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Latent profile and latent transition analyses of eating disorder phenotypes in a clinical sample: A 6-year follow-up study

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ABSTRACT

The DSM-IV classification of Eating Disorders (EDs) identifies clinical entities showing considerable overlap and diagnostic instability across time. Latent profile analysis (LPA) allows the identification of underlying groups of individuals according to their patterned responses across a set of features. LPA was applied to data regarding EDs symptoms of a clinical sample of 716 EDs patients, with a current DSM-IV diagnosis of threshold and subthreshold EDs. Latent transition analysis (LTA) was used to examine the longitudinal stability of the obtained profiles. The latent profiles were compared for psychopathological variables and long-term outcomes (recovery, relapse), based on a 6-year follow-up after a cognitive behavioural treatment. Five different phenotypes were identified: "severe binging", "moderate binging", "restricted eating", "binge and moderate purging", and "binge and severe purging". The relevance of this characterization was confirmed by the differences in terms of psychopathological features and outcomes. Over the long term, a three-profile solution was adopted, clustering the subjects into "binge eating", "binge eating and purging", and "restricted eating". Latent profiles showed a moderate stability over the 6-year period, with probability estimates of stability within status over time of 0.57 for "binge eating", 0.40 for "binge eating and purging", and 0.41 for "restricted eating". The implications for DSM 5 were discussed, and the relative high rate of transition within phenotypes confirmed the significant instability of EDs phenomenology.

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1. Introduction

The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (APA, 2000) included three main Eating Disorders (ED) categories: Anorexia Nervosa (AN), Bulimia Nervosa (BN), and Eating Disorders Not Otherwise Specified (EDNOS). In the future DSM edition (DSM 5), Binge Eating Disorder (BED) will be included among the main diagnoses, and some diagnostic criteria will be changed, in order to improve the actual EDs diagnostic system (APA, 2011).

The DSM classification represents an undoubted progress for reliability and communication between clinicians and researchers. However, it has been pointed out that the price that psychiatry had to pay for these benefits is very high, since the diagnostic process lost out in terms of sophistication and specificity (Andreasen, 2007). As diagnostic criteria influence how we recognize, research, and treat EDs, it is important to ensure their empirical validity (Keel et al., 2004) and clinical utility (First et al., 2004). Although data on psychological correlates (Bulik et al., 1995; Ricca et al., 2001; Crow et al., 2002) and the course of illness (Herzog et al., 1999; Fairburn et al., 2000; Keel et al., 2000; Keel et al., 2003) seem to support current nosologic schemes, other data suggest considerable overlap among AN, BN and EDNOS (Strober et al., 2000; Ricca et al., 2010a; Castellini et al., 2011). As many as 50% of individuals with AN develop BN, and among individuals with BN, approximately 30% report histories of AN (Tozzi et al., 2005; Castellini et al., 2011). The high crossover rate between the diagnoses and the psychological dimensions common to the different disorders seem to suggest that the ED diagnoses are neither entirely independent nor entirely overlapping conditions (Clinton and Norring, 2005; Wilfley et al., 2007; Eddy et al., 2008).

In order to investigate ED symptom-based subgroups, latent class analysis (LCA) (Sullivan et al., 1998; Bulik et al., 2000; Keel et al., 2004; Striegel-Moore et al., 2005; Duncan et al., 2007) or latent profile analysis (LPA) (Wade et al., 2006; Mitchell et al., 2007; Wonderlich et al., 2007; Eddy et al., 2009; Thomas et al., 2011), and latent transition analysis (LTA) (Cain et al., 2010; Peterson et al. 2011) for longitudinal data, have been proposed. These approaches allow the identification of underlying (or latent) groups of like individuals on the basis of their patterned

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responses across a set of ED features (Eddy et al., 2009). In particular, LPA has the advantage of allowing for the inclusion of continuous indicators, whereas LCA is limited to categorical indicators. Some common conclusions can be derived from the mentioned studies, in spite of the sampling differences and the use of different indicators. I A low weight subgroup resembling AN (Bulik et al., 2000), or a restricting-type AN (AN-R) (Keel et al., 2004), has been identified, while several studies distinguished subgroups characterized by objective binge eating and purging behaviours (Sullivan et al., 1998; Bulik et al., 2000; Keel et al., 2004; Striegel-Moore et al., 2005; Duncan et al., 2007) from subgroups resembling BED, characterized by objective binge eating in the absence of compensatory behaviours (Sullivan et al., 1998; Bulik et al., 2000; Striegel-Moore et al., 2005).

In the available literature, with the exception of the Eddy et al. (2009) and Mitchell et al. (2007) studies, only community samples have been considered, so that the results may not be generalized to clinical ones. Furthermore, only Wade et al. (2006) adopted a longitudinal perspective in order to investigate the obtained latent profiles. However, the majority of the above mentioned studies used a limited set of clinical indicators such as body-mass index (BMI), fear of weight gain, body dissatisfaction, overvaluation of weight/shape, and frequency of objective binge eating, vomiting, and laxative abuse.

The aims of the present study were as follows: (1) to use latent profile analysis in order to empirically identify ED phenotypes in a clinical sample, by means of a large set of external validators, and to examine the longitudinal stability of these phenotypes using latent transition analysis; (2) to characterize the obtained phenotypes in terms of psychopathological features and long-term outcomes.

2. Methods

The study was conducted at the Outpatient Clinic for Eating Disorders of the Psychiatric Unit of the University of Florence, Italy. Participants were recruited from referrals by family doctors and other clinicians. All the diagnostic procedures and the psychometric tests are part of the routine clinical assessment for patients with EDs, performed at our clinic. Before the collection of data, during the first routine visit, the procedures of the study were fully explained; after that, the patients were asked to provide their written informed consent. The study protocol was approved by the Ethics Committee of the Institution.

2.1. Participants

All patients attending the Outpatient Clinic for Eating Disorders between June 1998 and February 2003 were enroled in the study, provided they met the following inclusion criteria: age between 18 years and 60 years; current DSM-IV diagnosis of AN, BN, BED, subthreshold BED (s-BED), EDNOS Anorectic type (EDNOS-A), EDNOS Bulimic type (EDNOS-B) assessed by means of the Structured Clinical Interview for DSM-IV (First et al., 1995). The diagnoses were based on the current symptomatology at referral, and inter-rater reliability for diagnoses at baseline was 0.91 (κ coefficient). The diagnosis of BED was made according to the DSM-IV criteria. The diagnosis of EDNOS was made in individuals with an ED of clinical severity, but who did not meet the diagnostic criteria for AN, BN, or BED. Among patients with EDNOS, those who met all the criteria for AN, except amenorrhoea and/or underweight, were classified as EDNOS-A, whereas those who met all the criteria for BN, except frequency and/or duration of binge eating and compensatory behaviours, were classified as EDNOS-B (Ricca et al., 2001). The s-BED diagnosis was performed when binges occurred at a minimum average frequency of once a week for a minimum duration of 6 consecutive months, according to the study of Striegel-Moore et al. (1998).

The Structured Clinical Interview for DSM-IV was used to identify the presence of comorbid axis I mental disorders (First et al., 1995).

Exclusion criteria were as follows: BMI of <14 kg/m^2 (patients with a BMI of <14 kg/m^2 were considered unsuitable for psychotherapy and were referred to an inpatient treatment); comorbid schizophrenia, bipolar I disorder, illiteracy, intellectual disability; severe medical conditions that preclude an outpatient treatment, such as severe heart, renal, and/or liver failure; current use of psychoactive medications, with the exception of antidepressant medication and benzodiazepines, which were kept stable during the study.

Of the 976 Caucasian cases with an ED consecutively referred, 53 subjects were excluded from the study for the following reasons: comorbid schizophrenia ($n=4$ patients); comorbid bipolar I disorder ($n=11$ patients); illiteracy ($n=9$ patients); BMI of <14 kg/m^2 ($n=10$ patients); severe medical conditions, such as heart disease ($n=8$ patients), renal failure ($n=4$ patients), and hepatic failure ($n=7$ patients). Fifty-one subjects were excluded because they did not meet the criteria for the diagnosis of EDNOS specified above. In particular, subjects who did not meet more than one criteria for AN ($n=9$ patients) or for BN ($n=12$ patients), and subjects who reported fewer binges than the minimum average frequency of once a week for a minimum duration of 6 consecutive months, which are the criteria for s-BED ($n=30$ patients), were excluded.

The final ED sample consisted of 872 patients. Of these 872 subjects who met the participation criteria, 856 (98.1%) agreed to participate in the study.

2.2. Study design and measures

The clinical assessment was conducted on the first day of admission (T0), at the end of an individual Cognitive Behavioural Therapy-CBT (T1), 3 years after the end of treatment (T2), and 3 years after the first follow-up (T3). At T2 and T3, the patients were contacted by phone and invited to the clinic for a follow-up visit.

Sociodemographic, psychopathological, clinical and anthropometric data were collected through a face-to-face interview by two expert psychiatrists (V.R., G.C.) who had no therapeutic relationship with any of the participants they assessed. Anthropometric measurements were made using standard calibrated instruments. Diagnoses were performed by means of the Structured Clinical Interview for DSM-IV (First et al., 1995).

Eating attitudes and behaviours were specifically investigated by means of the Eating Disorder Examination Questionnaire (EDE-Q) (Fairburn and Beglin, 1994; Mond et al., 2004). A specific distinction was made between objective binge episodes (OBEs) and subjective binge episodes (SBEs): the first were defined as the consumption of a large amount of food in a discrete episode, at the same time experiencing a sense of loss of control. SBEs were defined as the consumption of a not objectively large quantity of food in a discrete episode, at the same time experiencing a sense of loss of control (Fairburn and Cooper 1993; Bardone-Cone et al., 2008). Significant discrepancies between the EDE-Q and the EDE interview with respect to assessment of binge eating behaviour have been reported (Fairburn and Beglin, 1994). These findings are more likely to reflect the inherent difficulty of assessing binge eating behaviours by self-report rather than a particular failing of the EDE-Q. For this reason, the number of weekly OBEs and SBEs was evaluated by means of a face-to-face clinical interview, according to specific questions extracted from the Eating Disorder Examination Interview (EDE 12.0D) (Bardone-Cone et al., 2008) and from DSM-IV (APA, 2000).

Impulsivity levels were assessed by means of the Barratt Impulsiveness Scale (BIS-II) (Patton et al., 1995). Emotional eating was assessed by means of the Emotional Eating Scale (EES) (Arnow et al., 1995).

Finally, patients were evaluated by means of the following questionnaires: Symptom Checklist-90 Revised (SCL90-R), a psychometric instrument devoted to the identification of the psychopathological distress (Derogatis et al., 1973); the Beck Depression Inventory (BDI), which is a widely used and well-established measure to assess current depression level and symptoms (Beck et al., 1961); the State-Trait Anxiety Inventory (STAI Form Y-1), to measure trait levels of anxiety (Spielberg et al., 1970).

2.3. Treatment

After the first visit, eligible subjects were treated with an individual CBT (which is the standard intervention for outpatients at our clinic) which applies validated behavioural and cognitive strategies widely used in the treatment of these patients. As far as AN and EDNOS-A are concerned, patients were provided an individual CBT consisting of about 40 h-long manual-based sessions conducted over a minimum of 40 weeks. In the present study, we used CBT as described elsewhere (Pike et al., 1996; Garner et al., 1997). BN, EDNOS-B, BED and s-BED patients were treated with an individual CBT, according to the manual of Fairburn et al. (1993).

Outcomes were defined as follows.

Recovery at 6-year follow-up: patients were considered recovered when T3 assessment determined the absence for no less than 8 weeks of the DSM-IV or DSM 5 criteria for any Eating Disorder, including EDNOS, defined according to the criteria mentioned above (Section 2.1).

Relapse: according to Keel et al. (2005), relapse was defined as the return to a full syndrome or EDNOS criteria after a period of remission.

2.4. Statistical analysis

2.4.1. Latent profile analysis

Latent profile analysis (LPA) (Lazarsfeld and Henry, 1968) was used to identify underlying (or latent) groups of like individuals on the basis of their patterned responses across a set of ED features (manifest or indicator variables), collected

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