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Original article

Multidimensional eating profiles associated with personality traits during emerging adulthood: A cluster-analytic approach

Profils multidimensionnels d'alimentation associés aux traits de personnalité au cours de l'âge adulte émergent : une approche par clusters

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ABSTRACT

Introduction. – Personality traits can give a fuller understanding for eating behaviors, such as food choice, (un)healthy eating.

Objective. – To examine eating styles with a multidimensional perspective considering cognitive, affective and conative (or behavioral) components of eating styles in emerging adulthood, and how they may be related to the Big Five and impulsivity traits.

Methods. – Self-reported questionnaires were used to explore the association between the eating styles, Big five traits and facets of impulsivity among young French adults ($n = 450$; *Mean Age* = 20.84 years; *SD* = 2.4, with 79.6% of women).

Results. – On the basis of cluster analysis, six eating styles were identified: *Healthier*, *Uninhibited*, *Dysregulated*, *Stress-related*, *Restrictive* and *Ethical restraint* eaters. Results suggest that *Uninhibited* eaters reported lower scores on Conscientiousness and higher scores on Negative and Positive urgency. The *Dysregulated* group had lower scores on Extraversion, and high scores on Neuroticism, Negative urgency and Lack of premeditation. *Restrictive* eaters showed low levels of Openness and Lack of premeditation. The *Ethical restraint* style was characterized by low scores on Agreeableness and Positive urgency. The ability or inability to cope with both emotional distress and positive and negative impulsive behaviors was related to young adult's eating cognitions and behaviors.

Conclusion. – Considering the existence of subtypes of eaters and separate associated personality-related traits, an individual differences perspective (e.g., age, gender, disposition to control one's emotional experiences) should be incorporated.

R É S U M É

Examiner les styles d'alimentation dans une perspective multidimensionnelle en tenant compte des composantes cognitives, affectives et conatives (ou comportementales) de l'alimentation à l'âge adulte émergent, et comment ils peuvent être liés aux Big Five et au trait d'impulsivité. Des questionnaires en auto-évaluation ont été utilisés pour explorer l'association entre les styles alimentaires, les caractéristiques des Big Five et les facettes de l'impulsivité chez des jeunes adultes français ($n = 450$; âge moyen = 20,84 ans ; *ET* = 2,4, avec 79,6 % de femmes). Sur la base d'une analyse en clusters, six styles d'alimentation ont été identifiés : les mangeurs *en santé*, *désinhibés*, *dérégulés*, *liés au stress*, *restrictifs* et *restrictifs éthiques*. Les résultats suggèrent que les mangeurs *désinhibés* ont obtenu des scores plus faibles en Conscience et des scores plus élevés en urgences négative et positive. Le groupe *dérégulés* a obtenu

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des scores plus bas en Extraversion et des scores élevés en névrosisme, urgence négative et manque de préméditation. Les mangeurs *restrictifs* ont montré de faibles niveaux d'ouverture et de manque de préméditation. Le groupe de style *restrictif éthique* a été caractérisé par des scores faibles en agréabilité et en urgence positive. La capacité ou l'incapacité à faire face à la fois à la détresse émotionnelle et aux comportements impulsifs positifs et négatifs était liée aux cognitions et aux comportements alimentaires des jeunes adultes. Compte tenu de l'existence de sous-types de mangeurs et de traits de personnalité associés distincts, une perspective en termes de différences individuelles (par ex., âge, genre, disposition à contrôler ses expériences émotionnelles) doit être développée.

1. Introduction

Although a growing body of literature has investigated the psychological processes of eating behaviors or eating styles in children and adults (e.g., [Sleddens et al., 2015](#)), surprisingly few studies have examined the eating behaviors of young adults 18–29 years, especially in France ([Stok et al., 2018](#)). The majority of recent studies on eating behaviors in France focus on clinical (e.g., [Chevance et al., 2017](#); [Legendre & Bégin, 2020](#)) or general (e.g., [Camilleri et al., 2015](#); [Riou et al., 2015](#); [Rozin et al., 2011](#)) adult populations. However, emerging adulthood is a specific and critical time for eating behaviors, identified as a period for weight gain ([Deliens et al., 2014](#)) and changes in dietary intake ([Winpenney et al., 2017](#)). Efforts to control weight are common among young adults, with overweight and obesity prevalence around, respectively, 13% and 5.5% among young adults in France ([Obépi, 2012](#)). Therefore, prevention programs countering unhealthy eating habits in young adults are needed, especially as these behaviors may remain throughout adulthood ([Deliens et al., 2016](#)).

Thus, understanding the factors involved in unhealthy eating behaviors such as overeating or high intake of “junk foods” is crucial in promoting healthy behaviors. A major difficulty encountered in studies of eating behaviors is the lack of multidimensional models that capture the diversity of patterns – due to focus on the problematic eating styles: restrained eating, emotional eating and external eating, with high inter-correlation between them ([Van Strien & Van de Laar, 2008](#)). In this regard, only emotional states related to the eating and eating behaviors were considered, without taking account of other determinants such as cognitive (e.g., it's cheap, it's complicated, it's dietary) and sensorial-emotive (e.g., it's good, nourishing, tasty) dimensions associated with eating behaviors ([Rigaud et al., 2005](#)). This present study aims to address the need for a quantitative and multidimensional approach for the analysis of the eating behaviors that simultaneously takes into account the multiple structural eating features that individuals sought while eating. Therefore, pattern-based approaches – i.e., a cluster-analytic procedure – can identify qualitatively distinct subgroups or profiles of eaters. Furthermore, variations in eating styles should be investigated in relation to other dispositional factors, such as personality traits.

Identifying and knowing which personality traits may characterize each eater subtype (problematic or not) paves the way for a better understanding of the transactions between eating behaviors and dispositional factors. The Big-Five factor model of personality ([Goldberg, 1990](#); [John et al., 2008](#); [McCrae & Costa, 2013](#)) proposes that personality consists of five universal personality dimensions or traits (i.e., Openness to experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism.). Openness refers to the tendency to be creative, imaginative, flexible and intellectually curious. Conscientiousness is related to higher levels of self-discipline, organization and reliability. Extraversion represents the tendency to experience positive emotions, and to be social, cheerful and assertive. Agreeableness comprises compliance, trust

and compassion. Finally, Neuroticism is associated with the experience of negative emotions and emotional reactivity.

An increasing number of researchers are pointing out the added value of including personality dimensions in diagnosing, understanding and treating eating disorder patients (e.g., [Bollen & Wojciechowski, 2004](#); [Carriere et al., 2019](#); [Claes et al., 2005](#); [Dubovi et al., 2016](#); [Ghaderi & Scott, 2000](#); [MacLaren & Best, 2009](#)). More widely, dimensional personality approach (i.e., traits), which covers most of the descriptions of personality than the categorical approach ([John et al., 2008](#)), may be related to healthy or unhealthy eating attitudes or behaviors in the general population of adults (e.g., [de Bruijn et al., 2005](#); [Goldberg & Strycker, 2002](#); [Lunn et al., 2014](#); [Walker et al., 2015](#)). Nevertheless, this relationship remains unexplored, especially in France. Indeed, there has been relatively little research on the specific connections between personality and eating behaviors in non-clinical samples. Previous research on eaters' personality has essentially focused on specific eating disorders such as anorexia nervosa, bulimia nervosa or binge eating disorders (see for a review [Cassin & Vonranson, 2005](#); [Farstad et al., 2016](#)) or among adult persons with obesity ([Elfhag & Morey, 2008](#); [Provencher et al., 2008](#)).

Emotional eating style (i.e., eating in response to negative emotions) was strongly positively associated with Neuroticism and negatively related to Conscientiousness and Extraversion among adults or undergraduate students ([Elfhag & Morey, 2008](#); [Heaven et al., 2001](#); [Keller & Siegrist, 2015](#)). External eating (i.e., eating in response to cues, such as sight and smell) showed similar correlations ([Elfhag & Morey, 2008](#); [Heaven et al., 2001](#)). Restrained eating style (i.e., eating implies conscious determination and effort to restrict food intake in order to control body weight) found to be negatively correlated with Neuroticism and positively related to Openness and Conscientiousness ([Elfhag & Morey, 2008](#); [Heaven et al., 2001](#); [Keller & Siegrist, 2015](#); [Provencher et al., 2008](#)). Nevertheless, results varied according to the studies and a study on Japanese university students ([Momoï et al., 2016](#)) showed divergent results that may raise questions about cultural influence or specific clinical outcomes. Furthermore, these diverging results may be due to different dimensions of restrain – i.e., rigid vs. flexible control of eating behavior ([Westenhoefer et al., 1994](#)). Overall, results of these previous studies suggest that personality traits might influence people's eating behaviors in terms of eating style but also of food frequency intake and food habits among young adults (see for a review [Lunn et al., 2014](#)).

In addition to the above-mentioned personality traits, it is also necessary to consider a further dimension reflecting the tendency to acting without forethought, that is impulsivity ([Whiteside et al., 2005](#)). Studies highlighted that impulsiveness was strongly positively related to emotional eating style among obese persons ([Elfhag & Morey, 2008](#)), binge-eating among undergraduate students ([Racine et al., 2009](#)) and bulimia nervosa disorders among young women ([Sysko et al., 2017](#)). As stressed in a systematic review ([Waxman, 2009](#)), impulsivity was increasingly recognized as a risk factor for eating disturbance but previous studies all too

often neglected the multifaceted construct of impulsivity. According to Whiteside and Lynam (2005), five separate facets constituted impulsivity. (i) Urgency was negative when describing the difficulty to inhibit impulse when people have a negative affect experience, such as sadness. Positive urgency reflects impulsive acts when people experience positive affect, such as joy. (ii) Lack of premeditation characterizes a tendency to act without considering consequences. (iii) Lack of perseverance represents difficulty in staying focused on a task that may be uninteresting or problematic. (iv) Sensation seeking is considered as a tendency to enjoy and pursue stimulating, exciting or unconventional experiences. The impulsivity trait, especially negative urgency domain, is related to Neuroticism, while other domains of impulsivity were more associated with low conscientiousness or high extraversion (Whiteside & Lynam, 2001).

Few studies have been made to clarify the role of each facet on healthy to unhealthy eating styles among young adults. It should therefore be stressed that these studies investigated impulsivity, specifically negative urgency, in an eating disorder context (e.g., Fischer et al., 2013; Racine et al., 2015; Wolz et al., 2017). Mobbs et al. (2010) showed that adult overweight and obese women have higher levels of Urgency and Lack of Perseverance than a control group. Significantly, Negative urgency and lower Perseverance was strongly associated with bulimic symptoms, such as purge or binge eating, and food addiction (Allyson et al., 2013; Claes et al., 2005; Lee-Winn et al., 2016; Murphy et al., 2014; Peterson and Fischer, 2012; Stojek et al., 2014). To date no survey has been conducted to determine relations between impulsivity facets and eating styles in a non-clinical sample.

Furthermore, to our knowledge, there has been no research into the relationships between personality traits (impulsivity and Big Five traits) and eating profiles considering thoughts (e.g., cognitive expectations), emotions and behaviors associated with eating. Given the importance of personality traits in key aspects of eating behavior in emerging adulthood, this study explored several aspects of eating behaviors related to safety – or at-risk – eating profiles (using a person-oriented method) in a sample of young French adults. In brief, the purposes of this study were to:

- classify distinct eating behavior profiles in a sample of French young adults using cluster analysis;
- explore how they differ in terms of personality characteristics.

2. Methods

2.1. Participants

The final sample was composed of 450 young French adults from the Centre-Val-de-Loire and Champagne Ardennes Regions, including 83.6% ($n = 376$) undergraduate students. Less than 10% were working (9.7%, $n = 44$) or looking for a job (6.7%, $n = 30$). They were mainly following courses in psychology (40.7%, $n = 153$), but students from other majors, i.e., law science (29.0%, $n = 109$) and health and social sciences (11.7%, $n = 44$), were also included. The sample was 79.56% women ($n = 358$) and 20.4% men ($n = 92$). The mean age was 20.84 ($SD = 2.4$, range 18.00 to 30.00). The mean age of the women was 20.6 ($SD = 2.27$) and 21.8 for the men ($SD = 2.42$). The men were significantly older than the women ($t = 4.54$, $p < .001$). The majority of young adults sampled lived in urban areas (75.1%, $n = 335$). They mainly lived alone (60.2%, $n = 271$), with a partner (16.7%, $n = 75$) or at their parents' home (15.5%, $n = 70$). Less than 8% lived on campus or in a student residence (7.6%, $n = 34$).

2.2. Measures

Demographic data for gender, age, undergraduate degree, employment, weight and height (to calculate the body mass index – BMI) were collected via a set of self-reported questionnaires.

2.2.1. Eating behaviors

The first part of the survey, the eating questionnaire, contained of the questionnaire on the Attitudes, Emotions and Behaviors related to eating proposed by Rigaud et al. (2005). This scale consisting of 79 items, evaluated (i) Attitudes toward eating and food in 9 patterns: reflected the primary interest in the: useful, cost, health, natural, dietary, flavors and tastes, balanced diet, political and de-stress aspects of eating (36 items). The second and third part of the questionnaire was devoted to (ii) emotional and satisfaction dimensions. It evaluated the Emotional valence associated with eating (negative to positive affects; e.g., "I feel, when I think of the food. . ." sad/happy; anguish/relaxed etc.; 9 items). In addition, an item that measured the emotional disturbance when the person deviates from their diet. The third part considered personal judgment about food, in terms of satisfaction (e.g., "I think the foods that I consume are" . . . Unattractive/attractive, Poor/good quality; 17 items). Finally, another component concerned (iii) *Healthy/at-risk eating behaviors*. Four Behaviors identified as health-related (4 items) were measured: the regularity of meals; snacking frequency or snacks per day, dieting to lose weight; and level of physical activity. Also, 13 items derived from Eating Disorder Risk Scales of the French version of Eating Disorder Inventory (Criquillon-Doublet et al., 1993; Maiano et al., 2016) evaluated three eating disorder symptoms (related to anorexia, bulimia and binge behaviors). Participants responded on 3 to 7 points Likert scales, with higher scores specifying more eating satisfaction, positive emotion and lower eating disturbance. In the present study, Cronbach's alpha showed good internal consistency ($\alpha = .67$ to $.78$).

2.2.2. Big Five traits

The French version of the Big Five Inventory (BFI-Fr; Plaisant et al., 2010) assess the Big Five domains of personality. Participants rated how well 44 different adjectives described themselves (e.g., "I see myself as someone who. . ." is outgoing, sociable/gets nervous easily). They are asked to quantify each characteristic on a 5-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (5). A higher mean score indicates a tendency toward a given personality trait. The BFI-Fr good reliability and validity across young adult samples (Plaisant et al., 2010). In this study, Cronbach's alpha for this scale was .69 to .86.

2.2.3. Impulsivity traits

The second part of the questionnaire measured impulsivity with the help of the Impulsive Behavior Scale - P (UPPS-P) proposed by Billieux et al. (2012) for the French version. This questionnaire was derived from the multidimensional impulsivity model (Whiteside et al., 2005). It is composed of 20 items and investigates five subdomains specific to impulsivity: Positive urgency, Negative urgency, Lack of premeditation, Lack of perseverance and Sensation seeking. In the UPPS-P, the respondent indicates her/his agreement by evaluating declarative statements on a four-point Likert scale, ranging from *Totally agree* (1) to *Strongly disagree* (4). Higher scores reveal high impulsivity. Coefficient alpha estimates of reliability were satisfactory for all UPPS-P subscales in this study (.74 to .85).

2.3. Procedure

We recruited undergraduates studying a range of subjects (e.g., law sciences, psychology, medicine) at two universities in France

(University of Reims and University of Tours). The young working adults were solicited by bulletin boards (e.g., pub, cafeteria). Volunteer participants were asked to provide the investigator with their email contact information. An automatic individual invitation to complete the questionnaire was then sent to them. The online version (developed using Lime Survey®) was not available to the general public, and young adults could only access it by following a link provided by the researchers. Multiple responses were not authorized. A respondent could only answer once (activation of cookies to avoid repeated participation). First, the overall objective of the study was presented to interested people. After obtaining the consent of the participants, data were collected by individuals completing anonymous questionnaires. The modalities of the questionnaire were explained in an information letter. The volunteers then completed individual online questionnaires, sent by email, in their own time. The confidentiality and anonymity of the answers and the importance of respect for the privacy of other participants were emphasized at this time. The average time to complete the questionnaire was 30–35 min. The response rate (completed questionnaires) was about 81 percent. This study was performed in line with the principles of the Declaration of Helsinki for psychological research involving human subjects.

2.4. Analytical strategy

Descriptive statistics were carried out for all key variables. Independent *t*-tests (Student *t*-test for parametric distribution; continuous variables) were employed to examine gender differences in constructs. To identify healthy/at-risk eating groups who shared similar eating behavioral patterns, a cluster analysis was performed. Cluster analysis is an exploratory statistical technique that identifies subgroups of cases in a specific population based on shared characteristics. The cluster analysis procedure was used to identify different eating behavioral clusters based on BMI, attitudes, emotions and behaviors identified by the Rigaud et al. scale (2005). The *K*-means clustering method, with *z*-standardization of incorporated variables, was employed to determine jointly the optimal number of clusters. To be consistent with clustering methods used in previous studies (Newby & Tucker, 2004), we carried out two types of cluster analysis: hierarchical clustering to define the clusters; and *k*-means clustering to assign participants to their *best fitting* clusters. First, we used hierarchical cluster analysis (Ward's method and squared Euclidian distances) – a method that minimizes within-cluster variance and maximizes between-cluster variance – to determine the number of clusters (based on the tree; Hair et al., 2006). The interpretability of cluster solutions was derived from the *k*-means cluster analyses. This method was preferred, compared to hierarchical methods, because it is less sensitive to outliers and strengthens homogeneity within clusters, and heterogeneity between clusters. For continuous variables, differences between clusters of eating behavior variables were evaluated using analysis of variance (ANOVA). A 5% level of significance was used for all statistical tests. Data analysis was performed using IBM SPSS® Statistics Version 23.

3. Results

3.1. Eating characteristics of the sample

Less than 14% of participants reported always eating three times a day (13.5%, $n = 60$), 11.4% ($n = 51$) most of the time and 75.1% reported irregular meals ($n = 335$). Snacking once a day had the highest frequency (53.6%, $n = 241$), never (22.7%, $n = 102$), two or three times a day (20.0%, $n = 90$). Around 4% declared snacking more than 4–5 times a day ($n = 17$). Concerning frequency of dieting,

64.7% ($n = 291$) participants reported that they never do it, 24.2% ($n = 166$) sometimes and 6.8% ($n = 31$) often or always. Ten participants (2.2%) were on a special diet due to illness. For frequency of physical activity, 46.4% ($n = 209$) reported low intensity (less than the equivalent of one hour of walking per day), 34.9% ($n = 157$) normal intensity and 18.7% ($n = 84$) high or very high intensity. The majority of young adults (58.0%, $n = 261$) showed normal weight (BMI between 18.5 to 24.9), 14.4% pre-obesity (BMI between 25 to 29.9, $n = 65$), 14% underweight (BMI less than 18.5, $n = 63$), 10.9% overweight (obesity class II i.e., BMI between 30 to 34.9; $n = 49$), 2.2% moderate obesity (obesity class II i.e., BMI between 35 to 39.9; $n = 10$) and less than 1% morbid obesity (obesity class III i.e., BMI higher than 40; .7%; $n = 3$).

To check for the gender effect, given the difference in the number of men and women in our sample, we compared their personality dimensions and eating variable scores (see Table 1). Women scored statistically higher than men on dieting frequency, cost, sensorial, de-stresses, health and dietary aspects of food. Men had higher scores than women on BMI, snacking frequency, physical activity and lower scores on emotional disturbance after making a diet exception. The *t*-test for personality traits reached statistical significance for Consciousness, Neuroticism, and Negative urgency, with higher scores for women. On the other hand, men reported higher on Sensation seeking than women. All details of these results (means, standard deviation, *t*-test and *p*-value) are described in the Table 1.

3.2. Typology of eating style

Two-step cluster analysis revealed six clusters.

The first of the six clusters, labeled *Healthier* patterns ($n = 109$, 24.2%), was characterized by relatively low BMI, irregularity of meals but less compulsive eating. They tend to emphasize health, balanced diet, natural and dietary aspects of food (attitudes). Emotions related to food were characterized by positive valence and high levels of satisfaction. The second cluster, *Dysregulated* patterns ($n = 46$, 10.2%), was characterized by moderate higher BMI, a high frequency of snacking and dieting, with a primary interest for the dietary aspects of food. This group was also characterized by negative emotions toward food and a high frequency of compulsive and impulsive behaviors (binge eating and bulimia symptoms). The third cluster, labeled *Uninhibited* patterns ($n = 72$, 16%), was characterized by high BMI, favored sensorial, cost and useful aspects of food at the expense of natural or health features. This eating pattern tends to show bulimic behaviors but low emotional disturbance when breaking the diet. The fourth cluster, entitled *Stress-related* patterns ($n = 27$, 6%), was characterized by low snacking, and high food investment, especially on natural, personal balance and health aspects. For this group, the diet must help in coping with stress. In terms of emotions, negative emotion and low satisfaction toward food described Cluster 4, with high frequency of binge eating episodes. The fifth cluster labelled *Restrictive* patterns ($n = 104$, 23.1%) described a pattern combining low BMI, high dieting frequency and emotional disturbance related to deviation of diet, global food disinvestment and food dissatisfaction, and a tendency to show restrictive behaviors. The sixth cluster, named *Ethical restraint* patterns ($n = 92$, 20.4%) characterized low BMI, irregular meals, high snacking and sport frequencies. Attitudes toward food were focused on natural, political, health and dietary aspects. Negative emotions were retrieved on three dimensions: emotional valence and dissatisfaction toward food consumed, and disturbance when an exception to diet occurred. This group showed no disturbance eating behaviors.

The ANOVAs conducted revealed a significant effect of cluster membership on each of the eating factors investigated, except for the useful aspect of eating and compulsive behavior. Descriptive

Table 5
Prevalence, means, standard deviations, and gender comparisons for eating behaviors and personality scales.

	Whole sample (n = 450)	Women (n = 358)	Men (n = 92)	t	p
	Mean (SD)	Mean (SD)	Mean (SD)		
Habits					
BMI	21.80 (3.45)	21.48 (3.43)	23.05 (3.24)	-3.9	***
Meal frequency	2.09 (.87)	2.10 (.87)	2.2 (.89)	-0.8	ns
Snacking frequency	3.94 (.79)	3.90 (.78)	4.11 (.82)	2.3	*
Dieting frequency	4.21 (1.12)	4.13 (1.15)	4.50 (.97)	-2.8	**
Sport frequency	1.75 (.82)	1.65 (.76)	2.14 (.92)	-5.3	***
Attitudes					
Useful	2.55 (.67)	2.6 (.68)	2.5 (.63)	1.5	ns
Cost	2.77 (.73)	2.8 (.74)	2.6 (.69)	2.2	*
Natural	2.01 (.74)	2.1 (.75)	2.0 (.69)	1.5	ns
Flavors & tastes	2.72 (.47)	2.8 (.49)	2.6 (.42)	2.6	**
Political	1.80 (.71)	1.8 (.71)	1.8 (.72)	-0.4	ns
Stress	1.84 (.57)	1.9 (.58)	1.7 (.53)	2.6	**
Balanced diet	2.56 (.66)	2.6 (.68)	2.5 (.62)	0.7	ns
Health	2.26 (.67)	2.3 (.68)	2.1 (.64)	2.5	**
Dietary	2.17 (.67)	2.2 (.66)	1.97 (.69)	3.3	***
Emotions					
Emotional valence	8.57 (1.82)	8.5 (1.81)	8.8 (1.89)	-1.1	ns
Emotional disturbance	2.63 (.58)	2.58 (.61)	2.82 (.44)	-3.5	***
Satisfaction	3.93 (.82)	3.9 (.81)	4.0 (.86)	-1.0	ns
Disorders					
Restrictive behaviors	2.59 (.37)	2.59 (.38)	2.63 (.36)	-0.8	ns
Compulsive behaviors	2.72 (.60)	2.72 (.71)	2.74 (.70)	-0.5	ns
Bulimic behaviors	2.43 (.71)	2.58 (.60)	2.82 (.44)	-0.3	ns
Big Five					
Extraversion	3.32 (2.93)	3.3 (.87)	3.4 (.84)	-0.5	ns
Agreeableness	3.61 (.51)	3.6 (.53)	3.6 (.46)	1.2	ns
Conscientiousness	3.47 (.75)	3.6 (.72)	3.2 (.77)	4.6	***
Neuroticism	3.26 (.85)	3.4 (.81)	2.9 (.94)	4.6	***
Openness	3.50 (.72)	3.5 (.71)	3.6 (.77)	-1.3	ns
Impulsivity					
Positive urgency	15.29 (2.48)	15.3 (2.44)	15.1 (2.64)	0.7	ns
Negative urgency	13.65 (2.76)	13.9 (2.76)	12.9 (2.62)	3.1	**
Lack of perseverance	8.02 (2.26)	8.0 (2.29)	8.0 (2.18)	0.3	ns
Lack of premeditation	7.39 (2.33)	7.3 (2.36)	7.6 (2.25)	-1.1	ns
Sensation seeking	14.53 (2.93)	14.3 (2.94)	15.2 (2.79)	-2.6	**

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. ns: non-significant; BMI: body index mass.

statistics for the clusters and ANOVAs are reported in Table 2. Concerning demographic characteristics, members of Cluster 5 tended to be younger than those of the Clusters 2 and 6, $F(5, 542) = 3.58$, $p < .01$. Differences between the clusters on other sociodemographic variables were not significant.

3.3. Comparisons between personality trait scores according to eating styles

Finally, we ran an ANOVA for each personality variable in order to explore potential differences between the eating groups. One-way analyses of variance detected significant between-cluster differences for Extraversion, Agreeableness, Conscientiousness and Openness (see Table 3 for more details). The post-hoc test revealed that *Dysregulated* group reported lower scores on Extraversion than *Healthier* and *Stress-related* groups. Concerning Neuroticism, the *Dysregulated* group also tended to reveal higher scores than the *Healthier* group. The *Ethical restraint*, *Uninhibited* and *Restrictive* groups showed, respectively, lower scores on Agreeableness, Conscientiousness and Openness than the *Healthier* group.

Lastly, people with *Dysregulated* and *Uninhibited* patterns had significantly higher scores on Negative urgency than the *Healthier* group. Moreover, the *Dysregulated* cluster was characterized by higher scores on Lack of premeditation than *Healthier* and *Restrictive* groups. Concerning Positive urgency, *Ethical restraint* and *Uninhibited* clusters revealed, for the former, lower scores than the *Healthier*, *Dysregulated* and *Uninhibited* groups, and for the latter, higher scores than the *Restrictive* and *Ethical restraint* groups.

4. Discussion

The first aim of this study was to explore whether a typology in eating patterns (or styles) could be distinguished based on the major dimensions of eating behaviors in an emerging adulthood sample: cognition (attitudes toward food), emotion (related to eating and diet breakdown) and behaviors (related to healthy and problematic behaviors). The results yielded six distinctive at-risk-healthy eating profiles.

Healthier eaters (24%) characterized emerging adults concerned with natural, healthy and diet aspects, and reported with satisfaction and positive emotions toward eating. This group showed no problematic eating behaviors, except a tendency to eat meals irregularly – a typical trait in young adults (Pendergast et al., 2016). This group could correspond to the type *Healthier* profile proposed by Heerman et al. (2017) for adults.

Uninhibited eaters (15%) accounted for the more severely overweight with an instrumental investment of food with major concerns about convenience and pleasure (cost, useful and taste). In contrast, the natural and healthy aspects of food were nonessential. They focused on food-related stimuli (enjoyment of food and eating) more than the internal state, and demonstrated overeating behaviors, without emotional disturbance when they overeat (e.g., guilt). This profile matches the *Uninhibited* eaters proposed by Kristeller and Rodin (1989) and presents a probable risk of obesity.

Dysregulated eaters (9%) were overweight people who tend to snack and diet repeatedly. Another specificity was their overall lack of interest in eating (food disinvestment) and negative

Table 2
Descriptive statistics for the six clusters.

Variables	Cluster 1 Healthier <i>n</i> = 109 24.22%	Cluster 2 Uninhibited <i>n</i> = 46 10.22%	Cluster 3 Dysregulated <i>n</i> = 72 16.00%	Cluster 4 Stress-related <i>n</i> = 27 6.00%	Cluster 5 Restrictive <i>n</i> = 104 23.11%	Cluster 6 Ethical restraint <i>n</i> = 92 20.44%	Group comparisons	
Sociodemographic	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>F</i>	<i>p</i>
Age								
Age	20.37 (2.48)	21.29 (2.71)	20.53 (2.07)	20.63 (2.39)	20.10 (1.87)	21.14 (2.20)	2.51	*
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>Chi</i> ²	<i>p</i>
Gender								
Men	20 (21.7)	12 (13.0)	12 (13.0)	11 (11.9)	18 (19.5)	19 (20.6)	4.53	<i>ns</i>
Women	87 (24.3)	34 (9.5)	57 (15.9)	24 (6.1)	83 (23.2)	73 (20.4)		
Activity								
Employed	9 (8.0)	5 (11.8)	3 (3.5)	2 (8.3)	7 (7.2)	8 (8.2)	8.31	<i>ns</i>
Student	91 (84.0)	38 (82.4)	66 (93.0)	24 (87.5)	87 (83.1)	80 (87.7)		
Unemployed	9 (8.0)	3 (5.9)	3 (3.5)	1 (4.2)	10 (9.6)	4 (4.1)		
Areas								
Rural	19 (17.4)	8 (17.6)	8 (10.7)	1 (0.4)	13 (12.2)	10 (12.8)	15.87	<i>ns</i>
Periurban	14 (12.8)	9 (20.6)	5 (7.1)	3 (12.5)	16 (15.9)	4 (4.2)		
Urban	76 (69.8)	29 (61.8)	59 (82.1)	24 (85.1)	73 (72.0)	75 (81.9)		
Life style								
With a partner	15 (13.8)	7 (14.7)	14 (19.3)	1 (4.2)	14 (13.3)	28 (30.0)	25.97	<i>ns</i>
Alone	70 (64.4)	28 (61.8)	44 (61.4)	19 (70.8)	57 (56.6)	40 (43.8)		
In family	16 (14.9)	7 (14.7)	10 (14.0)	3 (12.5)	17 (16.9)	20 (21.9)		
Campus	8 (6.9)	4 (8.8)	4 (5.3)	3 (12.5)	14 (13.3)	4 (4.1)		
Eating	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>F</i>	<i>p</i>
Habits								
BMI	-.27 (.72)	.38 (1.21)	.53 (1.18)	-.10 (.73)	-.44 (.81)	-.92 (.98)	9.75	***
Meal frequency	-.39 (.92)	.30 (.97)	.29 (.96)	.13 (1.01)	.24 (.94)	-.31 (.96)	7.42	***
Snacking frequency	.06 (.82)	-.52 (1.04)	-.25 (1.00)	-.66 (.90)	-.22 (.97)	.58 (.83)	12.11	***
Dieting frequency	.20 (.86)	-1.26 (1.11)	-.11 (.94)	-.03 (.90)	.42 (.68)	-.37 (1.06)	19.54	***
Sport frequency	-.14 (.91)	-.27 (.96)	-.23 (.83)	-.05 (.92)	-.28 (.90)	.21 (.97)	2.75	* (Cl.5 < Cl.6)
Attitudes								
Useful	.28 (.83)	.07 (1.03)	.73 (.87)	.60 (.75)	-.41 (1.04)	-.51 (.83)	19.29	***
Cost	.38 (.80)	-.06 (1.01)	.66 (.93)	.57 (.87)	-.32 (.95)	-.52 (.91)	17.59	***
Natural	.44 (.74)	-.20 (.77)	-.80 (.49)	1.26 (.72)	-.84 (.59)	.90 (.71)	93.60	***
Flavors & tastes	.19 (.81)	-.21 (.88)	.77 (.79)	1.19 (.84)	-.68 (.86)	-.04 (.96)	29.85	***
Political	.33 (.93)	-.32 (.69)	-.54 (.61)	1.07 (.97)	-.68 (.60)	.55 (1.02)	35.11	***
Stress	.24 (.85)	-.02 (1.01)	.42 (.93)	1.69 (.81)	-.58 (.66)	-.18 (.87)	31.24	***
Balanced diet	.51 (.71)	-.38 (.98)	.24 (.87)	1.17 (.26)	-.84 (.93)	.03 (.79)	34.82	***
Health	.58 (.66)	-.17 (.86)	-.65 (.62)	1.14 (.64)	-.92 (.61)	.86 (.65)	96.13	***
Dietary	.39 (.69)	.49 (1.01)	-.33 (.86)	.95 (.71)	-.79 (.77)	.52 (.98)	37.93	***
Emotions								
Emotional valence	.70 (.72)	-.36 (.83)	.01 (.71)	-.47 (1.14)	.25 (.72)	-.94 (.90)	37.61	***

Table 2 (Continued)

Eating	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>F</i>	<i>p</i>
Emotional disturbance	-.09 (.96)	.23 (.74)	.39 (.60)	.06 (.97)	-.54 (1.22)	-1.11 (1.10)	6.92	***
Satisfaction	.77 (.66)	-.16 (.78)	.04 (.82)	-.35 (1.07)	.10 (.66)	-1.00 (.92)	41.07	***
Disorders								
Restrictive behaviors	.04 (.98)	.10 (.88)	.05 (.89)	.10 (.84)	-.16 (1.04)	-.07 (1.20)	41.07	***
Compulsive behaviors	.40 (.31)	-1.95 (1.02)	.17 (.72)	-.66 (1.36)	.18 (.86)	.28 (.53)	22.22	***
Bulimic behaviors	.18 (.88)	-1.31 (.87)	-.31 (.99)	-.19 (1.06)	.15 (.92)	.48 (.64)	59.10	***

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. ns: non-significant; BMI: body index mass.

Table 3

Means (standard deviations) of the six clusters on the personality scales.

Variables	Cluster 1 Healthier	Cluster 2 Uninhibited	Cluster 3 Dysregulated	Cluster 4 Stress regulated	Cluster 5 Restrictive	Cluster 6 Ethical restraint	Group comparisons		
	<i>Mean</i> (<i>SD</i>)	<i>Mean</i> (<i>SD</i>)	<i>Mean</i> (<i>SD</i>)	<i>Mean</i> (<i>SD</i>)	<i>Mean</i> (<i>SD</i>)	<i>Mean</i> (<i>SD</i>)	<i>F</i>	<i>p</i>	<i>Bonferroni</i> <i>post-hoc test</i>
Big Five									
E	3.43 (.84)	2.94 (.92)	3.42 (.93)	2.88 (.72)	3.73 (.94)	3.41 (.74)	3.17	**	Cl.2 > Cl.1&4
A	3.77 (.45)	3.60 (.50)	3.57 (.57)	3.61 (.48)	3.62 (.55)	3.50 (.55)	3.38	*	Cl.1 > Cl.6
C	3.64 (.62)	3.34 (.76)	3.30 (.70)	3.67 (.83)	3.61 (.74)	3.65 (.74)	2.77	*	Cl.1 > Cl.3
N	3.22 (.79)	3.70 (.83)	3.38 (.79)	3.48 (.91)	3.32 (.86)	3.32 (.69)	1.91	.07	Cl.2 > Cl.1
O	3.60 (.72)	3.52 (.77)	3.38 (.79)	3.57 (.63)	3.29 (.71)	3.59 (.74)	2.44	*	Cl.1 > Cl.5
Impulsivity									
PU	15.49 (2.25)	15.79 (2.31)	16.09 (2.10)	15.08 (2.70)	15.05 (2.63)	14.75 (2.52)	2.57	*	Cl.6 < Cl.1,2,3; Cl.3 > Cl.5&6
NU	13.86 (2.58)	14.88 (3.07)	14.79 (2.39)	13.46 (2.69)	13.47 (2.85)	13.19 (2.78)	3.64	**	Cl.2&3 > Cl.1,4,5,6
LPe	7.93 (2.02)	8.47 (2.52)	8.40 (2.29)	7.42 (2.10)	8.24 (2.73)	7.66 (1.91)	1.47	ns	-
LPr	7.08 (1.77)	8.47 (2.42)	7.74 (2.72)	7.13 (2.38)	6.96 (2.49)	7.23 (2.88)	2.638	*	Cl.2 > Cl.1&Cl.5
SS	14.49 (2.97)	14.76 (2.98)	14.67 (2.59)	14.17 (2.91)	14.06 (3.19)	14.10 (2.88)	.596	ns	-

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. ns: non-significant; Cl.: cluster; E: extraversion; A: agreeableness; C: conscientiousness; N: neuroticism; O: openness; PU: positive urgency; NU: negative urgency; LPe: lack of perseverance; LPr: lack of premeditation; SS: sensation seeking.

emotions related to food (e.g., sad, ashamed, anxious). These eaters tended to exhibit impulsive or compulsive eating behaviors (such as over snacking and bingeing). Dieting can be used to correct body weight, but the breakdown of restrictive control may drive them to excessive food intake (Canetti et al., 2002). This profile consistently tends to exhibit problematic eating behaviors and may be at-risk for developing bulimia disorder. It corresponds to emotional style related to negative affects to eating (i.e., an internal context).

Stress-related eaters (6%) described eaters of normal weight, with low snacking but may have binge eating episodes. These may consider eating as a means of reassurance or coping with stress (i.e., associated to situational contexts). Moreover, natural and health aspects were also important, and this group expressed negative emotions and dissatisfaction about food consumption. Stress-driven eaters may be disinhibited or overridden during negative affect or stress (Groesz et al., 2012). Stress and negative mood were the most frequently cited precipitants of binge eating (e.g., Rosenbaum & White, 2015).

The prototype of the *Restrictive* eaters (23%) appeared to show lower weight, were more likely to be dieters with a form of asceticism related to eating (food disinvestment). Not surprisingly, it is the only group with restrictive eating behaviors. The people in this

group report negative or aversive emotions (e.g., guilt after breaking a diet). This type of dietary restraint showed more rigid rules around food and this group may be at-risk for the development of a restrictive eating disorder.

Finally, *Ethical restraint* eaters (20%) considered relatively thin people that presented the classical eating style of young people (snacking, disorganized meals), while promoting a healthy lifestyle based on physical activity and the ethical and organic aspects of food (e.g., foodstuffs free of pesticides, local, environmentally friendly). Calorie intake is also taken into account. This group feels negative emotions about eating (e.g., guilt after consuming inappropriate or unethical food) but showed no problematic behaviors (i.e., consciously restricting intake in accordance with their ideology). So, it seems that *Ethical restraint* eaters may be more likely to experience mood disturbance when diet was challenged than behavioral expression. This relationship between dietary restraint and degree of moral diet (e.g., vegetarianism) was found in a previous study (Martins et al., 1999). This type of dietary restraint appeared nevertheless more flexible than *Restrictive* eaters.

In accordance with previous studies (Kristeller & Rodin, 1989; Newby & Tucker, 2004; Tanton et al., 2015), our results show that the understanding of eating behaviors should be

conceptualized as multidimensional. Our results established variability in the subtypes of eaters, allowed researchers to distinguish between emotionally or behaviorally vulnerable eaters and non-problematic eaters. Based on this typology, the current study proposed to compare the personality scores of these groups in order to determine the specific traits of each.

Dysregulated eaters tended to be low in Extraversion, in Conscientiousness and had high scores in Neuroticism. These individuals tend to be more reserved, anxious, and emotional reactive/unstable with a lower tolerance for stressful situations (Verduyn and Brans, 2012). They were less socially confident and experienced more negative emotions, when compared with participants who showed Healthier and Stress-related profiles. This type of eater eats primarily to regulate (or to cope with) emotional distress and low social confidence. In other words, less extravert people could eat as a socio-emotional compensation strategy, which may lead to frequent disruptive eating behaviors. These findings appear to confirm and extend the results of earlier studies on the major role of Neuroticism on eating disturbances among adults (Miller et al., 2006; Walker et al., 2015). The impulsivity traits profile was also characterized by high scores on Negative urgency and Lack of premeditation. High impulsivity scores were previously underlined on emotional eating style (Elfhag & Morey, 2008), or on bulimia and binge eating, especially Negative urgency (Claes et al., 2005; Lee-Winn et al., 2016; Mushquash et al., 2019; Racine et al., 2009; Sysko et al., 2017). Lack of planning was previously positively correlated with disorganized eating behaviors (Claes et al., 2005). Dysregulated eaters engaging in eating to regulate or to escape their negative emotions, were also characterized by impulsive actions when experiencing negative affect. This association may reflect the affect-regulation functions of eating.

Uninhibited eaters showed lower scores on Conscientiousness and higher Negative and Positive urgency scores and Lack of premeditation in comparison with Healthier eaters. People who are low in Conscientiousness tend to be more spontaneous and undisciplined (McCrae et al., 2013), and show lower abilities to resist temptation, or defer the performance of a task. The Conscientiousness scores underlined that these eaters tend to be less persistent, planned and achievement-oriented (McCrae et al., 2013). This result is in accordance with Gerlach et al. (2015), in which the authors concluded that Neuroticism appeared to be a risk factor for obesity. Concerning impulsivity traits, *Uninhibited* eaters expressed difficulties related (i) to suppress or refrain from eating responses, especially in conditions of strong emotions and (ii) to consider possible long-term negative consequences of overeating. The result concerning Urgency was congruent with Mobbs et al.'s study (2010) on overweight and obese persons. In addition, it should be noted that both positive and negative emotions could lead to overeating. Previous studies have shown that overweight and obese persons have high levels of Lack of perseverance (i.e., doing something despite it being difficult). This result was not found in the non-clinical population, but on the other hand Lack of premeditation was higher in this group. Eating behaviors related to repeated negative affect and poorer decision-making abilities (reflected by a Lack of premeditation, an unplanned impulsiveness) may lead to "myopia bias" concerning the potential negative consequences and long-term complications of overeating. In line with our results, previous studies (Gerlach et al., 2015) have shown that obesity was associated with a tendency to choose immediate rewards independently of long-term negative consequences.

Restrictive eaters showed significantly lower scores on Openness and Lack of Premeditation. In the current study preference for routine and concreteness emerged as characteristics of *Restrictive* eaters more than other eaters. This result suggests that these individuals showed specific personality trait organization, which may lead them to consider eating essentially as an instrumental

activity, without emotional or affective investment. Constricted range of interests seems to play a role in the expression of eating disorder attitudes and behaviors (dietary restriction; [Momi et al., 2016](#); [Tasca et al., 2009](#)). Another characteristic was the high score on Lack of premeditation, which underlined higher self-control associated to rigid cognitive and behavioral restraints. In accordance with this result, ([MacLaren & Best, 2009](#)) found that impulsiveness had be negatively associated with oral control and dieting.

Finally, *Ethical restraint* eaters were characterized by lower Agreeableness (score and lower Positive urgency). Research from the past decade suggests the association between Agreeableness and eating behaviors is mixed and focused on eating disorders ([Farstad et al., 2016](#)). In our study, the *Ethical restraints* group with low agreeableness was related to more difficulty for individuals to regulate the negative affect and cognitions associated with eating (food mistrust). Eating healthily to manage illness seems to be the most important motive (i.e., egoistic motives) when purchasing food.

Despite these encouraging results, the current study can be summed up in the following points. First, although, the BFI-Fr is a widely used and well-recognized measure of personality it does not allow evaluation facets of each personality trait (contrary to the NEO-PI-3). Future studies also should examine impulsivity personality and eating styles, including measures to evaluate (and differentiate) compulsive/impulsive dimensions. Furthermore, this study was specific to a French sample mainly recruited from the university, which does not constitute a real picture of young adults in general (e.g., in terms of education level and socioeconomic status). Given the small size of the sample and the overrepresentation of females, our overall results should be regarded solely as preliminary findings to be confirmed by future research. This study used a survey method (with potential self-reported bias) and a cross-sectional design, limiting the ability of the findings to predict causality among the variables. Future studies could design longitudinal studies involving a larger sample, with follow-up measurements, which will allow for conclusions to be drawn on causal relationships between personality dimensions and eating profile. From a gratification perspective, motivation (e.g., reward, social orientation, goal achievement) associated with eating could be assessed. Future research should consider this, and also the influence of cultural, gender and social issues/environment on eating patterns and their links with personality characteristics.

5. Conclusion and clinical implications

In summary, the current study revealed specific subdomains of personality, which may be linked to healthier or at-risk eating styles in a university student sample. These results indicate that specific personality traits emerge as an explanation of individual differences in eating styles. Dysregulated eaters mainly ate to escape negative emotional experiences (to others and themselves) without considering the long-term consequences. *Uninhibited* eaters overate based on sensibility of emotional urgency (positive or negative) without taking into account the results. *Restrictive eaters* reported higher self-regulation, with few imaginative or creative thoughts, were "in control" relative to eating. *Ethical restrainers* choose to have restrictive choice in terms of foods based on personal and ethical beliefs, with low arousal of positive urgency and lack of Agreeableness. The results of this study will help provide explorative information that can contribute to consider adaptive or maladaptive outcomes of eating styles based on personality variables. A more comprehensive model of eating behaviors in the general population should consider concomitantly both

cognitive-affective and volition determinants. Finally, the current study clearly showed that subgroups of eaters differ highly in their personality profiles, which could be a way to improve interventions and/or preventive programs. Obesity/binge eating interventions could be more effective if they are tailored to at-risk personality profiles. For example, a cognitive-behavioral intervention strategies targeting identification and modification of the strong negative reactions (neuroticism) could be beneficial for the Dysregulated eaters. A complementary perspective is to offer interventions encouraging beneficial personality traits (e.g., increasing extraversion or conscientiousness). Personality-targeted interventions seem to be effective in reducing addictive behaviors, and promoting general health behavior (Conrod et al., 2011; Magidson et al., 2014), which could be extended to include eating behaviour. Also, personality-focused prevention could improve healthy eating and reduce (or prevent escalation of) risky eating behaviors. More research focused on the personality-eating interactions is needed, which could facilitate the development of preventive interventions targeting individual differences factors related to healthy eating patterns.

Disclosure of interest

The author declares that she has no competing interest.

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Ethical approval

All procedures performed in these studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

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