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Naturalistic follow-up of subjects affected with anorexia nervosa 8 years after multimodal treatment: personality and psychopathology changes and predictors of outcome.

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ABSTRACT

Background: Eating disorders (EDs) are serious mental illnesses of growing clinical and social impact. Despite their severity, there is still no satisfactory evidence-based treatment. Follow-up investigations are the most reliable studies to enlighten long term outcome predictors and modifiers.

Methods: 59 subjects affected with anorexia nervosa were assessed 8 years after their admission into an outpatient multimodal treatment program for eating disorders. The follow-up changes in diagnostic criteria were compared with chi-square test. Improved and not-improved subjects were compared. Clinical, personality and psychopathology features between T0 and T1 were compared with t-test for repeated measures. Correlation between T0 features and changes at T1 in personality and psychopathology features were assessed.

Results: the rate of complete remission was 42%, an overall rate of 67.8% improved, a rate of 18.6% worsened. Concerning personality, a significant decrease of harm avoidance and increase in self-directedness were evidenced. Interoceptive awareness, drive for thinness, bulimia were significantly reduced at follow-up. Many T0 personality facets were related to personality and psychopathology improvement at follow-up

Conclusion: multimodal treatment encompassing psychiatric, nutritional and psychological approaches is at the moment the most reliable approach for the treatment of moderate to severe anorexia nervosa with a discrete rate of improvement. Some personality and psychopathology characteristics may represent specific factors which favor resistance and impair improvement. Future approaches should consider the personalization of therapeutic approach according to these features.

1. Introduction

Anorexia nervosa (AN) is a group biologically-based serious mental illness of growing clinical and social impact due to its increasing prevalence in general population, and to its long and severe course, associated to high rates of chronicity, mortality and relapse [1, 2, 3, 4].

Current follow-up studies on AN are limited in number, hampered by dropout rates, sample width, and heterogeneity, and also affected by a lack of consistence about definitions of recovery, remission and relapse [5]. According to literature studies published in the last ten years, AN course and outcome show a huge heterogeneity [6]. Remission rates appeared to be related with follow-up duration, with global EDs remission rates around 48.7% at 2.5 years follow-up [7]. Nevertheless it is frequent the diagnostic crossover, and there is an heavy influence of complicating factors on outcome [8].

The AN shows the highest time to obtain remission among other Eating Disorders (EDs) [7, 8]. Remission rates for AN are 37.1% after 2.5 years, with partial remission but favorable outcome in 68.6% of patients [7], and from 52.1% to 53.9% after 6 years [9]. These results are maintained at 12 years follow-up [10]. Binge-purging subtype of AN showed lower recovery rates than restricter subtype [7]. Studies with more restrictive criteria, that consider remission as stable absence of any eating symptom and maintenance of

normal BMI for almost 3 years, showed considerably lower remission rates, around 15% in AN at 12 years follow-up [5]. Transitions from AN to full criteria BN are less frequent (cumulative probability across studies around 2:1) and crossover from BN to AN are unlikely (cumulative probability around 13:1) [8].

In addition to the heterogeneity of the findings, a major limit of follow-up studies is that they are mostly based on objective symptoms and body weight [11, 12, 13] while emotional and behavioral aspects are often neglected, despite evidences that residual emotional and psychosocial impairments increase relapse risk [14, 15, 16, 17].

To provide an overall assessment of the functioning of the patients along with the comorbidities of their eating disorders may be relevant to the evaluation of its therapeutic needs, and in determining its course and outcome [11, 18].

Personality traits have proven to influence EDs onset, maintenance and prognosis [4, 17, 19, 20, 21, 22]. Nevertheless, the study of their changes in time has been largely neglected by current follow-up studies [23]. According to Cloninger's model, EDs are characterized by peculiar personality profiles. The dimensional approach of Cloninger's model investigates seven personality traits and the Temperament and Character Inventory is an instrument of evaluation that has been used previously to deepen the knowledge about personality traits of different psychiatric patients with great reliability in the scientific field [24]. AN patients show lower Novelty Seeking (NS) and Cooperativeness (C) and higher Persistence (P) than general population [21, 24, 25] and with respect to healthy siblings of the same family [26]. Psychological treatments modify personality traits, driving EDs patient's closer to healthy controls [21, 27]. HA, P, SD and ST significantly change after psychological treatments, independently from ED diagnosis and BMI changes [28], with an overall reduction of HA and ST and an increase of RD, SD and C [29, 30]. Nevertheless recovered patients with AN still

show higher HA and higher P [31] and lower SD [32] than healthy controls.

Our study provides a prospective 8-years investigation on a sample of AN patients treated with an integrate treatment model. As an adjunct to clinical outcome variables (e.g. the modification of eating attitudes and behaviors, and of diagnostic criteria), the assessment of the present research also encompasses the changes in TCI personality traits, in EDI-II eating psychopathology, along with in general psychopathology. Finally, the present research also explores the relationship between changes in personality traits and those in eating and general psychopathology. The hypothesis is that personality changes may play a role in the long-term outcome of the disease. Clinical and therapeutic implications of our results in the context of Eating Disorders treatment will be discussed.

2. Methods

We recruited a sample of 264 female outpatients from Eating Disorder Pilot Center of the Department of Neuroscience (CPR DCA), University of Turin, first evaluated between January 1st, 2003 and December 31st, 2005 (T0 time of this study) who received a full diagnosis of AN according to DSM IV or DSM IV-TR. The diagnosis was established by a psychiatrist during the first examination at the intake in the center (T0) and at the follow-up point 8 years later (T1) using the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition (SCID-I) [33]. Other inclusion criteria were 1) the absence of previous or current full criteria comorbidities assessed both at T0 and between T0 and T1 with the SCID-I; 2) the lifetime absence of a psychosis or another major psychiatric diseases; 3) patients have been treated for at least 2 years at Regional Pilot Centre for Eating Disorders with full adherence to standard therapeutic protocol: psychiatric visits once/month; diet-therapy follow up once/month and Brief-Adlerian Psychodynamic Psychotherapy (B-APP) of 20 sessions (once/week) according to the manualized model of Fassino and coworkers [34].

All patients gave their informed written consent. The Institutional Review Board of “AOU Città della Salute e della Scienza di Torino” approved this study.

Among 264 eligible subjects, 121 were contacted to be enrolled in research while 143 were out of reach. Among these 33 refused to take part in the study for personal reasons and 29 they did not give back the package of tests or filled them incorrectly. Finally 59 subjects with AN participated into the study.

2.1 Outcome Measures

Clinical data (height, weight, BMI and minor psychiatric symptoms) of participants were collected at their first access into the center (T0) and at the time of follow-up (T1), and in both time points they were assessed with a battery of psychometric tests including: Temperament and Character Inventory (TCI) [35]; Eating Disorder Inventory-2 (EDI-2), [36]; The Body Shape Questionnaire (BSQ) [37]; The Binge Eating Scale (BES) [38]; Beck Depression Inventory (BDI) [39].

2.2 Statistical Analysis

The sample recruited for the follow-up study was compared with the whole sample of patients admitted in the Outpatient Service in the period of the follow-up using the ANCOVA corrected for age, age of onset and years of study to evidence the level of representativeness of the final follow-up sample. A $p < .001$ level of significance was applied to this analysis.

The rates of each diagnosis at T0 and at T1 were compared with the χ^2 test.

The t-test for repeated measures was applied to the clinical measures, personality traits, eating psychopathology of whole sample. The diagnostic subgroups were not considered separately because of the numeric exiguity. The personality dimensions showing significant changes at follow-up were referred to the percentile distribution of the normative sample [35].

Based on the clinical evolution the subjects were subgrouped into four groups: 1) “healed” group (i.e. who did not display the DSM 5 criteria for an eating disorder at T1); 2) “improved” group (rise of the BMI higher than 1 point with respect to T0); 3) “stable” group (those who did not worsen); 4) “worsened” group (those who displayed a worsening of the BMI).

The four groups were compared at T0 with one way ANOVA to evidence possible prognostic factors. A t-test for repeated measures between T0 and T1 was performed separately between the not-worsened (healed+improved+stable) and the worsened groups to evidence risk factors for long-term worsening.

In order to evidence the relationship between the changes in personality and psychopathology traits and baseline features they were computed the *delta scores* (T1 minus T0 score) for each variable which displayed a significant change at follow-up. They were performed two linear regression analysis: first they were used the T0 personality traits as independent variables and the deltas as dependent ones. Second they were used the deltas of personality traits as independent variables and the deltas of clinical and psychopathology measures as dependent ones.

Statistical analysis were carried out with SPSS 17 for Windows. In consideration of the explorative and naturalistic nature of the follow-up study it was considered a $p < 0.05$ for significance threshold.

3. Results

No significant difference was found with ANCOVA between the follow-up and the sample recruited at T0.

3.1 Clinical course and diagnostic migration

[insert Figure 1 here]

Figure 1 displays the diagnostic distribution of the sample at T0 and the diagnostic distribution at T1. 42.4% of the sample reaches a healthy condition. Eating disorder not otherwise specified emerged at the follow-up. The rate of ANR diagnosis is stable while the ANP and ANBP diagnoses significantly reduced. 67.8% of subjects improved, 81.4% of subjects did not worsen, and 18.6% had an unfavorable outcome.

[insert Figure 2 here]

Figure 2 shows the courses of the different diagnostic groups. Chi-square test evidences that they are significantly different ($\chi^2=14.041$; $df=6$; $p<.029$). ANR subjects display the highest rate of worsening but also of healing. Purging subjects improve more than the other groups but reach the healthy condition less frequently than ANR subjects. Bingeing-purging subjects display a pattern similar to that on ANR subjects but with less healthy outcomes.

[insert Table 1 here]

Table 1 displays the evolution of each diagnostic subgroup. The chi-square analysis did not reach the significance, nevertheless the initial diagnosis tend to migrate more frequently towards remission for ANR subjects, and towards ANR subtype for ANP and ANBP. ANR subjects more frequently maintain the same diagnosis after 8 years, followed by the ANBP.

3.2 Changes between T0 and T1 among clinical, personality and psychopathology measures in the whole group

[insert Table 2 here]

Table 2 displays the clinical, personality and psychopathology changes at follow-up. They are evident significant improvement of overall BMI ($p<.000$), purging behavior ($p<.000$) and also laxative use ($p<.004$).

The sample evidenced an improvement in Harm Avoidance ($p<.005$; form 95° to 85° percentile), and Self-directedness ($p<.000$; form 9° to 25° percentile), with particular improvement of Resourcefulness ($p<.001$), Purposefulness ($p<.005$), Responsibility ($p<.008$) and Fear of Uncertainty ($p<.01$).

Four psychopathology traits improved: interoceptive awareness ($p<.000$), drive for thinness ($p<.001$), bulimia ($p<.001$), impulsiveness ($p<.004$), and interpersonal distrust ($p<.005$). Both the BSQ ($p<.004$) and the BES ($p<.009$) evidenced a significant improvement.

3.3 T0 comparison between the four outcome subgroups

[insert Table 3 here]

Table 3 displays the T0 comparison between the four outcome subgroups. The healed group displays lower anticipatory worry and pessimism ($p < .011$), harm avoidance ($p < .006$), body dissatisfaction ($p < .029$) and binge-eating ($p < .006$) with respect to the stable group. It also displays higher attachment with respect to improved subgroup ($p < .016$).

3.4 T-test at T0 and t-test for repeated measures in the not-worsened VS worsened subgroups

Higher levels of drive to thinness ($t = 2.207$; $df = 57$; $p < .031$) and body dissatisfaction ($t = 2.278$; $df = 57$; $p < .026$) and higher levels of BSQ scores ($t = 2.168$; $df = 57$; $p < .039$) characterized the worsened group.

The changes between T0 and T1 evidence a nonsignificant improvement in bingeing-purging behaviors coupled with a nonsignificant improvement in Self-directedness and at the BSQ are characteristic of the worsened group (Table 4).

[insert Table 4 here]

3.5 Regression analysis between T0 personality features and delta scores of changed variables

Table 5 displays the linear regression analysis between the T0 personality features and the deltas of personality and psychopathology at T1. Many improvements in personality and psychopathology features are related with T0 personality features.

[insert Table 5 here]

3.6 Regression analysis between delta scores of personality and clinical variables

BMI increases with the reduction in harm avoidance (HA) ($B=.480$; $t=2.251$; $p<.033$), and the increase in resourcefulness (SD3) ($B=.579$; $t=2.719$; $p<.011$). Vomiting decreases with the reduction in harm avoidance (HA) ($B=.536$; $t=2.192$; $p<.037$); bulimia decreases with the increase in resourcefulness (SD3) ($B=.514$; $t=2.071$; $p<.048$); body dissatisfaction decreases with the increase in responsibility (SD1) ($B=.538$; $t=2.220$; $p<.035$); inadequacy decreases with the increase in purposefulness (SD2) ($B=.518$; $t=2.159$; $p<.040$), interoceptive awareness decreases with the increase in responsibility (SD1) ($B=.478$; $t=2.387$; $p<.024$).

4. Discussion

The present research followed-up 59 patients affected with anorexia nervosa enrolled in the Pilot Centre for Eating Disorders eight years before for a multidisciplinary treatment. The direct comparison of the follow-up sample with the whole initial sample evidenced a good representativeness of the first with respect to clinical, personality and psychopathology measures.

4.1 Clinical course and diagnostic migration

The follow-up sample in its complex evidences a significant change in the diagnostic distribution after 8-years from the intake in the program for eating disorder treatment. A high rate of the sample displayed a complete remission of the anorexia nervosa, an in general about 70% of the subjects were improved compared to only the 19% which are worsened. This result is in line with the best outcomes reported by previous literature [7, 9, 40], and it underlines that the current standards of care, even though far from being optimal, gained a significant degree of effectiveness in the last ten years [41].

As concerns the diagnostic migration the most relevant evidence concerns the high number of subjects who become healthy (42.4%) with a complete absence of symptoms at follow-up. Another interesting result is the stability of the number of ANR diagnoses between T0 and follow-up, coupled with and the significant decrease of ANP and ANBP diagnoses. This datum apparently suggests a strong resistance of the subjects affected with ANR to healing. Instead, when the course of the disease is considered, it is evident that the subjects affected with RAN are both the subjects that more frequently heal but also worsen, while those who were affected with the purging form of AN display the higher resistance to a complete remission but also the lower rate of stability or worsening. In its

complex the picture of the follow-up concerning the diagnostic migration and the rate of improvement related to initial diagnosis in our sample suggests that initial diagnosis does not represent a relevant prognostic factor as concerns the long-term improvement. This partially contrasts with recent literature which suggest that a diagnosis of bingeing-purging type of anorexia nervosa [42, 43] or higher rate of bingeing-purging behaviors in general [44] represent negative prognostic factors for treatment outcome. This suggests that, more than being a specific negative prognostic factor for treatment outcome, the diagnosis of bingeing-purging behaviors needs a specific adjustment of treatment strategy with respect to the RAN diagnosis [45].

4.2 Changes at follow-up in clinical, personality and psychopathology measures

Among the clinical variables considered at follow-up the BMI, the daily purging behaviors and the use of laxatives were significantly reduced in the whole sample. More resistant to change was the bingeing attitude which did not decrease significantly. This confirms the relevance of bingeing as a factor related to resistance as already evidenced by literature [44]. The mean BMI of AN subjects has significantly improved reaching the cutoff for the diagnosis of anorexia nervosa, while purging behaviors and the use of laxatives were reduced to levels near to the zero. This underlines that the multimodal treatment on the sample considered as a whole was effective to produce a remission of the diagnosis of anorexia nervosa even in severely affected subjects (BMI=16) [46], and that this change may be long- lasting in time [7, 9].

The change in clinical symptoms was coupled with changes in both personality dimensions and psychopathology. In particular both Self-directedness and three of its facets and Harm Avoidance significantly improved with treatment. These two features have been

described as core personality traits of many axis I mental disorders [22, 47] and also supposed to be related to frailty in personality structure [48] and they represent a core feature of the personality profile in anorexia nervosa.

4.3 The relationship between personality improvement and psychopathology changes

According to one of the hypothesis of the paper it is thus possible that at least partly the overall improvement of ED symptoms may be due to a development of the core personality features which have been evidenced at follow-up. The better adjustment produced by the change in these traits may reduce the suffering of the individual and his/her need for the expression of eating symptom. The correlation analysis partly support this hypothesis. In fact the correlation between T0 personality features and the follow-up improvement in clinical and psychopathological measures is very extensive. As an hypothesis, according to the conception of the anorexia nervosa as a disorder of the self [49, 50, 51] which is conceived as the integrating function between cognitive, emotional, relational, body and somatosensory functions of the individual [52] we may argue that the improvement in these personality traits may represent the expression of a better integration of the self which is accompanied by a better interoceptive awareness and reduced drive to thinness and bulimia.

4.4 Predictors of change and resistance

When the four outcome groups have been compared some personality and psychopathology features significantly distinguished each other, thus representing specific outcome predictors. In particular the harm avoidance and the fear of uncertainty along with the binge eating scale were significantly lower in healed subjects when compared with stable ones. This suggests that the high harm avoidance

represents a specific factor which obstacles the progression of the multimodal treatment towards healing. This dimension have been evidenced as a core trait in eating disorders [21] but also in a large range of other mental disorders [22, 47]. It was already demonstrated a negative outcome predictor for depression [53] and present data seem to confirm its negative relevance also for the course of eating disorders. Since the present study, narcissistic personality traits were evidenced as the strongest predictors of stability in the short-term treatment in eating disorders [54], future research should explore the possible relationship between harm avoidance and narcissistic traits in this population.

The meaning of the BES scores as predictor of stability is more difficult to interpret, even though it may be related to the above mentioned literature evidences about the worse evolution of subjects affected with binge-purging anorexia with respect to those affected with restricter type [42, 43, 44]. A lower attachment distinguishes the healed and the improved subgroups, being a predictor of a more complete long-term resolution of the eating episode. Attachment has been claimed as a major component of the complex relational and intrapsychic dynamics affecting eating disorders [50]. Nevertheless it is possible that during the multimodal treatment the differences in this feature may be vicariated by the attitudes of therapists who actively support patients to therapeutic alliance [55, 56] until the reaching of an improvement. Finally the rates of body dissatisfaction are the only predictors of worsening with respect to healing. Body dissatisfaction is a psychopathologic core feature of eating disorder, and it has been demonstrated as independently related to attachment [57]. Recently Grenon and coworkers [58] proposed a complex model relating this feature to parental bonds mediated by attachment anxiety and media internalization. The present finding suggests that this feature may represent the most relevant target for therapies addressing resistances in ED treatment [59], and that these may be centered on attachment dynamics [48].

When follow-up changes were compared between the non-worsened and the worsened subjects it emerged that only three changes between T0 and T1 were related to the different outcome. In the worsened group the purging behavior and the body shape score did not reduce significantly, while the self-directedness did not rise. This finding is very new and difficult to explain, nevertheless it could be related to the evidence of a better outcome for early onset anorexia nervosa with respect to late onset one [60] since the worsened sample displays a relatively lower age at intake. This issue deserves future exploration, since the meaning of relatively high self-directedness for eldest patients could be significantly different with respect to that which is gained during a multimodal treatment by younger subjects.

5. Conclusion

The present study presents some data concerning the outcome of multimodal treatment on a relatively small sample of anorectic subjects. It evidences an outcome which resembles that already presented by literature. The improvement in harm avoidance and self-directedness, along with many eating psychopathology features also supports the relevance of these already known core personality features in eating disorders. Nevertheless the wide but weak correlation between personality traits and clinical and psychopathology features suggests that the dynamics linking personality changes and clinical outcome are complex and possibly mediated by factors which should be further objects of study.

As new findings some predictors of outcome have been evidenced both as regards psychopathology and personality features. Moreover the role of attachment as a personality trait, but also as a possible underlying factor to body dissatisfaction may represent a new suggestion for future research and psychotherapeutic approaches to overcome resistances.

5.1 Limitations

The main limitations of the present study concern the relative small number of subjects which reduces the possibility of further statistical exploration concerning clinical subgroups and may have reduced the strength of some performed analysis. Moreover due to the follow-up nature of the study possible recruitment biases may have affected the recruited sample. The absence of a specific assessment of the relapse episodes during the period of follow-up reduced the information about clinical course of the subjects. Nevertheless the assessment of personality and psychopathology features of recruited subjects with the same assessment instruments of the intake permitted a follow-up of personality and psychopathology features which adds some new evidences to existing literature.

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Table 1. Distribution of the anorectic subtypes at follow-up

Diagnosis at T0		Diagnosis at T1 (Follow-up)					Total
		Healed	ANR	ANP	ANBP	ED NOS	
Restrictor	N°	10 (52.6%)	6 (31.6%)	1 (5.3%)	2 (10.5%)	0 (0.0%)	19 (100.0%)
Anorexia	% of the total	16.9%	10.2%	1.7%	3.4%	0.0%	32.2%
Purging	N°	6 (33.3%)	8 (44.4%)	2 (11.1%)	2 (11.1%)	0 (0.0%)	18 (100.0%)
Anorexia	% of the total	10.2%	13.6%	3.4%	3.4%	0.0%	30.5%
Binge-purging	N°	9 (40.9%)	5 (22.7%)	1 (4.5%)	5 (22.7%)	2 (9.1%)	22 (100.0%)
Anorexia	% of the total	15.3%	8.5%	1.7%	8.5%	3.4%	37.3%
Total	N°	25 (42.4%)	19 (32.2%)	4 (6.8%)	9 (15.3%)	2 (3.4%)	59 (100.0%)

ANR = Restrictor Anorexia Nervosa; ANP= Purging Anorexia Nervosa; ANBP=Bingeing-purging Anorexia Nervosa; EDNOS= Eating Disorder Not Otherwise Specified

Table 2. comparison between T0 and T1 variables in the whole group

Clinical Variables	T0 (n = 59)	T1 (n = 59)	t	p
Age	30.20 ± 8.89	37.46 ± 8.56	-30.69	.000
BMI	16.06 ± 0.94	17.54 ± 2.16	-5.58	.000
Purging behavior (per day)	3.70 ± 5.51	0.69 ± 2.14	4.94	.000
Laxative use (per day)	0.31 ± 0.46	0.09 ± 0.28	3.03	.004
TCI				
Harm Avoidance (HA)	24.24 ± 6.99	21.48 ± 6.95	2.94	.005
Fear of Uncertainty (HA1)	7.94 ± 2.98	7.06 ± 2.60	2.75	.010
Self Directedness (SD)	21.12 ± 8.17	26.47 ± 7.98	-5.36	.000
Purposefulness (SD1)	3.76 ± 2.42	4.97 ± 2.41	-2.98	.005
Responsibility (SD2)	3.73 ± 1.93	4.65 ± 1.92	-2.83	.008
Resourcefulness (SD3)	2.06 ± 1.63	2.90 ± 1.77	-3.79	.001
EDI-2				
Drive for Thinness	10.25 ± 8.17	7.08 ± 6.53	3.49	.001
Bulimia	4.29 ± 5.41	2.51 ± 4.10	3.49	.001
Interpersonal distrust	6.29 ± 4.86	4.49 ± 4.26	2.94	.005
Interoceptive awareness	10.12 ± 7.01	5.54 ± 6.40	5.01	.000
Impulsiveness	6.68 ± 6.05	4.08 ± 4.29	3.11	.004
Social Insecurity	7.61 ± 4.84	6.10 ± 4.47	2.636	.011
BES	17.64 ± 12.13	12.96 ± 11.51	2.807	.009
BSQ	102.76 ± 43.32	76.96 ± 53.81	3.11	.004

Table 3. T0 ANOVA comparison among outcome subgroups

	Healed	Improved	Stable	Worsened			
	(N=25)	(N=18)	(N=5)	(N=11)	F	P	Post-hoc
	Mean±SD	Mean±SD	Mean±SD	Mean±SD			
HA1	6.3±3.2	8.8±2.0	10.8±.5	9.1±2.0	4.415	.011	healed < stable
HA	21.4±7.4	24.4±6.8	32.0±2.4	26.7±4.1	4.589	.006	healed < stable
RD2	5.0±1.9	1.2±.8	4.5±2.4	4.1±2.8	4.007	.016	healed > improved
BD	8.5±7.4	8.7±8.3	8.8±8.2	11.6±7.8	3.231	.029	healed < stable
BES	11.2±7.3	23.0±15.4	30.7±10.1	25.0±11.4	5.202	.006	healed < stable

HA1 = Anticipatory Worry and Pessimism; HA = Harm Avoidance; RD2 = Attachment; BD = Body Dissatisfaction; BES = Binge Eating Scale

Table 4. t-test for repeated measures among non-Worsened vs Worsened anorectic subjects

	non-Worsened (n = 48)	Worsened (n= 11)
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Variable	T0		T1		T0		T1	
	Mean±SD	Mean±SD	t	p	Mean±SD	Mean±SD	t	p
Age	29.60 ± 7.92	36.94 ± 7.68	-40.89	.000	32.91 ± 12.41	39.72 ± 11.85	-6.65	.000
BMI	16.04 ± 0.95	18.18 ± 1.68	-8.92	.000	16.01 ± 0.93	14.72 ± 1.75	4.07	.000
Binge behaviour	0.35 ± 0.48	0.12 ± 0.33	0.31	.003	0.45 ± 0.52	0.55 ± 0.52	-0.43	.676
Purging behaviour	3.71 ± 5.72	0.56 ± 2.27	0.47	.000	3.63 ± 4.71	1.27 ± 1.34	1.54	.156
TCI								
Self-directedness	20.89 ± 8.53	26.46 ± 8.53	-5.02	.000	22.09 ± 6.61	26.45 ± 5.24	-1.85	.094
EDI-2								
Interoceptive Awareness	10.02 ± 7.14	5.90 ± 6.87	3.94	.000	10.55 ± 6.71	4.00 ± 3.55	3.85	.003
BSQ	95.95 ± 40.39	69.86 ± 52.51	3.08	.005	128.83 ± 47.92	104.17 ± 54.44	0.97	.377

Table 5. Regression analysis between T0 personality features and delta scores of changed variables

Independent Variables	Dependent Variables	B	t	p
Δ Vomiting	Compassion (C4) T0	2.068	2.771	.039
	Total cooperativeness (C) T0	6.984	2.943	.032
Δ Anticipatory Worry and Pessimism (HA1)	Extravagance (NS3) T0	1.746	2.743	.041
	(Disorderliness) NS4 T0	1.667	2.657	.045
	Persistence (P) T0	1.015	2.891	.034
	Attachment (RD3) T0	2.519	2.719	.042
	Uninterested conscience (C5) T0	1.460	2.777	.039
	Shyness with strangers (HA3)T0	1.739	2.942	.032
Δ Harm avoidance (HA)	Extravagance (NS3) T0	1.907	2.748	.040
	Fear of uncertainty (HA2) T0	2.003	2.740	.041
	Sentimentalism (RD1) T0	1.532	2.996	.030
Δ Purposefulness (SD2)	Attachment (RD2) T0	.600	3.003	.030
	Persistence (P) T0	.554	2.931	.033
	Purposefulness (SD2) T0	3.149	4.202	.008
	Helpfulness (C3) T0	1.775	3.561	.016
Δ Resourcefulness (SD3)	Explorative activity (NS1) T0	.830	2.718	.042
	Extravagance (NS3) T0	1.518	3.350	.020
	Persistence (P) T0	=.812	3.250	.023
Δ Drive to thinness	Highlighted second nature (SD5) T0	8.335	2.634	.046
Δ Inadequacy	Fatigability (HA4) T0	1.490	3.500	.017
	Responsibility (SD1) T0	8.685	3.316	.021
	Purposefulness (SD2) T0	5.374	3.470	.018
	Self-acceptance (SD4) T0	9.677	3.435	.019
	Highlighted second nature (SD5) T0	9.186	3.263	.022
	Self-directedness (SD) T0	8.113	3.411	.019
Δ Interpersonal distrust	Extravagance (NS3) T0	1.661	2.821	.037
	Disorderliness (NS4) T0	1.847	3.181	.025
	Anticipatory worry and pessimism	2.491	3.507	.017

	(HA1) T0			
	Fear of uncertainty (HA2) T0	1.730	2.788	.039
	Shyness with strangers (HA3) T0	1.796	3.283	.022
	Fatigability (HA4) T0	1.250	3.530	.017
	Sentimentalism (RD1) T0	1.275	2.938	.032
	Persistence (P) T0	.879	2.705	.043
	Empathy (C2) T0	3.541	3.212	.024
	Self-forgetfulness (ST1) T0	5.004	2.750	.040
Δ Interoceptive awareness	Extravagance (NS3) T0	1.666	2.830	.037
	Disorderliness (NS4) T0	1.604	2.764	.040
	Anticipatory worry and pessimism	2.060	2.901	.034
	(HA1) T0			
	Fatigability (HA4) T0	1.102	3.114	.026
	Highlighted second nature (SD5) T0	6.327	2.702	.043
	Empathy (C2) T0	3.811	3.458	.018
	Transpersonal identification (ST2) T0	2.065	2.895	.034
Δ Impulsivity	Transpersonal identification (ST2) T0	2.126	2.974	.031
Δ Social insecurity	Fatigability (HA4) T0	1.644	3.453	.018
	Responsibility (SD1) T0	7.673	2.619	.047
	Empathy (C2) T0	3.866	2.609	.048
