data cannot be made publicly available, because this was not explicitly approved by the participants at the moment of assessment.

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any potential conflict of interest.

Authors' Contribution

LA collected and analyzed the data and conducted the literature review. EK designed the study, drafted the manuscript, verified the statistical analysis, conducted the final review, and made final revisions.

References

1. Adams, R. C., Sedgmond, J., Maizey, L., Chambers, C. D., & Lawrence, N. S. (2019). Food Addiction: Implications for the Diagnosis and Treatment of Overeating. *Nutrients*, *11*, 2086. https://doi.org/10.3390/nu11092086
2. American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders Fourth Edition Text Revision (DSM-IV-TR)*. Washington DC: American Psychiatric Association. https://doi.org/10.1176/appi.books.9780890423349
3. Avena, N. M., & Hoebel, B. G. (2003). Amphetamine-sensitized rats show sugar-induced hyperactivity (cross-sensitization) and sugar hyperphagia. *Pharmacology, Biochemistry and Behavior, 74*(3), 635–639. https://doi.org/10.1016/S0091-3057(02)01050-X
4. Avena, N. M., Rada, P., & Hoebel, B. G. (2008). Evidence for sugar addiction: behavioral and neurochemical effects of intermittent, excessive sugar intake. *Neuroscience & Biobehavioral Reviews*, *32*(1), 20-39. https://doi.org/10.1016/j.neubiorev.2007.04.019
5. Avena, N. M., & Gold, M. S. (2011). Variety and hyperpalatability: are they promoting addictive overeating? 123. *The American journal of clinical nutrition*, *94*(2), 367-368. https://doi.org/10.3945/ajcn.111.020164
6. Brunault, P., Ducluzeau, P. H., Courtois, R., Bourbao-Tournois, C., Delbachian, I., Réveillère, C., & Ballon, N. (2018). Food addiction is associated with higher neuroticism, lower conscientiousness, higher impulsivity, but lower extraversion in obese patient candidates for bariatric surgery. *Substance Use & Misuse*, 53(11), 1919-1923. https://doi.org/10.1080/10826084.2018.1433212
7. Colantuoni, C., Schwenker, J., McCarthy, J., Rada, P., Ladenheim, B., Cadet, J. L., Schwartz, G. J., Moran, T. H., & Hoebel, B. G. (2001). Excessive sugar intake alters binding to dopamine and mu-opioid receptors in the brain. *Neuroreport, 12*(16), 3549–3552. https://doi.org/10.1097/00001756-200111160-00035
8. Costa, P. T., & McCrae, R. R. (1992). The five-factor model of personality and its relevance to personality disorders. *Journal of Personality Disorders, 6*(4), 343–359. https://doi.org/10.1521/pedi.1992.6.4.343
9. Davis, C., Curtis, C., Levitan, R. D., Carter, J. C., Kaplan, A. S., & Kennedy, J. L. (2011). Evidence that 'food addiction'is a valid phenotype of obesity. *Appetite, 57*(3), 711-717. https://doi.org/10.1016/j.appet.2011.08.017
10. Dingemans, A., Martijn, C., Jansen, A. T. M., & van Furth, E. (2009). The effect of suppressing negative emotions on eating behavior in binge eating disorder. *Appetite, 52*, 51-57. https://doi.org/10.1016/j.appet.2008.08.004
11. Dingemans, A. E., Spinhoven, P., & Van Furth, E. F. (2007). Predictors and mediators of treatment outcome in patients with binge eating disorder. *Behaviour Research And Therapy, 45*, 2551–2562. https://doi.org/10.1016/j.brat.2007.06.003
12. Donnellan, M. B., Oswald, F. L., Baird, B. M., & Lucas, R. E. (2006). The mini-IPIP scales: tiny-yet-effective measures of the Big Five factors of personality. *Psychological assessment, 18*(2), 192. https://doi.org/10.1037/1040-3590.18.2.192

13. Drewnowski, A., Krahn, D. D., Demitrack, M. A., Nairn, K., & Gosnell, B. A. (1995). Naloxone, an opiate blocker, reduces the consumption of sweet high-fat foods in obese and lean female binge eaters. *The American journal of clinical nutrition, 61*(6), 1206–1212. https://doi.org/10.1093/ajcn/61.6.1206
14. Echeverri-Alvarado, B., Pickett, S., & Gildner, D. (2020). A model of post-traumatic stress symptoms on binge eating through emotion regulation difficulties and emotional eating. *Appetite, 150*, 104659. https://doi.org/10.1016/j.appet.2020.104659
15. Elfhag, K., & Morey, L. C. (2008). Personality traits and eating behavior in the obese: poor self-control in emotional and external eating but personality assets in restrained eating. *Eating behaviors, 9*(3), 285-293. https://doi.org/10.1016/j.eatbeh.2007.10.003
16. Evers, C., Marijn Stok, F., & de Ridder, D. T. (2010). Feeding your feelings: Emotion regulation strategies and emotional eating. *Personality and social psychology bulletin, 36*(6), 792-804. https://doi.org/10.1177/0146167210371383
17. Gearhardt, A. N., Boswell, R. G., & Potenza, M. N. (2014). *Neuroimaging of eating disorders, substance used is orders, and addictions: Overlapping and unique systems*. In: Brewerton DT, Dennis A Baker, editors. Eating disorders, addictions and substance use disorders: Research, clinical and treatment perspectives. Berlin, Heidelberg: Springer; pp. 71–89. https://doi.org/10.1007/978-3-642-45378-6_4
18. Gearhardt, A. N., Corbin, W. R., & Brownell, K. D. (2009). Preliminary validation of the Yale food addiction scale. *Appetite, 52*(2), 430-436. https://doi.org/10.1016/j.appet.2008.12.003
19. Gearhardt, A. N., Corbin, W. R., & Brownell, K. D. (2016). Development of the Yale Food Addiction Scale Version 2.0. *Psychology of Addictive Behaviors, 30*(1), 113. https://doi.org/10.1037/adb0000136
20. Gearhardt, A. N., White, M. A., Masheb, R. M., Morgan, P. T., Crosby, R. D., & Grilo, C. M. (2012). An examination of the food addiction construct in obese patients with binge eating disorder. *International Journal of Eating Disorders, 45*(5), 657-663. https://doi.org/10.1002/eat.20957
21. Gosnell, B. A., & Levine, A. S. (2009). Reward systems and food intake: role of opioids. *International journal of obesity*, *33*(2), S54-S58. https://doi.org/10.1038/ijo.2009.73
22. Granero, R., Hilker, I., Agüera, Z., Jiménez-Murcia, S., Sauchelli, S., Islam, M. A., Fagundo, A. B., Sánchez, I., Riesco, N., Dieguez, C., Soriano, J., Salcedo-Sánchez, C., Casanueva, F. F., De la Torre, R., Menchón, J. M., Gearhardt, A. N., & Fernández-Aranda, F. (2014). Food addiction in a Spanish sample of eating disorders: DSM-5 diagnostic subtype differentiation and validation data. *European eating disorders review : the journal of the Eating Disorders Association, 22*(6), 389–396. https://doi.org/10.1002/erv.2311
23. Groesz, L. M., McCoy, S., Carl, J., Saslow, L., Stewart, J., Adler, N., Laraia, B., & Epel, E. (2012). What is eating you? Stress and the drive to eat. *Appetite, 58*(2), 717–721. https://doi.org/10.1016/j.appet.2011.11.028
24. Heatherton, T. F., & Baumeister, R. F. (1991). Binge eating as escape from self-awareness. *Psychological Bulletin, 110*(1), 86–108. https://doi.org/10.1037/0033-2909.110.1.86
25. Heaven, P. C., Mulligan, K., Merrilees, R., Woods, T., & Fairooz, Y. (2001). Neuroticism and conscientiousness as predictors of emotional, external, and restrained eating behaviors. *International Journal of Eating Disorders, 30*(2), 161-166. https://doi.org/10.1002/eat.1068

26. Iasonidou, E., Constantinou, E., Ferreira, N., & Koushiou, M. (2023). Emotional responding and distress tolerance in women at high vs. low risk for eating disorders in response to physical and cognitive stress. *Mediterranean Journal of Clinical Psychology 11*(3). https://doi.org/10.13129/2282-1619/mjcp-3796
27. Keller, C., & Siegrist, M. (2015). Does personality influence eating styles and food choices? Direct and indirect effects. *Appetite, 84*, 128-138. https://doi.org/10.1016/j.appet.2014.10.003
28. Konttinen, H., Männistö, S., Sarlio-Lähteenkorva, S., Silventoinen, K., & Haukkala, A. (2010). Emotional eating, depressive symptoms and self-reported food consumption. A population-based study. *Appetite*, *54*(3), 473-479. https://doi.org/10.1016/j.appet.2010.01.014
29. Kringelbach, M. L. (2005). The human orbitofrontal cortex: linking reward to hedonic experience. Nature reviews. *Neuroscience, 6*(9), 691–702. https://doi.org/10.1038/nrn1747
30. Leigh, S. J., & Morris, M. J. (2018). The role of reward circuitry and food addiction in the obesity epidemic: An update. *Biological psychology, 131*, 31–42. https://doi.org/10.1016/j.biopsycho.2016.12.013
31. Lin, X., & Li, H. (2021). Obesity: Epidemiology, Pathophysiology, and Therapeutics. *Frontiers in Endocrinology, 12*, 706978. https://doi.org/10.3389/fendo.2021.706978
32. Manzoni, G. M., Rossi, A., Pietrabissa, G., Mannarini, S., Fabbricatore, M., Imperatori, C., Innamorati, M., Gearhardt, A. N., & Castelnuovo, G. (2021). Structural validity, measurement invariance, reliability and diagnostic accuracy of the Italian version of the Yale Food Addiction Scale 2.0 in patients with severe obesity and the general population. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, *26*, 345-366. https://doi.org/10.1007/s40519-020-00858-y
33. Minhas, M., Murphy, C. M., Balodis, I. M., Samokhvalov, A. V., & MacKillop, J. (2021). Food addiction in a large community sample of Canadian adults: prevalence and relationship with obesity, body composition, quality of life and impulsivity. *Addiction (Abingdon, England)*, *116*(10), 2870–2879. https://doi.org/10.1111/add.15446
34. Monteleone, P., Piscitelli, F., Scognamiglio, P., Monteleone, A. M., Canestrelli, B., Di Marzo, V., & Maj, M. (2012). Hedonic eating is associated with increased peripheral levels of ghrelin and the endocannabinoid 2-arachidonoyl-glycerol in healthy humans: a pilot study. *The Journal of Clinical Endocrinology & Metabolism*, *97*(6), E917-E924. https://doi.org/10.1210/jc.2011-3018
35. Murphy, C. M., Stojek, M. K., & MacKillop, J. (2014). Interrelationships among impulsive personality traits, food addiction, and Body Mass Index. *Appetite*, *73*, 45–50. https://doi.org/10.1016/j.appet.2013.10.008
36. Nogueiras, R., Romero-Picó, A., Vazquez, M. J., Novelle, M. G., López, M., & Diéguez, C. (2012). The opioid system and food intake: homeostatic and hedonic mechanisms. *Obesity facts, 5*(2), 196–207. https://doi.org/10.1159/000338163
37. Nolan, L. J., & Jenkins, S. M. (2019). Food addiction is associated with irrational beliefs via trait anxiety and emotional eating. *Nutrients, 11*(8), 1711. https://doi.org/10.3390/nu11081711
38. Oliveira, J., Colombarolli, M. S., & Cordás, T. A. (2021). Prevalence and correlates of food addiction: Systematic review of studies with the YFAS 2.0. *Obesity Research & Clinical Practice, 15*(3), 191-204. https://doi.org/10.1016/j.orcp.2021.03.014

39. Oliver, G., Wardle, J., & Gibson, E. L. (2000). Stress and food choice: a laboratory study. *Psychosomatic medicine, 62*(6), 853–865. https://doi.org/10.1097/00006842-200011000-00016
40. O'Malley, P. M., & Johnston, L. D. (2002). Epidemiology of alcohol and other drug use among American college students. *Journal of studies on alcohol. Supplement,* (14), 23–39. https://doi.org/10.15288/jsas.2002.s14.23
41. Ozier, A. D., Kendrick, O. W., Knol, L. L., Leeper, J. D., Perko, M., & Burnham, J. (2007). The eating and appraisal due to emotions and stress (EADES) questionnaire: development and validation. *Journal of the American Dietetic Association, 107*(4), 619-628. https://doi.org/10.1016/j.jada.2007.01.004
42. Praxedes, D. R., Silva-Júnior, A. E., Macena, M. L., Gearhardt, A. N., & Bueno, N. B. (2023). Prevalence of food addiction among patients undergoing metabolic/bariatric surgery: A systematic review and meta-analysis. *Obesity reviews : an official journal of the International Association for the Study of Obesity, 24*(2), e13529. https://doi.org/10.1111/obr.13529
43. Praxedes, D. R. S., Silva-Júnior, A. E., Macena, M. L., Oliveira, A. D., Cardoso, K. S., Nunes, L. O., Monteiro, M. B., Melo, I. S. V., Gearhardt, A. N., & Bueno, N. B. (2022). Prevalence of food addiction determined by the Yale Food Addiction Scale and associated factors: A systematic review with meta-analysis. *European eating disorders review: the journal of the Eating Disorders Association, 30*(2), 85–95. https://doi.org/10.1002/erv.2878
44. Randolph, T. G. (1956). The descriptive features of food addiction. Addictive eating and drinking. *Quarterly journal of studies on alcohol, 17*(2), 198-224. https://doi.org/10.15288/qjsa.1956.17.198
45. Spoor, S. T., Bekker, M. H., Van Strien, T., & van Heck, G. L. (2007). Relations between negative affect, coping, and emotional eating. *Appetite, 48*(3), 368-376. https://doi.org/10.1016/j.appet.2006.10.005
46. Stice, E., Yokum, S., Bohon, C., Marti, N., & Smolen, A. (2010). Reward circuitry responsivity to food predicts future increases in body mass: moderating effects of DRD2 and DRD4. *Neuroimage*, *50*(4), 1618-1625. https://doi.org/10.1016/j.neuroimage.2010.01.081
47. Sultson, H., Kukk, K., & Akkermann, K. (2017). Positive and negative emotional eating have different associations with overeating and binge eating: Construction and validation of the Positive-Negative Emotional Eating Scale. *Appetite, 116*, 423-430. https://doi.org/10.1016/j.appet.2017.05.035
48. Talbot, L. S., Maguen, S., Epel, E. S., Metzler, T. J., & Neylan, T. C. (2013). Posttraumatic stress disorder is associated with emotional eating. *Journal of Traumatic Stress*, *26*(4), 521-525. https://doi.org/10.1002/jts.21824
49. Tang, C. S. K., Gan, Y., Ko, J., Kwon, J. H., Wu, A., Yan, E., & Yogo, M. (2021). The associations among emotional factors, personality traits, and addiction-like eating: A study on university students in six Asian countries/regions. *International Journal of Eating Disorders*, *54*(2). https://doi.org/10.1002/eat.23298
50. Telch, C. F., & Agras, W. S. (1994). Obesity, binge eating and psychopathology: Are they related? *International Journal of Eating Disorders, 15*(1), 53–61. https://doi.org/10.1002/1098-108X(199401)15:1<53::AID-EAT2260150107>3.0.CO;2-0
51. VanderBroek-Stice, L., Stojek, M. K., Beach, S. R. H., vanDellen, M. R., & MacKillop, J. (2017). Multidimensional assessment of impulsivity in relation to obesity and food addiction. *Appetite*, *112*, 59–68. https://doi.org/10.1016/j.appet.2017.01.009

52. Volkow, N. D., Fowler, J. S., Wang, G. J., & Goldstein, R. Z. (2002). Role of dopamine, the frontal cortex and memory circuits in drug addiction: insight from imaging studies. *Neurobiology of learning and memory, 78*(3), 610–624. https://doi.org/10.1006/nlme.2002.4099

53. Volkow, N. D., Wang, G. J., Fowler, J. S., & Telang, F. (2008). Overlapping neuronal circuits in addiction and obesity: evidence of systems pathology. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *363*(1507), 3191-3200. https://doi.org/10.1098/rstb.2008.0107

54. Volkow, N. D., Wang, G. J., Fowler, J. S., Tomasi, D., & Baler, R. (2012). Food and drug reward: overlapping circuits in human obesity and addiction. *Brain imaging in behavioral neuroscience*, 1-24. http://dx.doi.org/10.1007/7854_2011_169

55. Volkow, N. D., Wang, G. J., Ma, Y., Fowler, J. S., Wong, C., Ding, Y. S., Hitzemann, R., Swanson, J. M., & Kalivas, P. (2005). Activation of orbital and medial prefrontal cortex by methylphenidate in cocaine-addicted subjects but not in controls: relevance to addiction. *The Journal of neuroscience : the official journal of the Society for Neuroscience, 25*(15), 3932–3939. https://doi.org/10.1523/JNEUROSCI.0433-05.2005

56. Volkow, N. D., Wang, G. J., Maynard, L., Jayne, M., Fowler, J. S., Zhu, W., Logan, J., Gatley, J., Ding, Y.-S., Wond, C., & Pappas, N. (2003). Brain dopamine is associated with eating behaviors in humans. *International Journal of Eating Disorders*, *33*(2), 136-142. https://doi.org/10.1002/eat.10118

57. Wideman, C. H., Nadzam, G. R., & Murphy, H. M. (2005). Implications of an animal model of sugar addiction, withdrawal and relapse for human health. *Nutritional neuroscience, 8*(5-6), 269–276. https://doi.org/10.1080/10284150500485221

58. Yekaninejad, M. S., Badrooj, N., Vosoughi, F., Lin, C. Y., Potenza, M. N., & Pakpour, A. H. (2021). Prevalence of food addiction in children and adolescents: A systematic review and meta-analysis. *Obesity reviews : an official journal of the International Association for the Study of Obesity*, *22*(6), e13183. https://doi.org/10.1111/obr.13183

DOI: 10.13129/2282-1619/mjcp-4328