



## Food addiction: Prevalence, psychopathological correlates and associations with quality of life in a large sample



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### ABSTRACT

**Objective:** To determine the prevalence of food addiction in a large Brazilian non-clinical sample. Sociodemographic and psychopathological correlates of food addiction as well as associations with quality (QoL) domains were also investigated.

**Methods:** This cross-sectional study obtained data from a Brazilian anonymous web-based research platform (N = 7639; 71.3% females). Participants provided sociodemographic data and completed the modified Yale Food Addiction Scale 2.0, PHQ-9, hypomania checklist (HCL-32), Fagerström Test for Nicotine Dependence, AUDIT, modified Skin picking-Stanford questionnaire, Minnesota impulsive disorders interview, Symptom Checklist-90-Revised inventory (SCL-90R), early trauma inventory self report-short form, and the WHO Quality of Life instrument-Abbreviated version (WHOQOL-Bref). Associations were adjusted to potential confounders through multivariable models.

**Results:** The prevalence of food addiction was 4.32% (95%CI: 3.89–4.80%), and was more common among females. Food addiction was associated with a positive screen for a major depressive episode (OR = 4.41; 95%CI: 3.46–5.62), bipolar spectrum disorder (OR = 1.98; 95%CI: 1.43–2.75), and skin picking disorder (OR = 2.02; 95%CI: 1.31–3.09). Food addiction was also independently associated with exposure to early life psychological and sexual abuse ( $P = 0.008$ ) as well as with reduced physical, psychological, social, and environment QoL (all  $P < 0.001$ ).

**Conclusions:** Food addiction may be common in low and middle-income countries, though possibly less prevalent than in the US. Food addiction was associated with co-occurring mood disorders and skin picking disorder as

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well as with early life psychological and sexual abuse. Finally, food addiction was independently associated with broad reductions in QoL. Public health efforts towards the early recognition and management of food addiction are warranted.

## 1. Introduction

Evidence indicates that the consumption of highly processed, energy-dense food may be accompanied by functional alterations in brain reward system networks and neurotransmitter pathways (for example, dopaminergic and opioidergic systems) that also subservise putative neurobiological responses to drugs of abuse (Volkow et al., 2013a, 2016). Furthermore, it has been increasingly recognized that a subset of individuals may develop food addiction, a construct that encompasses behavioural features of eating that are also evident in people with substance use disorders (SUDs), including impulsivity, impaired control, functional impairment, and tolerance and withdrawal (Schulte et al., 2016). A self-report instrument referred to as the Yale Food Addiction Scale (YFAS) was developed based on DSM-IV-TR criteria for substance dependence (Gearhardt et al., 2009b). The YFAS has been validated across several languages and cultures, and evidence to date supports its robust psychometric properties, which are indicated by an adequate internal consistency reliability, a single-factor structure, and adequate convergent and discriminant validities compared to related constructs (e.g. weight cycling and binge eating) (Gearhardt et al., 2009a, b; Meule and Gearhardt, 2014). More recently, up-dated versions of the YFAS (i.e., the YFAS 2.0 and the briefer mYFAS 2.0) were developed to reflect DSM-5 criteria for SUDs (Gearhardt et al., 2016; Schulte and Gearhardt, 2017). Both the YFAS 2.0 and the mYFAS 2.0 instruments display consistent and adequate psychometric properties (Gearhardt et al., 2016; Schulte and Gearhardt, 2017).

A recent meta-analysis found a weighted prevalence of food addiction as assessed with different versions of the YFAS of 19.9%, with most included studies conducted in the US (Pursey et al., 2014). However, heterogeneity across studies was high (prevalence range: 5.4%–56.8%), with higher prevalence rates observed in studies that included clinical samples seeking treatment for overweight/obesity, as well as in studies with a higher prevalence of females in the sample (Pursey et al., 2014). Importantly, none of the component studies of this meta-analysis were conducted in low and middle-income countries (LMICs) (Pursey et al., 2014). Furthermore, relatively few studies have investigated the prevalence of co-occurring mental disorders and psychopathological correlates among individuals with food addiction. Available evidence suggests that food addiction is associated with a higher prevalence of depressive and anxiety symptoms (Chao et al., 2017b; Gearhardt et al., 2009b; Meule et al., 2014). The association of food addiction and alcohol and nicotine use disorders remain unclear. One study found that current smokers may have higher craving scores for highly palatable foods, whilst another study found that food addiction was not associated with tobacco use (Berenson et al., 2015; Chao et al., 2017b). In addition, food addiction and binge eating frequently co-occur (Gearhardt et al., 2014, 2013, 2012), and food addiction may predict binge-eating frequency more accurately than other factors related to binge-eating, such as negative affect eating disorder psychopathology (Gearhardt et al., 2012). Thus, these findings suggest that food addiction and disorders with binge-eating are overlapping, yet distinct constructs (Schulte et al., 2016). In addition, exposure to severe physical and sexual abuse during childhood was associated with a higher risk to develop food addiction among women (Mason et al., 2013). Moreover, the independent associations of food addiction and different quality of life (QoL) domains in non-clinical samples remain unclear.

Although skin picking disorder (SPD) and trichotillomania (TTM) are currently classified in the DSM-5 as obsessive-compulsive and related disorders (Stein et al., 2016), a growing body of evidence

indicates that these disorders share epidemiological, phenomenological, and neurobiological characteristics with SUDs and gambling disorder (Chamberlain et al., 2016; Figee et al., 2016). Therefore, some experts have proposed that skin picking disorder and trichotillomania could also be conceptualized as ‘behavioural addictions’ taking into account trans-diagnostic frameworks, such as the NIMH Research Domain Criteria (Chamberlain et al., 2016; Cuthbert and Insel, 2013). In addition, a recent study suggests that higher food addiction scores may be associated with detrimental psychopathological correlates in a treatment-seeking sample with gambling disorder (Jimenez-Murcia et al., 2017). However, no study has investigated associations of food addiction with skin picking disorder and trichotillomania.

Given the aforementioned gaps in the literature, the current study had three aims: (1) to estimate the prevalence and sociodemographic correlates of food addiction in a large web-based Brazilian sample; (2) to assess psychopathological correlates of food addiction including a positive screen for nicotine dependence, alcohol use disorder, major depressive episode, bipolar spectrum disorder, SPD, trichotillomania, and early life trauma with validated self-report measures; and (3) to determine the independent association of food addiction and QoL domains. We hypothesized that food addiction could be prevalent in our sample (which is derived from a LMIC i.e. Brazil), and that significant associations between food addiction and a positive screen for affective disorders, alcohol use disorder, nicotine dependence, SPD, and TTM. Finally, we hypothesized that the participants with food addiction could have a more impaired QoL compared to those without food addiction after multivariable adjustment to sociodemographic and psychopathological confounding variables.

## 2. Methods

### 2.1. Sample selection

Consecutive participants (N = 9603) were recruited through a large web-based Brazilian study (Portal Temperamento e Saúde Mental, [www.temperamentoesaudemental.org](http://www.temperamentoesaudemental.org)) (Lima et al., 2017). This website provides an encrypted and confidential platform for data collection. The research ethics committee of the Hospital Universitário Walter Cantídio (HUWC) approved the procedures for online data collection under the protocol number 1.058.252. To access the surveys, participants were required to be at least 18 years old and to sign a digital informed consent form. Validation and attention questions throughout the protocol were employed to assess data quality. Examples of questions included for example “How old are you?” and “How much attention are you paying while answering to this survey?”. Consistency of responses were verified (i.e., participants had previously provided their dates of birth), and also participants who indicated that they were not paying adequate attention to the questionnaires were excluded. Therefore, this study included participants who had provided valid responses to these questions. From the initial sample, 9585 participants answered the complete survey, and after quality checking 7639 subjects remained eligible and were included in the analyses (response rate: 79.7%). There were no statistically significant differences between participants who were not included in the final sample compared to those that did not pass our quality check in sociodemographic variables (data available upon request to the authors).

This online survey collected sociodemographic data (age, sex, educational level, ethnicity, marital status, religious affiliation, occupation, and gross monthly income). In addition, this web-based platform included several validated psychological and psychiatric measures, which

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