



A few clicks away: Emotional eating, but not external and restrained eating, predicts online food delivery use

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ABSTRACT

Online Food Delivery (OFD) services have grown rapidly in popularity, particularly following the COVID-19 pandemic. While these platforms offer substantial convenience, their association with the increased consumption of energy-dense foods has raised public health concerns. To date, research on OFD use has focused on sociodemographic or lifestyle factors, with relatively little attention given to psychological determinants.

The present study addressed this gap by examining whether individual differences in eating styles - emotional, external, and restrained eating - predict OFD use beyond basic sociodemographic variables, and whether these effects interact with body mass index (BMI).

Eighty-one adult participants completed an online survey assessing OFD use patterns and eating styles using the Dutch Eating Behavior Questionnaire. Hierarchical regression analyses tested the incremental predictive value of sociodemographics, eating styles, and eating style × BMI interactions in predicting OFD use.

Results indicated that people who identified as female and individuals with higher BMI reported more frequent use of OFD. Notably, emotional eating emerged as a significant positive predictor of OFD use, even after adjusting for sociodemographic variables and other eating styles. External and restrained eating was unrelated to OFD behavior. Eating styles did not interact with BMI in predicting OFD use.

These findings highlight emotional eating as a key psychological driver of OFD use, suggesting that emotional eaters may rely on such platforms as a coping mechanism for emotional distress. Future research should consider the role of state-level variables and explore potential associations between different eating styles and categories of food ordered.

1. Introduction

After the COVID-19 pandemic, Online Food Delivery (OFD) services, accessible via web browsers or dedicated mobile applications, have experienced a significant rise in popularity (Gupta et al., 2024), reshaping how individuals make decisions about what, when, and where to eat (Rioux et al., PsyArXiv). These app-based food delivery services (e. g., Just Eat, Glovo, Deliveroo, and Uber Eats) function as digital intermediaries between consumers and local restaurants. Through a mobile interface, users can select meals, place orders, and follow the delivery process in real time, offering rapid and convenient access to a wide variety of foods, often requiring minimal effort from the user. While OFD platforms have improved food accessibility, particularly for individuals with mobility limitations or during lockdown restrictions,

their growing availability has also raised public health concerns regarding their potential contribution to unhealthy dietary behaviors (Partridge et al., 2020). As such, a better understanding of the psychological and behavioral determinants of OFD use is essential to better understand its possible role within the broader context of weight-related health risks, including cardiovascular diseases and musculoskeletal disorders.

To date, research has primarily focused on consumer behavior, establishing that factors such as service quality, perceived control on purchases, and satisfaction are key drivers of usage intentions (Annaraud & Berezina, 2020; Li et al., 2022; Rombach et al., 2023). Regarding user characteristics, large-scale surveys have linked OFD use to specific lifestyle traits, finding positive associations with higher BMI, smoking, and impulsive buying, whereas older age and suburban

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residence appear to be protective factors (Giacomini et al., 2023; Keeble et al., 2020). However, sociodemographic predictors often show complex patterns; for instance, gender differences have been found to vary by context, emerging specifically within student populations, where those identifying as female report more frequent use (Giacomini et al., 2023). Such inconsistencies indicate that demographic variables may act as proxies for underlying psychological tendencies, particularly eating styles, that more directly shape OFD behavior. Here, we argue that sociodemographic variables alone are insufficient to explain OFD use, and that it is necessary to look beyond these characteristics and investigate the psychological traits that drive this behavior.

Indeed, while previous findings provide important insights into who tends to use OFD platforms, they offer limited understanding of why individuals engage in this behavior, particularly from a psychological standpoint. Relatively few studies have systematically examined the psychological and cognitive factors that may drive OFD use, particularly through the lens of validated constructs from the psychology of motivation (Portingale et al., 2023; Zhang et al., 2022). Among these, eating styles such as emotional eating (Kaplan & Kaplan, 1957), external eating (Schachter et al., 1968), and restrained eating (Herman & Polivy, 1975), represent well-established dimensions that have been linked to maladaptive eating patterns and weight gain in offline contexts (Benbaibeche et al., 2023; Burton et al., 2007). Yet, their role in predicting OFD use remains largely unexplored.

Crucially, the transition from offline to online food environments may uniquely exacerbate these specific maladaptive traits. OFD platforms are distinct environments characterized by specific features: they are saturated with appetizing visual cues, utilize push notifications to trigger desire, and offer rapid “one-click” access to energy-dense foods, which translates to no physical effort nor energy consumption to obtain those foods. Theoretically, these features interact directly with the mechanisms of specific eating styles. For example, the removal of physical barriers (e.g., travel time, cooking effort) provides an immediate outlet for emotional eating, allowing individuals to cope with negative affect within a short time frame. Similarly, the visually rich interface acts as a constant environmental cue, potentially overwhelming the regulatory capacity of external eaters. Investigating these psychological determinants is crucial for moving beyond a simple description of user characteristics. By shifting the focus to eating styles, we aim to identify the underlying mechanisms that might explain why certain individuals are more prone to OFD use, going beyond the influence of sociodemographic descriptors alone.

1.1. Eating styles and weight balance

Research on the psychological underpinnings of excessive food consumption has identified three major eating styles associated with overeating: (i) *emotional eating*: the tendency to eat in response to emotional distress, particularly negative emotions or stress (Kaplan & Kaplan, 1957); (ii) *external eating*: the tendency to eat as a response to external food cues (e.g., the sight or smell of food) regardless of hunger (Schachter et al., 1968); (iii) *restrained eating*: the chronic attempt to reduce food intake in order to prevent weight gain or promote weight loss (Herman & Polivy, 1975).

Among these, emotional eating has been consistently linked to weight gain and difficulty in maintaining weight loss (Frayn & Knäuper, 2017). It is also associated with the presence and severity of binge eating disorder (Ricca et al., 2009), and mediates the relationship between depression and BMI (Lazarevich et al., 2016), suggesting that eating in response to negative emotions can impact weight regulation (van Strien et al., 2013). Recent evidence suggests that OFD use may exacerbate this tendency. Chinese college students who ordered takeaway food online 4–5 or 6–7 days per week reported significantly higher emotional overeating than those ordering online 2–3 times per week or less (Zhang et al., 2022). Similarly, OFD use has been linked to stronger urges to overeat, but not to restrict intake, pointing to a facilitation of “binge-

type” rather than restrictive eating patterns (Portingale et al., 2023). OFD platforms, saturated with appetitive images and promotions, may therefore reinforce emotional eating and exploit sensitivity to external cues, fostering maladaptive eating behaviors.

External eating has also been associated with increased food intake and higher BMI (Cebolla et al., 2014; Kakoschke et al., 2015; Pinaquy et al., 2003; van Strien et al., 2012), particularly in environments rich in food-related stimuli. Individuals with higher scores on the external eating subscale of the Dutch Eating Behavior Questionnaire (DEBQ) have been shown to consume more snacks while watching food commercials compared to neutral ones, a pattern not observed among low external eaters (van Strien et al., 2012). OFD platforms may thus amplify this cue-responsiveness by offering immediate, low-effort access to a wide variety of visually appealing foods, making fleeting exposures (e.g., in advertising or social media) more likely to translate into actual consumption.

The relationship between restrained eating and BMI and calorie intake seems more complex and context-dependent (Hagerman et al., 2021; Snoek et al., 2013; Stice et al., 2010). Dietary restraint predicts overeating when self-regulatory capacity is challenged, such as under stress or emotional arousal (Hagerman et al., 2021); it may also influence calorie intake and BMI through its association with emotional and external eating tendencies (van Strien et al., 2020). Some studies, however, reported negative associations between dietary restraint and food craving (i.e., a strong desire to eat specific types of food) or BMI, particularly in women (Burton et al., 2007; Lindroos et al., 1997). These inconsistencies partly reflect measurement differences: some instruments distinguish between “successful” restraint, as captured by the restraint subscale of the DEBQ and the Three-Factor Eating Questionnaire (Stunkard & Messick, 1985), and “unsuccessful” restraint, as assessed by the Restraint Scale (Herman & Mack, 1975). OFD use among restrained eaters may thus depend on whether restraint is effective or ineffective: individuals with unsuccessful restraint may turn to OFD during lapses in control, whereas those with successful restraint may avoid it as part of a weight-management strategy.

Together, prior evidence indicates that emotional and external eating are generally linked to greater intake and higher BMI, whereas the impact of restrained eating is more context dependent. OFD platforms, by providing rapid access to palatable foods, may accentuate these tendencies. Therefore, dissecting the specific contribution of each eating style is crucial to understand whether OFD platforms merely facilitate food access for the general population or if they interact with specific psychological vulnerabilities (e.g., the tendency to eat in response to emotions), thereby amplifying the risk of maladaptive dietary behaviors in the digital environment. While there are plausible theoretical grounds to expect that emotional, external, and restrained eating could all influence OFD use, it remains to be established whether all these traits, or only specific ones - and if so, which - are actual predictors of behavior in the digital environment. Yet, no study has systematically examined these differential associations.

1.2. Aims of the study

The present study investigates whether individual differences in emotional, external, and restrained eating predict the frequency of OFD use, beyond basic sociodemographic factors. Based on the influence of these traits on offline eating behavior, we derived some hypotheses about the influence of emotional, external, and restrained eating on OFD use.

First, we hypothesized that emotional eating would be a positive predictor of OFD use, given that OFD apps minimize the delay between the urge to soothe negative emotions and food consumption. Second, we hypothesized that external eating would positively predict OFD use due to the high exposure to visual food cues inherent to these platforms. Third, regarding restrained eating, we anticipated a negative association with OFD use. Because the DEBQ restraint scale primarily reflects

successful restraint, a form of dietary control associated with lower food intake, we expected individuals scoring high on this dimension to actively avoid OFD platforms to minimize exposure to “obesogenic” cues and maintain control over their diet.

Finally, we anticipated that eating styles, particularly restrained eating, may interact with BMI whereby the impact of emotional, external, and restrained eating on OFD is stronger with increasing BMI.

2. Material and methods

2.1. Participants

A total of 102 participants were included in the study. Inclusion criteria of the study were: aged 18 or older, no current or past neurological or psychiatric disorder, no current or past use of psychotropic substances other than nicotine and having used OFD platforms in the past. After the exclusion of participants with incomplete data ($n = 21$), the remaining 81 subjects were included in the study (Table 1). Data collection took place between May 2023 and November 2024 via the Qualtrics platform (<https://www.qualtrics.com>), and the protocol was performed in accordance with the ethical standards of the Declaration of Helsinki and was approved by the local Ethics Committee (Committee for Research Evaluation, CRIP, protocol number: RM-2023-657). The study was not pre-registered. Further details on sample size determination and recruitment are available in the Supplementary Materials.

2.2. Survey

The online survey was divided into three main sections: (i) socio-demographic information and dietary habits, (ii) online food delivery use, and (iii) eating-related questionnaires.

2.2.1. Sociodemographic information and dietary habits

After informed consent, participants were required to provide information about *gender*, *age*, *years of education*, and *subjective socio-economical status* assessed via the Mac Arthur Scale of Subjective Social Status (Adler et al., 2000). The scale depicts a 10-rung ladder symbolizing social standing, on which participants indicate their perceived socioeconomic status relative to others in their country, ranging from 1 (lowest) to 10 (highest). In addition, participants were asked to report

Table 1

Sociodemographic characteristics of the sample. BMI, body mass index; SSS, subjective socioeconomic status. Data were collected online via Qualtrics (May 2023–November 2024).

N = 81	
Gender (%)	
Male	32 (39.5%)
Female	49 (60.5%)
Age, years (M, SD) [Range]	26.1 (7.8) [19–55]
Education, years (M, SD) [Range]	15.1 (2.6) [8–21]
BMI, kg/m ² (M, SD) [Range]	22.5 (3.3) [16.5–36.4]
Dietary habits (%)	
Omnivore	72 (88.9%)
Vegetarian	2 (2.5%)
Vegan	1 (1.2%)
Other	6 (7.4%)
Currently dieting (%)	
Yes	10 (12.3%)
No	71 (87.7%)
SSS (M, SD) [Range]	6.3 (1.5) [3–10]

their *height* (in m) and *weight* (in kg), used to compute the BMI, their *dietary habits* and whether they were *currently dieting*.

2.2.2. Online food delivery use

We developed this section to collect information about patterns of OFD use, including whether participants used OFD platforms in the past.

- *OFD-COVID*. Changes in OFD use after the COVID-19 pandemic (1 = Decreased a lot; 2 = Decreased; 3 = Unchanged; 4 = Increased; 5 = Increased a lot).
- *OFD-Density*. Estimated number of restaurants or fast foods available in the OFD platforms in the living area (1 = 5 or less; 2 = 6–10; 3 = 11–15; 4 = 16–20; 5 = 21–25; 6 = More than 25).
- *OFD-Frequency*. Frequency of OFD use in the past month (1 = 0 times; 2 = 1 time; 3 = 2 times; 4 = 3 times; 5 = 4 times; 6 = 5 times; 7 = More than 5 times).
- *OFD-Times*. Frequency of OFD use *before lunch*, *during lunch*, *before dinner*, *during dinner*, and *after dinner* (1 = Never; 2 = Very rarely; 3 = Rarely; 4 = Occasionally; 5 = Frequently; 6 = Very frequently).
- *OFD-Food*. Frequency of ordering via OFD for different foods, including *Italian* (e.g., pizza, first and second course dishes), *ethnic* (e.g., Chinese, Japanese, Indian food), *fast-food* (e.g., hamburger, kebab, chicken nuggets), *poke or salad*, and *desserts* (e.g., ice-cream, donut, pastries) (1 = Never; 2 = Very rarely; 3 = Rarely; 4 = Occasionally; 5 = Frequently; 6 = Very frequently).

To characterize the mode of access, participants were also asked whether they primarily ordered food using a smartphone application or a web browser on a computer. The vast majority of the sample (95%, $n = 77$) reported using mobile delivery apps (e.g., UberEats, Deliveroo, Glovo), with only 5% ($n = 4$) using a web browser. Consequently, OFD use in this study primarily reflects app-based engagement.

2.2.3. Dutch Eating Behavior Questionnaire

In the last section, respondents were asked to fill-in the *Dutch Eating Behavior Questionnaire (DEBQ)* (Van Strien et al., 1986). The DEBQ assesses three eating styles, namely *emotional eating*, *external eating*, and *restrained eating*. It consists of 13 items for emotional eating, 10 items for external eating and 10 items for restrained eating (Likert scale from 1 = Never to 5 = Very often). A single score for each subscale was calculated by averaging the scores of the appropriate items.

The internal consistency of the emotional eating subscale was excellent (Cronbach's alpha = 0.96), and the internal consistency of the external eating and restrained eating subscales were good (Cronbach's alphas = 0.83 and 0.88, respectively).

2.3. Analytic plan

Analyses were performed in Jamovi (version 2.6.26) and were not pre-registered. Hierarchical regression analyses were performed with the GAMLj3 library. Results were deemed significant when $p \leq .05$; when appropriate, post-hoc tests were corrected for multiple comparisons with Bonferroni correction.

The analysis proceeded in three main stages. First, we described participants' usage patterns of OFD platforms, including perceived changes after the COVID-19 pandemic, the availability of app-affiliated restaurants in their residential area, ordering frequency across times of day and food types. Second, we constructed a composite outcome variable that summarized participants' ordering frequency across different food categories using principal component analysis (PCA). This PCA score was then used as the dependent variable in a hierarchical model aimed at identifying whether individual differences in emotional, external, and restrained eating predict greater use of food delivery platforms above sociodemographic information alone. The detailed analytic strategy used to test our hypotheses is available in the Supplementary Materials.

3. Results

3.1. Online food delivery use

3.1.1. OFD-COVID

A one-sample Wilcoxon signed-rank test was conducted to compare participants' ratings of perceived changes in online food delivery use after the COVID-19 pandemic against the neutral midpoint of the scale (3 = Unchanged). Participants mostly perceived increased delivery-app use ($W = 935, p = .002, r = 0.47; M = 3.83, SD = 0.98$).

3.1.2. OFD-density

The chi-square goodness-of-fit test on OFD-Density was significant, $\chi^2(5) = 17.7, p = .003$, indicating that participants most often perceived a high availability of restaurants in their area. The most frequently selected response was "more than 25 restaurants" (30.9%), followed by "6–10 restaurants" (23.5%), suggesting that many users reported living in areas with substantial OFD coverage (Table 2 and Fig. 1a).

3.1.3. OFD-frequency

The chi-square goodness-of-fit test on OFD-Frequency revealed a significant deviation from a uniform distribution, $\chi^2(6) = 14.5, p < .001$, showing that participants most frequently reported not having used OFD platforms at all in the past month (38.3%), followed by 1 (22.2%) and 2 times (21%) (Table 2 and Fig. 1b). To provide a prevalence perspective as well, we dichotomized responses into zero vs. one or more orders. A binomial test showed that the proportion of participants that placed at least one order in the past month was higher than chance (61.7% [50.3%, 72.3%], $p = .045$).

3.1.4. OFD-times

Median ordering frequency differed significantly across conditions ($\chi^2(4) = 210, p < .001$) (Fig. 2a). Food-app order frequency was significantly higher at lunch and dinner time ($M = 2.26$ and $M = 3.94$, respectively) compared to times between the main meals (i.e., before lunch, before or after dinner). Descriptive statistics and the full list of post-hoc comparisons are provided in the Supplementary Materials (Tables S1 and S2).

3.1.5. OFD-food

Food preferences differed significantly across food types ($\chi^2(4) = 97.2, p < .001$) (Fig. 2b): users ordered more frequently Italian cuisine ($M = 3.83$) and fast foods ($M = 3.43$), followed by ethnic ($M = 3.07$), poke/salad ($M = 2.65$), and desserts ($M = 1.69$). Descriptive statistics and the full list of post-hoc comparisons are provided in the Supplementary Materials (Table S3 and Table S4).

Table 2
Descriptive statistics for OFD-frequency and OFD-density.

OFD density	
5 or less	9 (11.1%)
6–10	19 (23.5%)
11–15	8 (9.9%)
16–20	11 (13.6%)
21–25	9 (11.1%)
More than 25	25 (30.9%)
OFD frequency	
0 times	31 (38.3%)
1 time	18 (22.2%)
2 times	17 (21%)
3 times	7 (8.6%)
4 times	3 (3.7%)
5 times	1 (1.2%)

3.2. Principal component analysis on OFD foods

A principal component analysis was conducted on participants' reported frequency of ordering different cuisine types via food delivery apps. The parallel analysis supported the retention of a single principal component explaining 37% of variance, aligning with theoretical expectations of a general OFD usage factor (Fig. S1). Examination of the factor loadings (see Table S5) revealed that this component was most strongly defined by energy-dense, meal-based foods. Component scores were extracted with the regression method to serve as the dependent variable (OFD-OnlineFoods) in subsequent hierarchical regression analyses. Complete details on PCA assumption checks and results are available in the Supplementary Materials.

3.3. Hierarchical linear regression

3.3.1. Sociodemographic factors

A series of hierarchical multiple regressions were conducted to examine whether trait-level eating behaviors predicted the composite index of online food delivery (i.e., OFD-OnlineFoods) use beyond demographic factors (Table 3). See Table S6 in Supplementary Materials for the results of the single steps of the hierarchical regression model.

In Step 1, gender ($\beta = 0.60, 95\%CI [0.14; 1.06], t(75) = 2.6, p = .012, \eta^2_p = 0.08$) and BMI ($\beta = 0.27, 95\%CI [0.04; 0.5], t(75) = 2.3, p = .024, \eta^2_p = 0.07$) were positive predictors, indicating that women and individuals with higher BMI more frequently rely on online food services.

3.3.2. Eating styles and BMI

In Step 2, emotional eating was a robust positive predictor of OFD use, explaining 8% of unique variance ($\beta = 0.35, 95\%CI [0.06; 0.63], t(72) = 2.4, p = .02, \eta^2_p = 0.08$), whereas external eating ($\beta = 0.07, 95\%CI [-0.18; 0.32], t(72) = 0.54, p = .59, \eta^2_p = 0.004$) and restrained eating ($\beta = -0.16, 95\%CI [-0.4; 0.08], t(72) = -1.3, p = .19, \eta^2_p = 0.02$) were not significant predictors of OFD use (Table 3 and Fig. 3). In Step 3, adding the two-way interactions with BMI did not lead to a significant increase in variance explained ($\Delta R^2 = 0.03, F(3, 69) = 0.95, p = .42$) (Table 3).

4. Discussion

Despite the widespread adoption of OFD platforms, most academic research on OFD use has continued to concentrate on marketing metrics and consumer behavior, leaving psychological determinants largely underexplored. The present study sought to shed light on this aspect by examining whether core psychological traits predict OFD use beyond basic sociodemographic variables.

Our data confirm an increase in OFD use following the COVID-19 pandemic, aligning with prior findings (Yao et al., 2023). Notably, over 60% of participants reported using OFD services at least once in the past month, and nearly one-third indicated having access to more than 25 app-affiliated restaurants in their area. These results point to both the growing normalization of OFD as a method of food procurement and the widespread accessibility of such services.

4.1. Sociodemographic determinants of OFD use

Our data revealed a positive association between gender and OFD frequency, with people who identified as female ordering food online more often than those who identified as male. This finding differentiates our results from previous reports suggesting higher OFD use among people who identified as males (Just Eat, n.d.; Keeble et al., 2020), or those finding no significant association with gender, such as the study by Buettner et al. (2023) on U.S. young adults (Buettner et al., 2023). However, our results align with the specific demographic context of our study. To our knowledge, only one prior study has explored predictors of

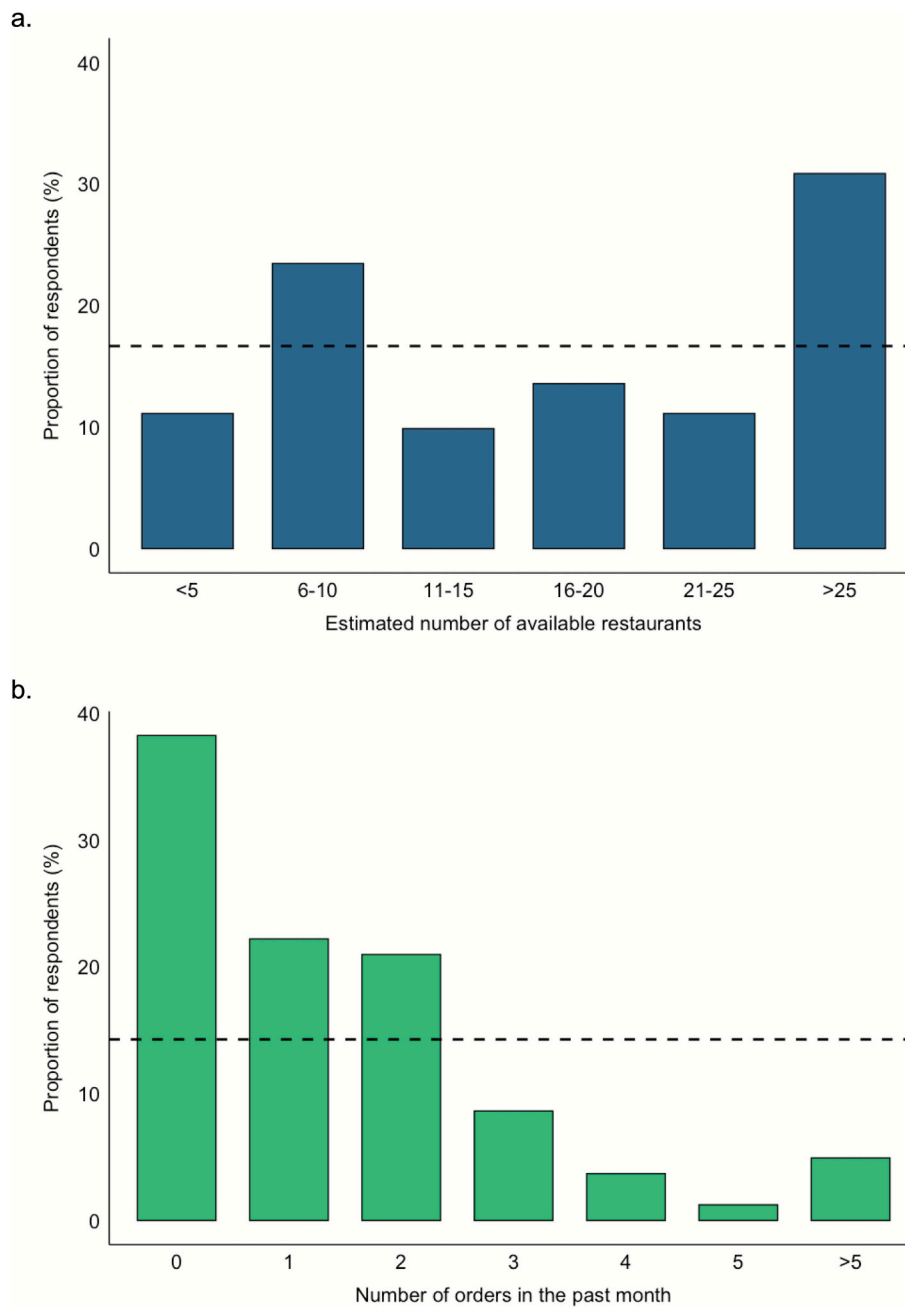


Fig. 1. OFD usage patterns. **(a)** Perceived density of restaurants available on OFD platforms in the participants' living area. **(b)** Frequency distribution of OFD use in the past month. Dashed lines represent chance level.

OFD use in a large Italian sample (Giacomini et al., 2023). In that study, Giacomini et al. found that gender effects were context-dependent: people who identified as female had higher OFD use specifically among university students, whereas no such difference was observed among workers. Although we did not formally assess employment status, our sample was recruited via university networks; thus, the higher frequency observed in our participants who identified as female is consistent with these local findings regarding student populations.

Consistent with previous findings (Albalawi et al., 2022; Giacomini et al., 2023), our results also show a positive relationship between BMI and OFD use. This supports growing concerns about the nutritional quality of foods typically available through OFD services (Mahawar et al., 2022; Wang et al., 2021). Our data confirmed that participants most frequently ordered Italian staples such as pizza and pasta, as well as fast food, items that are generally high in carbohydrates and/or fats.

These findings underscore the potential contribution of OFD to dietary habits that promote weight gain. While sociodemographic variables alone provide a useful foundation for understanding OFD behavior, they tell only part of the story. In the following sections, we show that incorporating psychological factors, particularly individual differences in eating styles, offers deeper insights into who turns to online food delivery and why.

4.2. Online food ordering when feeling down? Emotional eating and OFD use

Building on the sociodemographic predictors outlined above, we next examined whether eating styles could further clarify individual differences in OFD use. Including eating styles in the regression model explained an additional 8.4% of the variance in OFD use. As predicted,

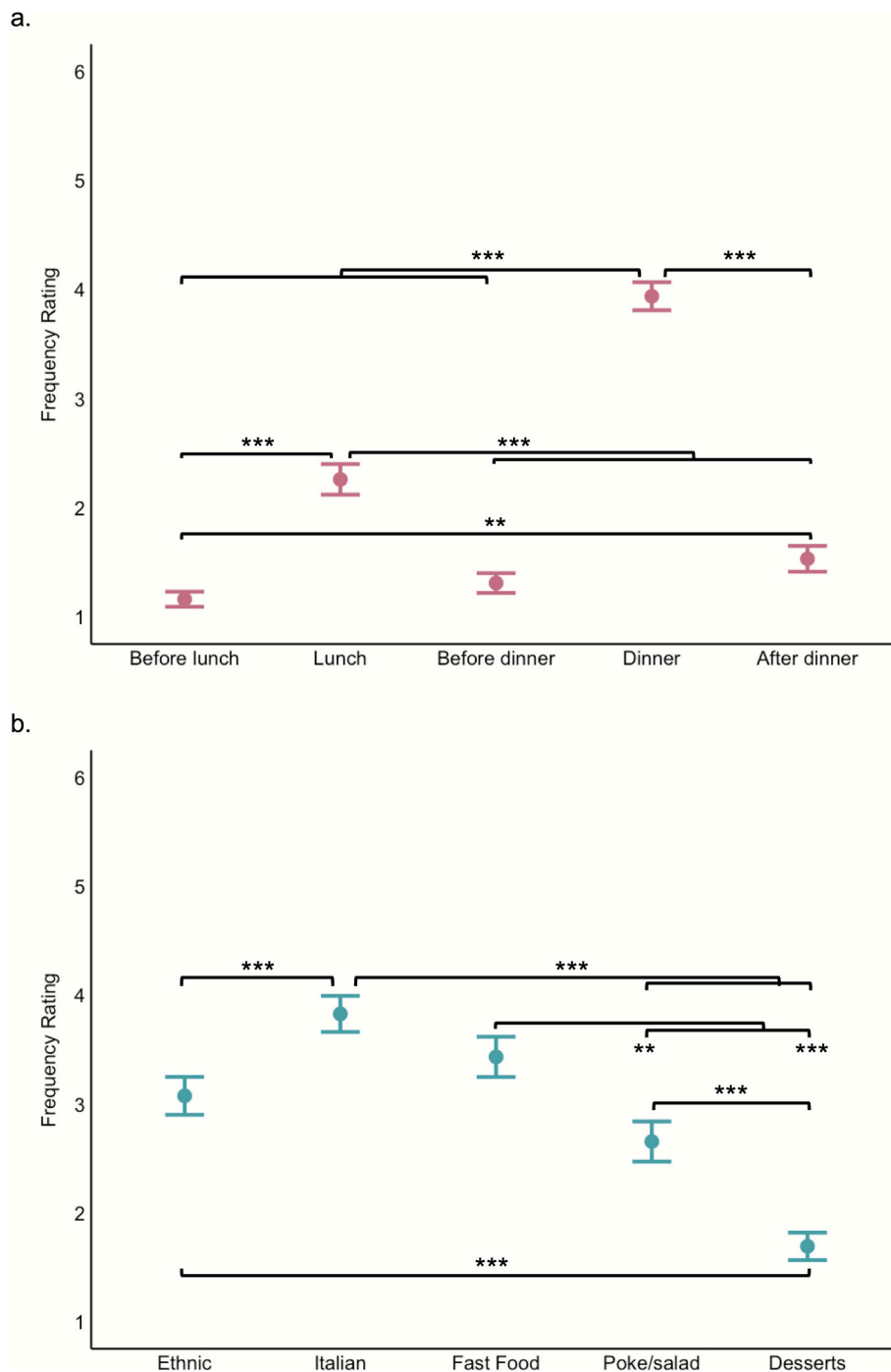


Fig. 2. Temporal and Dietary Patterns of OFD Use. (a) Average frequency of OFD orders across different mealtimes (lunch, dinner, and snacks). (b) Frequency of orders across different food categories. Error bars represent standard errors. **, $p < .01$; ***, $p < .001$.

emotional eating emerged as a significant positive predictor of OFD consumption, even after controlling for external and restrained eating. By contrast, neither external nor restrained eating styles were significantly associated with OFD use, and no eating style showed a significant interaction with BMI. Interestingly, BMI was no longer a significant predictor of OFD use after the addition of psychological traits, suggesting a potential mediatory role of emotional eating.

Although a growing body of research has examined the impact of emotions on food craving, overeating, and weight gain (Aulbach et al., 2025; Evers et al., 2018), only a few studies have explored the specific link between emotional eating and OFD consumption (Elhadidy et al., 2025; Portingale et al., 2023; Zhang et al., 2022). Elhadidy et al. (2025)

examined predictors of emotional overeating in a large sample of students and workers, using a framework similar to their previous study on OFD use (Giacomini et al., 2023). While they underscored the importance of several relevant predictors including identifying as female, higher BMI, and smoking in students, they did not find an association between OFD use and emotional overeating (Elhadidy et al., 2025). A key difference between their work and the present study lies in the analytic direction and theoretical framing: while Elhadidy et al. treated emotional overeating as the outcome and OFD use as a possible correlate, we reversed this logic by modelling OFD use as the dependent variable and testing whether stable eating styles, including emotional eating, predict greater use of food delivery services. Further, their

Table 3

Results of the hierarchical regression models. For each step, the standardized regression coefficient and its 95% confidence intervals, in addition to the t-score, p-value and η^2_p are reported. Results of model comparisons (step 2 vs. step 1, step 3 vs. step 2) are also shown.

Sociodemographic factors						
Step 1 ($R^2 = 0.14, F(5, 75) = 2.40, p = .045$)	β	95% CI	t (75)	p-value	η^2_p	
BMI	0.27	[0.04; 0.50]	2.31	0.02*	0.07	
Age	-0.11	[-0.35; 0.13]	-0.93	0.35	0.01	
Gender	0.60	[0.14; 1.06]	2.58	0.01**	0.08	
Education	-0.12	[-0.36; 0.12]	-0.97	0.34	0.01	
Subjective socioeconomic status	-0.08	[-0.30; 0.15]	-0.69	0.49	0.006	
Eating styles						
Step 2 ($\Delta R^2 = 0.11, F(3, 72) = 3.50, p = .02$)	β	95% CI	t (72)	p-value	η^2_p	
Emotional eating	0.35	[0.06; 0.63]	2.44	0.02*	0.1	
External eating	0.07	[-0.18; 0.32]	0.54	0.59	0.004	
Restrained eating	-0.16	[-0.40; 0.08]	-1.31	0.19	0.02	
Interactions with BMI						
Step 3 ($\Delta R^2 = 0.03, F(3, 69) = 0.95, p = .42$)	β	95% CI	t (69)	p-value	η^2_p	
BMI*emotional eating	0.08	[-0.18; 0.35]	0.63	0.53	0.006	
BMI*external eating	-0.16	[-0.48; 0.17]	-0.96	0.34	0.01	
BMI*restrained eating	-0.21	[-0.48; 0.07]	-1.50	0.14	0.03	

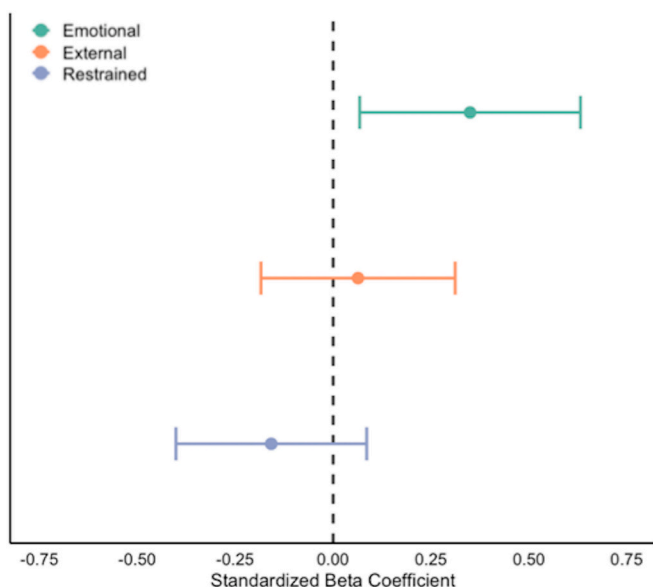


Fig. 3. Predictors of OFD Use. Forest plot depicting the relationship between OFD use (composite score) and Emotional Eating, External Eating, and Restrained Eating scores. Betas and 95% confidence intervals (CI) are shown.

measure of OFD use was dichotomous, whereas our study employed a composite, psychometrically derived index based on the self-reported frequency of ordering across multiple food types, independent of a specific time frame. This approach captures broader and more stable patterns of OFD behavior than point estimates tied to a fixed interval, while also allowing finer differentiation between individuals. These methodological and conceptual distinctions likely contribute to the discrepant findings and highlight the added value of examining trait-level predictors alongside a more nuanced measure of OFD use.

Consistent with our findings, Zhang et al. (2022) found that Chinese college students who ordered food online more frequently (4–5 or 6–7 times per week) reported significantly higher levels of emotional overeating - as measured by the Emotional Overeating Questionnaire (Masheb & Grilo, 2006) - than those who ordered less frequently (2–3 times per week or less), even after adjusting for relevant covariates (Zhang et al., 2022). Their results also showed that emotional overeating was unrelated to proximity to food outlets, suggesting that environmental triggers may play a less prominent role in this behavior.

We complement this literature by showing that individuals who tend to eat in response to negative emotions are also more likely to use OFD services, supporting recent suggestions that OFD may serve as a tool for coping with affective distress (Portingale et al., 2023). Together, these findings position emotional eating as a key psychological driver of OFD use, predicting online ordering beyond sociodemographic factors alone.

4.3. External and restrained eating: Why no link with OFD use?

We found no significant associations between either external or restrained eating and OFD use. This result is somewhat unexpected, as external eating reflects heightened sensitivity to food-related cues, which are ubiquitous in OFD apps. One explanation is that this trait may be more tightly coupled to immediate, in-person exposure to food cues, whereas the delayed gratification inherent to online ordering may dampen responsiveness (van Strien et al., 2012). Another possibility is that external eating may operate indirectly: prior evidence has shown it can mediate relationships between impulsivity, emotional eating, and actual food intake (Kakoschke et al., 2015; van Strien et al., 2020), suggesting that its effects on OFD behavior could be masked by these overlapping influences.

Restrained eating also showed no significant association with OFD use, consistent with the notion that dietary restraint is context-dependent: individuals high in restraint may generally inhibit OFD use but could be more prone to ordering during specific self-control-challenging situations (e.g., stress or emotional distress), resulting in no net association with the general frequency of use. Interestingly, we observed a negative trend between restrained eating and OFD frequency, aligning with the interpretation that the DEBQ restraint scale captures “successful” restraint (Adams et al., 2019). Those effectively regulating their intake may also be more capable to refrain from impulsive OFD use, whereas less successful dieters might instead be more vulnerable to such behaviors. Taken together, our findings suggest that the digital food environment may amplify affect-driven mechanism while not providing the necessary triggers to (not) engage restrained and external eaters.

As a final consideration, while our sample size exceeded the minimum requirement determined by our a priori power analysis for main effects, it may have been underpowered to detect smaller interaction effects. Consequently, the absence of a significant interaction between BMI and eating styles should be interpreted with caution and warrants replication in larger, stratified samples. Furthermore, we acknowledge the potential risk of Type I error accumulation inherent to exploratory research. While we minimized this risk by reducing the dimensionality of the dependent variable via PCA and applying Bonferroni corrections to post-hoc pairwise comparisons, the robustness of these associations should be confirmed in independent samples.

Future research should also examine how eating styles interact with

situational factors (e.g., time pressure, social setting) and whether they predict the nutritional quality of ordered meals (e.g., macronutrient composition or caloric density). Establishing such links will be critical for understanding how psychological dimensions of eating behavior translate into dietary choices within digital food environments.

CRedit authorship contribution statement

Francaantonio Devoto: Writing – review & editing, Writing – original draft, Visualization, Supervision, Formal analysis, Data curation, Conceptualization. **Carol Coricelli:** Writing – review & editing, Writing – original draft, Supervision, Data curation, Conceptualization. **Margaux Girati:** Writing – review & editing, Writing – original draft, Visualization, Formal analysis, Data curation. **Laura Zapparoli:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization.

Ethical statement

The protocol was performed in accordance with the ethical standards of the Declaration of Helsinki and was approved by the local Ethical Committee (Committee for Research Evaluation, CRIP, protocol number: RM-2023-657).

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Declaration of competing interest

The authors declare no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.eatbeh.2026.102071>.

Data availability

Data will be made available on request.

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