Title: Personality Profiles in Young Adults with Disordered Eating Behavior

Patrick Raynal, Tiffany Melioli, Henri Chabrol

Corresponding Author: Dr. Patrick Raynal,

Corresponding Author's Institution:

First Author: Patrick Raynal

Order of Authors: Patrick Raynal; Tiffany Melioli; Henri Chabrol

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To the Editor of Eating Behaviors

Dear Pr. Miller,

Please find enclosed a manuscript entitled "Personality Profiles in Subclinical Eating Disorders".

We would like to submit this work for publication as a full-length paper in *Eating Behaviors* (word counts: abstract: 179; text + references: 3497).

As possible referees, I suggest:

Jennifer D. Slane
VISN 4 Mental Illness Research, Education and Clinical Center, Pittsburgh VA, USA
E-mail: jennifer.slane@va.gov

Kelly L. Klump
Michigan State University, Dept of Psychology, East Lansing, MI, USA
E-mail: klump@msu.edu

Michael W. MacGregor
University of Saskatchewan, Saskatoon, Canada
E-mail: michael.macgregor@usask.ca

I thank you very much in advance for the reviewing process.

Sincerely,

Patrick Raynal, Ph.D.
Senior research scientist

Highlights

• 101 college students with disturbed eating behavior were classified on personality disorder traits

• Schizotypal, autistic, obsessional, borderline and cyclothymic traits were used

• 3 distinct clusters were obtained: high-traits, low-traits and schizotypal-borderline-cyclothymic

• Symptoms of depression, suicidal ideas, obsessive-compulsion and trait anger varied between groups

Running head: PERSONALITY IN DISORDERED EATING BEHAVIOR

Personality Profiles in Young Adults with Disordered Eating Behavior

Patrick Raynal[a], Tiffany Melioli[a], Henri Chabrol[a]

[a] Centre d'Etudes et de Recherches en Psychopathologie et Psychologie de la

Santé

Université de Toulouse, France

Corresponding author:

P. Raynal, Laboratoire CERPPS, Université de Toulouse-Jean Jaurès, 5 allées Antonio Machado, 31058 Toulouse, France

Phone number : 33 561 22 52 90

Fax number : 33 561 25 70 93

E-mail address: patrick.raynal@inserm.fr

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Abstract

Personality traits are closely related to eating disorders (ED) and might be involved in their maintenance and development. Nevertheless little is known regarding the association between personality traits and disordered eating in subclinical populations. College students answered questionnaires assessing disordered eating behaviors (DEB) and the following personality disorder (PD) traits: schizotypal, autistic, obsessional, borderline and cyclothymic. Participants with DEB (n=101, 87% women) displayed significantly higher scores for several variables including schizotypy, cyclothymic, borderline and obsessionnal traits compared to other participants (n=378). Cluster analysis in the DEB subsample led to the identification of three groups: 1) a cluster with a high level of traits (HT); 2) a cluster scoring high on schizotypal, borderline and cyclothymic traits (SBC); 3) a cluster with a low level of traits (LT). Symptoms of depression, suicidal ideations, trait anger and obsessive-compulsive symptoms were higher in the HT and the SBC clusters compared to the LT cluster. Given that two thirds of participants suffering from DEB appeared to display a morbid personality profile, taking into account PD traits of individuals with DEB appears of prime importance.

1. Introduction

Personality features might play an important role in both etiology and outcome of eating disorders (ED) (MacGregor & Lamborn, 2014). Personality disorders (PD) are common among individuals suffering from ED with a comorbidity reaching 60 % according to several studies (Cassin & von Ranson, 2005; Wonderlich & Mitchell, 2001). Furthermore, individuals suffering from anorexia nervosa (AN) are frequently affected by obsessive-compulsive PD (Young, Rhodes, Touyz, & Hay, 2013). Regarding individuals with bulimic symptoms, literature data have found a high prevalence of the traits associated with borderline PD (including impulsivity and sensation seeking) (Atiye, Miettunen, & Raevuori-Helkamaa, 2014; MacGregor & Lamborn, 2014; von Lojewski & Abraham, 2014).

While previous ED classifications were mainly based on the presence or absence of obsessive-compulsive or borderline PD traits, more recent studies have introduced larger comorbid personality psychopathology, leading to the description of three personality profiles, observed either in adolescents or in adults: undercontrolled, overcontrolled and low psychopathology profiles which could be associated to distinct illness course and treatment response (Lavender et al., 2013; Turner et al., 2014; Wildes & Marcus, 2013).

Other comorbidities of ED have been explored including autism-spectrum disorders. Recent studies have reported 20% of autism-spectrum traits among individuals with ED (Huke, Turk, Saeidi, Kent, & Morgan, 2013; Westwood et al., 2015). In addition, the presence of bipolar and schizophrenia-spectrum disorders were also described (Kouidrat, Amad, Lalau, & Loas, 2014; Remberk, Bazynska, Krempa-Kowalewska, & Rybakowski, 2014).

A major issue to better understand ED etiology lies in the relationship between clinical and subthreshold ED. Subthreshold ED have a high prevalence among adolescents and young women, representing an important source of physical and psychological impairments including symptoms of anxiety and depression (Chamay-Weber, Narring, & Michaud, 2005; Touchette et al., 2011). Nevertheless the relationship between threshold and subthreshold ED remains unclear, with a lack of consensus regarding whether subthreshold ED represent a less severe form of ED or a transitional phase to fullblown ED. Due to this lack of consensus, the characteristics of patients who will develop clinical ED are still unclear and surprisingly, to date, only a few studies focused on personality features associated to subthreshold ED. To our knowledge, only one study has explored the personality profiles of women with subthreshold ED, using an instrument assessing 18 dimensions of personality disorders. They have found the three personality clusters already emphasized in ED, suggesting that the same personality traits may contribute to both ED and subthreshold ED (Perkins, Slane, & Klump, 2013).

Following a similar approach, the aim of this study was to identify a typology of young adults with DEB based on personality disorder traits. Contrary to prior study, we focused on traits associated to ED and not limited to personality disorders (including traits reflecting the association to autistic, bipolar and schizophrenia spectra, that are obsessive-compulsive traits, borderline traits, autistic traits, cyclothymic traits and schizotypal traits).

2. Methods

2.1. Participants

Participants were recruited through social networks and official website of several French universities. Only those who answered >95% of the items were included in this study. The sample is thus composed of 479 individuals (96 males; 383 females) aged between 18 and 25 (mean age of males = 21 ±2.3; mean age of females = 20.7 ±1.9; p=.32). The study followed the ethical guidelines of the Helsinki Declaration and its procedures were approved by the ethics committee of the research ward. Participants provided their willingness to participate through a consent form and no compensation was offered. The questionnaires were anonymous.

2.2. Measures

2.2.1. Eating behavior

Disordered eating was assessed using the French translation of Eating Attitudes Test-26 (EAT-26) (Garner, Olmsted, Bohr, & Garfinkel, 1982; Leichner, Steiger, Puentes-Neuman, Perreault, & Gottheil, 1994) which assesses symptoms of ED through 26 items scored on a 6-point scale, ranging from 1 (never) to 6 (always). An example item is "I avoid eating when I am hungry." A cutoff score of 20 has been identified as indicating DEB (Garner et al., 1982).

2.2.2. Personality traits

2.2.2.1 Schizotypal traits

Schizotypal traits were assessed using the Schizotypal Personality Questionnaire-Brief (SPQ-B) (Raine & Benishay, 1995), a self-administered scale including 22 dichotomous items. Each item (e.g., "People sometimes find me aloof and distant") is scored 0/1 (no/yes).

2.2.2.2. Cyclothymic traits

The *Temperament Evaluation of Memphis, Pisa, Paris and San Diego autoquestionnaire* (TEMPS-A) (Akiskal et al., 2005) was used to measure cyclothymic traits, using the relevant subscale (12 items; e.g., "My ability to think varies greatly from sharp to dull for no apparent reason"). Items were scored 0 (no) or 1 (yes).

2.2.2.3. Obsessional personality traits

Obsessional traits were measured using the French version of the Obsessional personality disorder scale of the *Personality Diagnostic Questionnaire-4* (Bouvard, 2002; Hyler, Rieder, Williams, Spitzer, & Lyons, 1988). This scale contained 8 items (e.g., "I feel that my standards and ethics are higher than those of my peers") scored 0 (false) or 1 (true).

2.2.2.4. Borderline personality traits

Borderline PD traits were assessed using the nine relevant items of the *Personality Diagnostic Questionnaire-4* (Bouvard, 2002; Hyler et al., 1988). Items were scored from 1 (totally false) to 7 (totally true)*.

2.2.2.5. Autistic traits

Autistic traits were measured using the Autism spectrum Quotient (AQ) (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001) under its 10-item version (e.g., "When I am reading a story, I find it difficult to work out the characters intentions"). Items were scored 0 [no] or 1 [yes], except for items 2-6 and 9 that were scored inversely (Booth et al., 2013).

2.2.3. Psychopathogical symptoms

2.2.3.1. Depression symptoms and suicidal ideation

Depression was evaluated using The *Centre for Epidemiological Studies-Depression* scale (CES-D) (Radloff, 1977) under its 10-item version (e.g., "My sleep has not been good"). Responses were made on a 4-point Likert scale, ranging from 0 to 3. A short suicidal ideation scale was added (Chabrol, Rodgers, & Rousseau, 2007), containing 3 items (e.g., "I felt life was not worth living") that were scored similarly as CES-D.

2.2.3.2. State-trait anger

State-trait anger was assessed using the second part of the *State-trait anger expression inventory-2* (STAXI-2) (Spielberger, 1988) under its French version (Borteyrou, Bruchon-Schweitzer, & Spielberger, 2008). This scale contained 8 items (e.g., "I get easily angry") scored 1 (almost never) to 4 (almost always).

2.2.3.3. Obsessive-compulsive symptoms

Obsessive-compulsive symptoms were assessed using the French version of the *Obsessive Compulsive Inventory-Revised* (OCI-R) (Foa et al., 2002; Zermatten, Van der Linden, Jermann, & Ceschl, 2006). It contains 18 items (e.g., "I check things more often than necessary") scored from 0 ("Not at all") to 4 ("Extremely").

2.2.4. Substance use

Cannabis use was measured with the *Cannabis Use Disorder Identification Test-Revised* (CUDIT-R) (Adamson et al., 2010). Alcohol consumption was assessed using the first item of the Alcohol Use Disorders Identification Test (AUDIT) (Saunders, Aasland, Babor, Delafuente, & Grant, 1993).

All these questionnaires have demonstrated adequate reliability and validity (Adamson et al., 2010; Akiskal et al., 2005; Baron-Cohen et al., 2001; Bouvard, 2002; Foa et al., 2002; Garner et al., 1982; Hyler et al., 1988; Radloff, 1977; Raine & Benishay, 1995; Saunders et al., 1993; Spielberger, 1988; Zermatten et al., 2006).

2.2.5. Personal information

This study collected general information regarding the participants (age, sex, academic degree and academic results during the past semester). The variable "academic results" was obtained by asking students their overall grade for the last semester (Failed; Passed with grade ≥10/20 and <12/20; Passed with grade ≥12/20 and <14/20; Passed with grade ≥14/20 and <16/20; Passed with grade ≥16/20).

Cronbach alphas and score ranges are presented in Table 1. The obsessive-compulsive personality trait and the autistic trait scales showed suboptimal Cronbach's alphas ranging between 0.50 and 0.70, an acceptable level of consistency for short scales (Schmitt, 1996).

3. Results

Comparison of participants with and without DEB

Participants scoring above 20 on the EAT-26 (n=101, 87.3% female, 12.7% male) were compared to the rest of participants (considered as the control group; n=378, 77.2% female, 21.8% male). The proportion of female was higher in the group scoring above 20 (the DEB group) compared with the control group (p=0.018, Fisher's exact test). The DEB group had higher scores on all personality traits and psychopathological symptoms (Table 1). Cohen's d indicated large size effects.

Cluster analysis

Cluster analysis was conducted among the DEB group in two steps to generate personality profiles, based on personality traits (schizotypal, cyclothymic, borderline, obsessional and autistic) converted to z-scores. Absence of multicolinearity was evaluated through an analysis of the correlations between the variables selected for the cluster analysis (all variables had tolerance values > .40). In the first step, a hierarchical cluster analysis was conducted (Ward's method with squared Euclidean distance). Based on the dendrogram and the aggregation curve, a three-cluster solution was identified. In the second step, K-means clustering was used to assign individuals to one of the identified clusters. A discriminant analysis showed clear differences between clusters (Wilks' λ= 0.145, *p*<0.001) with 97.3% of cases correctly classified. Data revealed a first group that was well below the mean of DEB group on all traits (Figure 1; Table 2). This cluster was thus termed the "Low Traits" cluster (LT, *n*=35 [34.7%], women 94.3%, men 5.7%). A second group was characterized with high scores on schizotypal, borderline and cyclothymic traits and low scores on autistic and obsessional dimensions; it was thus called the "Schizotypal, Borderline and Cyclothymic" cluster (SBC, *n*=33 [32.7%], women 84.8%, men 15.2%). The last cluster was characterized by scores that were at least a half standard deviation above the mean on all dimensions – schizotypal, autistic, cyclothymic, borderline, obsessional– and was thus named "High Traits" cluster (HT, n=33[32.7%], women 81.8%, men 18.2%). Interestingly autistic traits were the most elevated traits in this cluster, with AQ-10 scores twice higher than in other clusters. No difference in sex ratio could be observed between the different clusters (*p* range=0.11-0.5, Fisher's exact test).

Cluster group differences in level of disturbed eating behaviors, psychopathological variables, frequency of cannabis and alcohol uses, and academic

results were tested using an analysis of variance. Compared to the LT cluster, the HT and

SBC clusters participants displayed higher scores on depressive symptoms, suicidal

ideas, obsessive-compulsive symptoms and state-trait anger (Table 2). In addition,

individuals from the HT group showed a lower level of academic degree in comparison

with the LT cluster.

4. Discussion

The aim of this study was to identify a typology of young adults with DEB based

on personality disorder traits. To our knowledge, this study is the second to explore

personality profiles among young adults with DEB, based on PD traits. Our classification

showed convergences and some differences with the previous study aiming at exploring

the PD trait profiles of women with DEB (Perkins et al., 2013). Perkins et al.'s study

(2013) described three clusters (Adaptive, Dysregulated, Rigid) with two clusters

closely matching those identified in our study. The Adaptive cluster corresponds to LT

as the group with lowest traits. The Dysregulated group, displaying the highest levels of

all traits with the exception of intimacy problems, appeared concordant with HT.

Interestingly, autistic traits were the highest component of HT, and differences in

autistic traits between HT and other clusters were large (1.5 SD). This finding thus

provides further support to the notion of an association between a sub-group of ED and

autistic traits (Courty et al., 2013; Oldershaw, Treasure, Hambrook, Tchanturia, &

Schmidt, 2011). This study also suggests to pay special attention to autistic traits among

participants suffering from DEB.

The Rigid cluster may appear, at first sight, relatively different from SBC. Indeed

SBC was composed of individuals with high cognitive and emotional dysregulation (as

suggested by high schizotypal, borderline and cyclothymic traits) and low rigidity (as

indicated by low autistic and obsessionnal traits). Nevertheless, the Rigid cluster

showed some dysregulation traits as it displayed a level of affective instability higher

than the Adaptive cluster. Furthermore, the compulsivity level in Rigid was lower than

in Dysregulated, suggesting that obsessionality was somewhat limited in Rigid cluster,

as it appeared in SBC (Perkins et al., 2013).

At the symptom level, the comparison between our results and Perkins et al.'s

study is limited by the difference in study variables. Our clusters did not differed from

each other on DEB scores, whereas differences appeared in some disordered eating

dimensions in Perkins et al.'s report. In our study, the most striking difference between

clusters was the prominence of obsessional-compulsive symptoms, with a score twice

higher in HT and SBC than in LT, while all other variables showed more modest inter-

cluster variations (Table 2). Considering that HT and SBC altogether represent two

thirds of individuals in our sample, these data indicate that obsessive-compulsive

symptoms are a very frequent comorbidity of DEB.

This study is not exempt from limitations. Firstly, the small sample size and the

low proportion of men may restrict the generalizability of the present finding. Secondly,

self-report measures were used, which can induce some bias in data collection.

Nevertheless, this study suggests that the classification of DEB in function of PD traits

could be extended to men, considering that no difference in sex ratio could be observed

between clusters. Moreover, personality traits of the autistic, schizotypal and bipolar

spectra may be relevant to the classification of DEB or subclinical ED. As a conclusion,

this study emphasizes the importance of taking into account PD traits in DEB. Two

thirds of DEB group appeared to display a morbid personality profile which might

represent a transitional phase to clinical ED. Further studies are needed to better

understand the role and implication of personality profile in the etiology of ED.

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Table 1

Comparison of the disordered eating behavior group (DEB)
with the control group (t-test).

			Control n=378		DEB n=101			
Variables (N=479)	*α*	*Range*	*M.*	*S.D.*	*M.*	*S.D.*	*t*	*Cohen's d*
Schizotypy	0.78	0-21	8.01	4.25	10.12	4.58	-4.39*	0.48
Autistic traits	0.53	0-8	3.06	1.59	3.33	1.74	-1.46	0.16
Cyclothymic traits	0.77	0-12	4.31	3.15	6.64	3.12	-6.64*	0.74
Borderline traits	0.82	9-60	29.28	10.08	39.50	12.45	-8.62*	0.90
Obsessional traits	0.58	0-8	3.58	1.54	4.02	1.52	-2.59*	0.29
Depression	0.69	1-25	12.16	3.90	15.02	3.83	-6.59*	0.74
Suicidal ideas	0.87	0-9	0.65	1.37	1.71	2.38	-5.79*	0.55
Obsess.-compulsive symptoms	0.83	0-64	17.00	10.49	22.66	11.92	-4.70*	0.50
State-trait anger	0.86	8-32	18.05	5.07	20.63	5.66	-4.44*	0.48
Academic degree	n.a.	1-6	2.60	1.30	2.57	1.35	0.21	0.02
Academic results	n.a.	1-5	3.03	1.03	3.05	1.16	-1.14	0.02
Alcohol use	n.a.	0-4	1.27	1.16	1.35	1.22	-0.65	0.07
Cannabis use	0.87	0-34	3.10	4.55	3.00	4.65	-0.20	0.02

* $p<0.05$ n.a.: not applicable

Table(s)

Table 2
Typology of 101 subjects with DEB based on the following traits: schizotypal, autistic,
  cyclothymic, borderline and obsessional;
Cluster comparison using ANOVA and post-hoc test

		Cluster:						
		LT		SBC		HT		
		$n=35$		$n=33$		$n=33$		
	N=101	34.65%		32.67%		32.67%		
Variables		*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*
Schizotypal traits		6.03^{ab}	3.34	11.33^{a}	3.40	13.06^{b}	3.72	37.85*
Autistic traits		2.54^{a}	1.44	2.33^{b}	0.96	5.09^{ab}	1.18	53.06*
Cyclothymic traits		3.34^{ab}	1.91	8.85^{a}	1.86	7.94^{b}	2.18	75.80*
Borderline traits		28.49^{ab}	8.20	43.30^{a}	9.372	47.09^{b}	11.06	36.03*
Obsessional traits		3.43^{a}	1.61	3.88^{b}	1.53	4.79^{ab}	1.14	7.71*
Eating behavior		36.71	14.29	31.48	10.43	34.12	12.22	1.50
Depression		12.06^{ab}	3.11	15.91^{a}	3.51	17.00^{b}	2.87	22.89*
Suicidal ideas		0.51^{ab}	1.46	1.91^{a}	2.58	2.82^{b}	2.45	9.41*
Obsess.-compulsive symptoms		13.57^{ab}	8.48	25.85^{a}	11.451	29.24^{b}	9.59	23.81*
State-trait anger		17.69^{ab}	5.30	21.58^{a}	5.51	22.67^{b}	5.08	8.36*
Alcohol		1.23	1.21	1.61	1.25	1.21	1.19	1.11
Cannabis		1.40	2.88	3.00	5.30	2.79	6.78	0.96
Academic degree		3.06^{a}	1.23	2.36	1.38	2.24^{a}	1.32	3.82*
Academic results		3.40	1.03	2.79	1.11	2.94	1.27	2.67

Note: Means with the same superscript letter are significantly different from each other
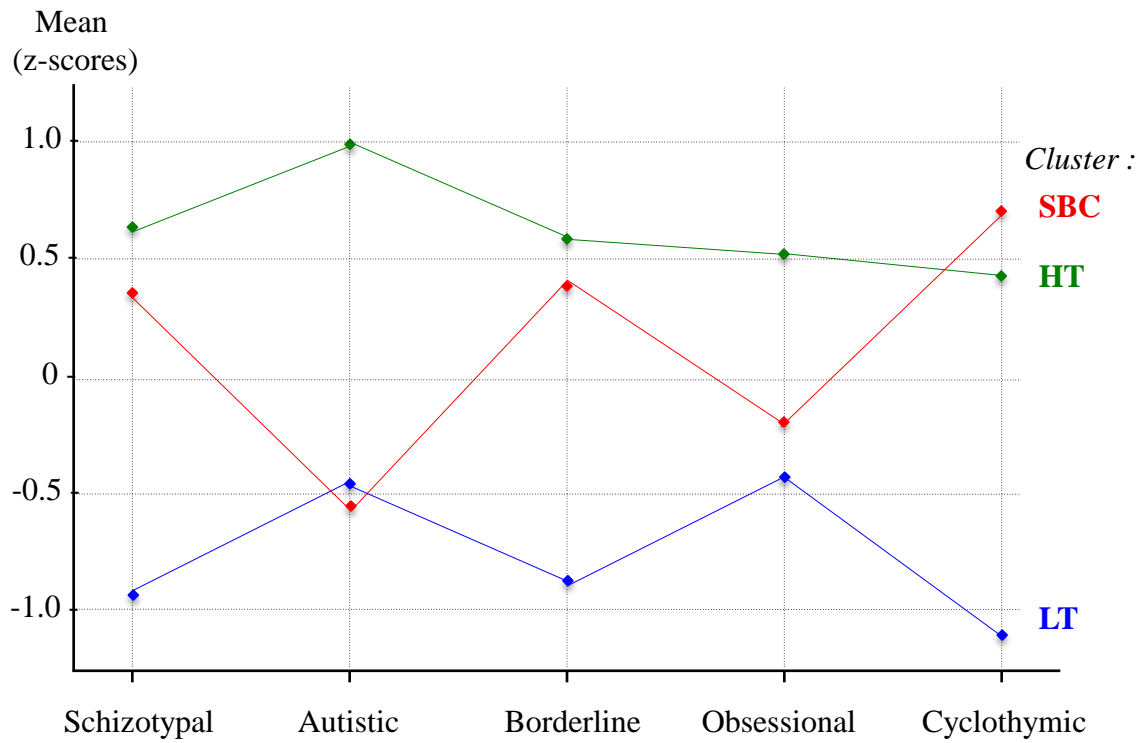(Tukey post-hoc test)
* $p<0.05$

Figure 1. Classification of individuals from the DEB group: Three-cluster solution based on scores for the dimensions indicated on the x-axis.

SBC : cluster with high level of Schizotypal, Borderline and Cyclothymic traits
HT : High Traits cluster
LT : Low Traits cluster