# Clinical insight in anorexia nervosa: Associated and predictive factors

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## Insight and Anorexia

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**Abstract**

Clinical and cognitive factors associated with clinical insight regarding both baseline level and its time-related changes, in outpatients treated for anorexia nervosa. The 193 participants were recruited at 13 French centers specializing in eating disorders (*FFAB network*) and assessed for insight (SAI-ED), body mass index (BMI), eating disorder severity, symptoms of depression and anxiety, emotional state, silhouette, and functionality; two cognitive tests were also administered. The 137 patients were then re-assessed 18 weeks later. Minimum and ideal subjective BMI and premorbid intelligence were associated with poor baseline insight. Contrary to nearly all other clinical factors, the level of insight revealed no improvement after four months of care. Only the higher value of the minimum lifetime BMI was significantly predictive of increased insight. More positive emotions (PANAS), less symptoms of depression and anxiety (HADS scores), and fewer syndromes (HADS above threshold) were the only factors that covaried with the changes in the level of insight. In conclusion, poor insight has little time variability, contrary to nearly all clinical and cognitive factors. As increased insight is mainly accompanied by improvements in the emotional domain, the latter could represent potential targets for patients with lack of awareness about their eating disorder.

**Key-words:** eating disorders, outcome, prognosis, depression, anxiety, cognitions, silhouette

## 1. INTRODUCTION

Lewis (1934) was the first to present a definition of clinical insight, referring to it as "the amount of realization the patient has of his own condition." This concept was later described as a multidimensional concept (David, 1990) including awareness of the illness, attribution of symptoms to the disease, and treatment compliance.

A large range of psychiatric disorders is associated with poor clinical insight (Goldberg, Green-Paden, Lehman, & Gold, 2001). They include schizophrenia (David et al., 1995), mood disorders (Ghaemi, Boiman, & Goodwin, 2000; Ghaemi & Rosenquist, 2004; van der Werf-Eldering et al., 2011), dementia (Harwood, Sultzer, & Wheatley, 2000; Zanetti et al., 1999), addiction (Arbel, Koren, Klein, & Latzer, 2013; Moeller et al., 2010), and eating disorders (Konstantakopoulos, Tchanturia, Surguladze, & David, 2011).

Patients with anorexia nervosa may be particularly impaired by poor insight (Arbel et al., 2013), as this disorder is characterized by distorted cognitions about body weight and shape and ambivalence about and variability in motivation to recover (Vitousek, Watson, & Wilson, 1998). Indeed, early descriptions of anorexia nervosa considered an individual's conviction of being fat despite an obvious state of emaciation to possibly be a delusion (Powers, Simpson, & T., 2005). Accordingly, Lasègue (Lasègue, 1873) and Bruch (Bruch, 1973) very early on highlighted that a drive for thinness was a key characteristic of anorexia nervosa and was difficult to acknowledge by patients with this disorder.

The quality of insight has been proven to be of clinical relevance in the treatment and prognosis of psychiatric disorders. A lack of insight has been associated with a poorer quality of life (Dias, Brissos, Frey, & Kapczinski, 2008), diminished psychosocial functioning (Yen et al., 2007), capacity status (Owen et al., 2009), less therapeutic compliance (Kao & Liu, 2010), reduced cognitive performance (van der Werf-Eldering et al., 2011), and more severe symptoms of an underlying psychiatric disorder (Cairns et al., 2005; Mintz, Dobson, &

Romney, 2003). Furthermore, enhancing motivation through specific (such as motivational interviews) and nonspecific interventions is considered to be essential in the treatment of eating disorders (Mac Donald et al., 2013; Denyson-day et al., 2018). The factors underlying a low level of initial insight are not well understood. Moreover, considering the lack of prospective studies, the possible drivers of insight improvement have rarely been analyzed. As indicated in a recent meta-analysis, the effectiveness of specialized treatments for anorexia nervosa has not improved over the past 40 years, and even though such treatments are relatively effective at returning patients to a healthy weight in the short term, they have no more impact on cognitive (psychological) symptoms and weight in the long term than non-specialized treatment (Murray, Quintana, Loeb, Griffiths, & Le Grange, 2018). Therefore, factors associated with improved insight could constitute interesting targets for intervention in patients with a low level of motivation for treatment.

The analysis in this paper was facilitated by the development of a valid and easily applicable instrument for the assessment of insight in anorexia nervosa: the Schedule for the Assessment of Insight for EDs (SAI-ED), a short (seven items) self-report questionnaire, which is easy to fill-in and compute (Konstantakopoulos et al., 2011). We decided to use the French network of treatment centers specialized in eating disorder and evaluate the insight of a number of patients diagnosed with anorexia nervosa twice, on average 18 weeks apart. We focused on three aspects, namely the consequences of anorexia nervosa on functionality, the potentially associated traits of depression and anxiety, and cognitions (efficiency and cognitive flexibility only). We generated the hypothesis that insight is closely linked to these three elements, meaning that (1) patients with baseline poor insight are more anxious or depressed and have more cognitive impairment; (2) that these three aspects are predictive of a poorer improvement of insight; and finally (3) that all factors improve with increasing insight.

## 2. METHODS

### *2.1 Instruments*

The clinical diagnosis of anorexia nervosa in the respondents in this study was verified by psychiatrists with at least five years expertise in eating disorders. They used a list of DSM-5 criteria and assessed the patients during a face-to-face interview at each site. Clinical assessments also inquired about present, subjective ideal, and lifetime (since puberty, if present) minimum and maximum BMI, age at onset of anorexia nervosa, and the presence of a familial history of this disorder (checked through the proband only). Minimum and maximum BMI respectively serve as abbreviations of lifetime lowest and lifetime highest BMI in the rest of this text for reasons of simplicity.

A set of specific questionnaires and tests was provided to every patient with an established diagnosis after obtaining their consent during the first visit. All tests except one (the National Adult Reading test (NART)) were repeated during the second (follow-up) session.

Insight was assessed through the SAI-ED self-report questionnaire (Konstantakopoulos et al., 2011), with the possible answers being positive, negative or unsure: 1 point was attributed for a positive answer (representing evidence of intact insight) and 0 for other responses. Since a threshold for poor versus preserved insight is usually considered to be useful in clinical practice, we divided patients into two groups, one with those with a score below 4 (corresponding to poor insight) and the other with the respondents who scored higher than or equal to 4 (high insight) (Konstantakopoulos et al., 2011). Even if the SAI-ED questionnaire has not been fully validated, it has been demonstrated to have a significant level of internal consistency (Cronbach's α 0.77). The French version was adopted after forward and backward translation of the scale. The Cronbach's α was determined to be "acceptable" (0.63) in the present sample. Eating disorder symptomatology was assessed using a French version of the Eating Attitudes Test-26 (EAT-26) (Garner & Garfinkel, 1979; Leichner, Steiger,

151 Puentes-Neuman, Perreault, & Gottheil, 1994). There are three subdivisions of the EAT-26,
152 which distinguishes “bulimia,” “dieting,” and “oral control” (Garner & Garfinkel, 1979).
153 Patient functionality was assessed using the Work and Social Adjustment Scale (WSAS)
154 (Mundt, Marks, Shear, & Greist, 2002). This instrument assesses the level of impairment in
155 the ability to work, manage the home, engage in social and private leisure activities, and
156 maintain close relationships. The maximum possible score is 40, with lower scores
157 representing better functionality.
158 Patients also undertook a body image perception test that consisted of viewing a diagram
159 representing the progression of ten female silhouettes (from 1 meaning "very thin” to 10
160 meaning “very fat”), each corresponding to a specific BMI (Williamson, Cubic, & Gleaves,
161 1993). Patients were then instructed to choose the silhouettes that they perceived to most
162 closely represent their current body image.
163 Respondents’ crystalline intelligence was assessed by the French version of the NART
164 (Mackinnon & Mulligan, 2005), a proven tool used to measure prior intellectual functioning.
165 The test requires participants to successfully pronounce 50 irregular words that violate the
166 grapheme-phoneme correspondence rules. The Brixton test (Burgess & Shallice, 1997), which
167 has been revealed to reflect cognitive flexibility in various types of patients with anorexia
168 nervosa (Tchanturia et al., 2011), was also administered to the patients involved in this study.
169 During this test, the subject is asked to predict the movements of a blue circle, which changes
170 location after each response. A concept (rule) has to be inferred from its movements to make
171 accurate predictions. Occasionally, the pattern of movement changes, and the participant has
172 to abandon the old concept in favor of a new one. Previous research suggests that there exists
173 no practice effect for this test (Burke et al., 2014).
174 Depression and anxiety scores were measured with the Hospital and Anxiety Depressive
175 Scale (HADS), a self-report instrument (Zigmond & Snaith, 1983) with seven questions

devoted to depression and a further seven to anxiety. This instrument provides quantitative and qualitative data, as, for both depression and anxiety, a score above 8 has been validated for current depressive or anxiety disorder (Bjelland, Dahl, Haug, & Neckelmann, 2002). Because the presence of a depressive or anxious disorder was evaluated both at the beginning and at the end of the protocol, we computed the number of patients in remission from these conditions during the second visit.

The emotional state of the study participants was assessed using the Positive and Negative Affect Schedule (PANAS), a self-report questionnaire that consists of two 10-item scales that reflect positive and negative affects (for example "active" is a positive affect and "guilty" is a negative affect)(Crawford & Henry, 2004). Each item is rated on a 5-point scale, with 1 signifying that words characterize the patient "not at all", and 5 meaning they "very much" do.

To simplify the comparison of the main socio-demographic aspects of the participants, we divided subjects into groups based on a number of different factors, such as their educational level (university graduates *versus* below), working activity (full or half-time *versus* absence), and familial history of eating disorder (having at least one relative at the second-degree diagnosed with anorexia nervosa or bulimia nervosa *versus* negative).

*2.2 Sample*

Female patients fulfilling the criteria for anorexia nervosa were screened for inclusion in 13 eating disorders centers throughout France. The care provided can vary between centers, but it consistently includes a multidisciplinary approach, involving both a psychiatrist or a psychologist and a nutritionist or a dietician. All patients are offered at least one recognized psychological approach to eating disorders (family therapy, cognitive-behavioral therapy, interpersonal therapy…), and psychotropic drugs are prescribed when needed (primarily antidepressants). Initially, 210 out-patients were included.

We ultimately excluded one center because all (N=13) patients were lost to follow-up, therefore basing our sample on the other 12 centers from all over France, with three located specifically in the Paris region. Each center recruited a minimum of four and a maximum of 37 patients for the current study. Four patients were excluded because there was mandatory data missing, such as their initial BMI (N=3) or their age (N=1).

The target schedule for the second visit was four months after the first visit, but there was room left for flexibility. In the end, the shortest follow-up took place 60 days later, while the longest did not occur until 15 months after the initial evaluation (sd=77.36); the average delay was close to our target (121.47 days). To address this variability, the delay between visits was included in the analyses, and, if relevant, it was also included in the multivariate approaches.

Of the respondents included in the initial analyses (N=193), 56 patients did not attend the follow-up visit (29,02%). This sample had a center effect ($\chi^2$29.257, df=12, p=.004), more frequently concerned outpatients ($\chi^2$=12.668, df=2, p.002), and was characterized by a higher initial (16.128, sd=2.966; sd=F=5.116, p=.025), minimum (13.919, sd=2.159; F=8.397, p=.004), and highest (21.970, sd=5.666; F=4.441, p=.036) BMI, and fewer positive (26.05, sd=7.986; F=6.534, p=.011) and negative (26.04, sd=6.641; F=55.982, p<.001) emotions according to the results of PANAS (Table 1).

*2.3 Statistics*

The normal distribution was initially tested for all the main variables (age, BMI, Brixton score, and EAT, NART, HADS, PANAS, and WSAS scores) and was statistically rejected for the majority (Kolmogorov-Smirnov test, p<.05). Non-parametric approaches (Mann-Whitney for averages, Fisher exact test for percentages, and Spearman for quantitative variables) were then used, except for the analyses of time-related changes, as in this case all the values had a normal distribution (Kolmogorov-Smirnov test, p>.05). The real values are included in the tables (beside rank values) for easier reading. To test the role of all significantly associated

variables, logistic regression analyses were used whenever the residual variance had a normal distribution (which was systematically checked before applying).

The problem of multiple testing was taken into account by using multivariate analyses at each stage of our hypotheses: our conclusions were based on these results only, rather than on all the significant statistics assessing all the parameters.

## 3. RESULTS

The initial sample of 193 patients was first assessed in terms of their level of insight. Applying the categorical approach, 88% of patients (N=171) were classified as having a high level insight (SAI-ED total score > 4). Patients with low insight (score < 4) were younger, with an earlier age at the onset of the eating disorder; they had a lower ideal subjective BMI and a lower NART value and rated themselves as larger than patients with better insight (Table 1). The multivariate approach indicated that the ideal subjective BMI ($\chi^2$=10.790, df=1, p=.001) and the NART score ($\chi^2$=5.241, df=1, p=.022) were the only features associated with poor insight: these two variables correctly classified 92.7% of patients.

When insight was assessed in a continuous way (Table 2), a significant positive correlation was observed between the level of insight (SAI-ED total score) and different continuous variables including age, present, minimum, and ideal subjective BMI, and the NART, silhouette, and WSAS scores. Insight also varied according to the patients' family history and their level of education (Table 2). In the multivariate analysis, the ideal subjective (t=4.168, p<.001) and minimum lifetime (t=3.184, p=0.002) BMI and the NART score (t=2.739, p=.007) were the only parameters still significantly associated with poorer insight. With an $r^2$ of 0.334, around a third of the total variance is explained by these three factors.

For the prospective approach of the protocol, the analyses were restricted to the 137 patients who were assessed at the second visit in average 18 weeks later. A substantial change

in the clinical picture of the patients was observed at this time (Table 3): patients had increased BMI and cognitive flexibility; the severity of their eating disorder was reduced; they presented less anxiety and depression at the dimensional and at the syndromic level; they were characterized by more positive emotions; they assessed themselves as larger; and they had an increased level of functioning (Table 3). Interestingly, in a logistic regression analysis taking into account collinearity, the improvement of the Brixton score (Wald $\chi^2$=9.354, p=0002) and the choice of a larger silhouette (Wald $\chi^2$=5.405, p=.020) were the only variables distinguishing the two waves of assessment. The level of insight revealed no statistical improvement, with only 27 patients increasing their insight between meetings.

We then assessed the baseline factors that were predictive of increased insight (gaining at least one point in the SAI-ED total score during the follow-up visit). Only the value of the minimum BMI (15.98 vs. 13.98) was significantly higher in patients who presented an improvement of their level of insight (Table 4). This tendency was still observed when a logistic regression analysis was performed for the multivariate conclusion (Wald ($\chi^2$=4.485, p=.034), with a minor capacity to predict such improvement ($r^2$=3.6%).

The next step of our analysis involved determining which factors' changes were most correlated (covarying) with the modifications observed in the level of insight over time (Table 5). Increased insight was correlated with increased PANAS positive emotions and decreased HADS-anxiety and HADS-depression scores: at a qualitative level, this involved an improvement of the positive PANAS score and caused the HADS scores to move below the threshold for depressive and anxiety disorders. Within the linear regression analysis based on these different factors, only values below the threshold for anxiety disorders were significantly associated with increased insight (p=.046), and the $r^2$ of the model was relatively low (9.7%).

As there is a wide variance in the ages represented in our sample (which makes sense considering that the 13 centers have variable recruitment methods), we reanalyzed the datasets restricting the analyses to adults only (i.e. aged 18 years or older). Some differences were observed (see appendixes for details), and the following similarities became clear: (1) the ideal BMI and NART values continue to explain a large percentage (93.5%) of poor insight (Table 1', appendix); (2) the ideal subjective and minimum lifetime BMI are still correlated to the level of insight, with these two parameters (along with the NART score) now only explaining 18.1% of the variance- (Table 2', appendix); (3) the Brixton and the silhouette ratings are still largely improved with time, even though they are not retained when collinearity is taken into account (Table 3', appendix); (4) the minimum lifetime BMI remains the most significant variable ($r^2$=6.4%) associated with later increased insight (Table 4', appendix); and (5) the factors covarying with the levels of insight between the two visits are more or less the same (Table 5', appendix).

## 4. DISCUSSION

The main results of this analysis revealed that poor insight in outpatients diagnosed with anorexia nervosa, assessed qualitatively or quantitatively, was strongly associated with ideal BMI and pre-morbid IQ (NART score) in this sample. After four months of a specialized treatment regime, nearly all clinical and cognitive factors improved, mainly due to increased cognitive flexibility and less body size image distortion. However, intriguingly, the level of insight was rarely improved. Furthermore, we observed only one baseline factor limiting the chances for later increased insight, minimum lifetime BMI, which presented a very limited predictive capacity (<5%). Increased insight between the two visits mainly co-varied with emotional and mood aspects, such as a more positive emotional state and decreased anxiety and mood symptoms and syndromes.

Contrary to our initial non-specific hypothesis, cognitive efficiency might play a role in traits rather than states and does not appear to be a limiting factor for improved insight (the NART score was associated with lower baseline insight but did not predict its time-related changes). The clinical factors involved in the level of insight mainly concerned ideal subjective BMI (associated) and lifetime minimum BMI (prognostic). The results reveal that associated mood and emotional aspects also play a major role, probably as accompanying factors. An improved depressive syndrome, a reduced level of depression, or increased positive emotions, were indeed all associated with improved insight in this study.

At the clinical level, three conclusions could be drawn from this study in which insight was assessed in a prospective manner. Firstly, despite the clinically successful treatment of all clinical and cognitive markers, insight was not improved in the vast majority of patients after an average of four months of specialized care. This discrepancy between clinical and insight improvements has already been demonstrated in studies concerning other psychiatric disorders, such as bipolar disorder (in which treatment outcome was not associated with the level of baseline insight) (Ghaemi et al., 2000) and schizophrenia (in which insight did not necessarily improve while other symptoms did) (Boczkowski, Zeichner, & DeSanto, 1985; Gunderson et al., 1984; Penn et al., 2009). The concept of insight and the way it is assessed could also explain why the level of insight did not change much among treated patients. Insight represents how patients recognize their disorder and potentially also the level of its severity. The overall improvement in eating or weight symptoms could rightly lead patients to rate a decreased need for care. The increase of insight might, therefore, be more difficult to detect following the improvement of these facets in the sample. However, the use of an instrument (SAI-ED) assessing a core aspect of the disorder (ask for care) with dichotomous ratings, may represent a psychometric limit. Another potential explanation is related to the self-report instead of the clinician-based approach, which was used to assess insight in the

present study. Indeed, self-report and clinician-based subscales of an instrument assessing insight in schizophrenia (VAGUS) were moderately correlated (Jeong et al., 2017), therefore potentially providing divergent results (Rozalski et al., 2019). On the other hand, self-reported data may give valuable information which is not accessible through clinician-based assessments, such as patient's unique beliefs and values (Cleary et al., 2014; Karow et al., 2008; Uher et al., 2012), and may be advantageous in uncovering the multidimensional nature of insight (Ouzir et al., 2012). Furthermore, a strong correlation was observed between clinician-rated and self-report ratings when the analyses are restricted to the *global* score of insight (Jeong et al., 2017). As all analyses performed here were based on the total score of SAI-ED, the self-report type of rating used in the protocol might have a limited impact on our results.

Secondly, there are very few known factors that preclude the possibility of improving insight, and the only one in our sample (minimum BMI) had a very low capacity of prediction. This is an important observation for clinicians, as it could mean that there is no objective marker to determine which patients have the lowest chance of improved insight. Improved mood and anxiety aspects were strongly associated with increased insight, and indeed, negative affects and mood symptoms have long been considered important target when providing effective treatments (Haynos et al., 2017; Solmi et al., 2018). In another study performed on patients with bipolar disorder, depressive symptoms were predictive of poorer insight (van der Werf-Eldering et al., 2011). Therefore, targeting mood and anxiety could be important to improve the insight of patients who are not sufficiently aware of their disorder and its severity to request care.

Thirdly, premorbid IQ was highly associated with the level of baseline insight in our sample, contrary to the results of a previous study on insight in anorexia nervosa (Konstantakopoulos et al., 2011). This is possibly because of the differences between these samples (only anorexia

nervosa out-patients are considered in the present sample while a mix of anorexia nervosa and bulimia nervosa in- and out-patients are analyzed in the aforementioned study). However, our findings are comparable to previous studies concerning schizophrenia (Aleman, Agrawal, Morgan, & David, 2006; Gerretsen et al., 2013). Notably, in a sample of patients with schizophrenia aged 60 years or more, the level of insight was better explained by premorbid intellectual function (24% of the total variance) than illness severity (16% of the variance) (Gerretsen et al., 2013). Concerning cognitive flexibility, we found that the changes in the Brixton test scores played only a very limited role in predicting an increase in insight. The Wisconsin card sorting test (WCST) has previously been associated with clinician-rated unawareness of illness but not self-rated insight (Trevisi et al., 2012). The Brixton score might, therefore, be insufficiently sensitive. However, among different tests used to detect the level of impairment of patients with anorexia nervosa, the Brixton test has been rated as one of the strongest (Tchanturia et al., 2004).

In accordance with the fact that our study sample was recruited from real-life treatment settings, this work has some important limitations. Firstly, the attrition rate was relatively high (around 29%), and our sample was largely heterogeneous, especially regarding age, and therefore not necessarily representative. Of the participants in our study, 29 were minors, and the SAI-ED scale has not been validated in this age group, limiting the generalizability of our results. Underage study participants were also overrepresented in the low baseline insight group, confirming our general finding that insight increases with age. Notably, after we excluded this group from the total sample, the results did not differ significantly. Moreover, the patients that were lost to the follow-up had significantly less positive and negative emotions based on their PANAS results. This point is somewhat concerning, as emotional avoidance has been demonstrated to be associated with poorer treatment outcomes (Seidel et al., 2018). However, these patients had no other differences in clinical criteria that would

indicate differences in disease severity. Moreover, most of the attrition rates of studies on anorexia nervosa ranged between 20% and 40% (Dejong, Broadbent, & Schmidt, 2012), averaging around 30% (Abdelbaky, Hay, & Touyz, 2013). Even though this attrition rate is in a "normal" range, it is important to acknowledge that it limits the capacity to generalize our results.

A number of other factors that have been previously revealed to be correlated with insight and that could have been interesting to assess are missing in the present analysis. Notably, this study does not use other assessments of cognitive flexibility (such as the TMT or the Wisconsin test), other cognitive functions, such as memory (Nair, Palmer, Aleman, & David, 2014), and executive function (Nair et al., 2014) and does not include any aspect of social cognitions. Psychiatric and addictive comorbidity (Yen et al., 2009); prescribed psychotropic drugs (Catapano et al., 2010); or associated personality disorders (Catapano et al., 2010). Social cognitions might be particularly lacking in the present analyses, as being correlated to insight in different psychiatric disorders (Béland et al., 2017; Vaskinn et al., 2013), and relatively independent from the neuro-cognitive tests used in this protocol. Actually, a two-factor model representing 'social cognition' and 'neurocognition' as separate constructs fitted the data of 100 patients with schizophrenia significantly better than a one-factor model (Sergi et al., 2007).

The use of psychotherapy that aims to increase insight was also not discussed, although this element could also be considered significant. The list of items assessed in this study was already relatively long and increasing it could have potentially impacted the recruitment process and the already high attrition rate. Moreover, the study sample was relatively large but unselected, reflecting real-life clinical settings. Studies more focused on rigorously selected samples could be a valuable approach to specific domains of insight in eating disorders. A possible study target could be patients with delusional ideas and a lack of

awareness of their illness. Interestingly, around 20% of patients with anorexia nervosa were considered as having delusional eating beliefs (Steinglass et al., 2007). Taking into account the complex overlap between anorexia nervosa, obsessive-compulsive disorder (Starcevic & Brakoulias, 2014), and disorders on the autism spectrum (Karjalainen, Rastam, Paulson-Karlsson, & Wentz, 2018) would require a specific study.

This study was also somewhat limited by the fact that all the univariate statistics were non-parametric due to the absence of normal distribution. This might have impacted the statistical possibility of detecting less important but nonetheless significant factors. However, a number of factors emerged, in this relatively heterogenous sample, that explain a fairly large proportion of the total variance, and making sense at a clinical level. This supports the use of a type of statistical method designed for non-normally distributed parameters.

Finally, refeeding is associated with improvements in various cognitive and behavioral symptoms of anorexia nervosa. However, in the current study, we did not detect a significant correlation between insight and BMI, in accordance with a previous cross-sectional study (Kontantakopoulos et al., 2010). Nevertheless, the relatively short follow-up period in our study precludes the capacity to detect the benefits of long-term weight gain. It is conceivable that the level of weight restoration during this period was not sufficient to impact the level of insight. Future studies with longer follow-up periods are needed to explore the association between refeeding and insight levels more precisely.

In conclusion, the level of insight did not change much during the treatment of the respondents in this survey. However, the improvement of the different facets of depression and anxiety was accompanied by an improvement of insight. Non-specific techniques are frequently used (such as a motivational interview) for patients with poor insight, but it might be interesting to focus directly on depression and anxiety symptoms, as they represent the most covarying factors according to the present cohort.

## REFERENCES


Abdelbaky, G., Hay, P., Touyz, S. , 2013. Factors associated with treatment attrition in anorexia nervosa: A systematic review. OA Evidence-Based Medicine. 1(1), 8.

Aleman, A., Agrawal, N., Morgan, K. D., David, A. S. , 2006. Insight in psychosis and neuropsychological function: meta-analysis. Br J Psychiatry. 189, 204-212.

Arbel, R., Koren, D., Klein, E., Latzer, Y. , 2013. The neurocognitive basis of insight into illness in anorexia nervosa: a pilot metacognitive study. Psychiatry Res. 209(3), 604-610.

Bjelland, I., Dahl, A. A., Haug, T. T., Neckelmann, D. , 2002. The validity of the Hospital Anxiety and Depression Scale. An updated literature review. J. Psychosom Res. 52(2), 69-77.

Boczkowski, J. A., Zeichner, A., DeSanto, N. , 1985. Neuroleptic compliance among chronic schizophrenic outpatients: an intervention outcome report. J. Consult. Clin. Psychol. 53(5), 666-671.

Bruch, H. , 1973. Eating disorders: Obesity, Anorexia Nervosa, and the Person within: Basic Books.

Burgess, P., Shallice, T. , 1997. The Hayling and Brixton Tests. Test manual.

Burke, T., Wynne, B., O'Brien, C., Elamin, M., Bede, P., Hardiman, O., Pender, N. , 2014. Retrospective investigations of practice effects on repeated neuropsychological measures of executive functioning. The Irish Journal of Psychology. 35(4), 178-187.

Cairns, R., Maddock, C., Buchanan, A., David, A. S., Hayward, P., Richardson, G., Hotopf, M. , 2005. Prevalence and predictors of mental incapacity in psychiatric in-patients. Br. J. Psychiatry. 187, 379-385.

Catapano, F., Perris, F., Fabrazzo, M., Cioffi, V., Giacco, D., De Santis, V., Maj, M. , 2010. Obsessive-compulsive disorder with poor insight: a three-year prospective study. Prog Neuropsychopharmacol Biol. Psychiatry. 34(2), 323-330.

Cleary, S.D., Bhatty, S., Broussard, B., Cristofaro, S.L., Wan, C.R., Compton, M.T., 2014. Measuring insight through patient self-report: an in depth analysis of the factor structure of the Birchwood Insight Scale. Psychiatry Res. 216(2), 263-8.

Crawford, J. R., Henry, J. D. , 2004. The positive and negative affect schedule (PANAS): construct validity, measurement properties and normative data in a large non-clinical sample. Br. J. Clin. Psychol. 43(Pt 3), 245-265.

David, A. , 1990. Insight. Lancet. 336(8715), 634.

David, A., van Os, J., Jones, P., Harvey, I., Foerster, A., Fahy, T. , 1995. Insight and psychotic illness. Cross-sectional and longitudinal associations. Br. J. Psychiatry. 167(5), 621-628.

Dejong, H., Broadbent, H., Schmidt, U. , 2012. A systematic review of dropout from treatment in outpatients with anorexia nervosa. Int. J. Eat Disord. 45(5), 635-647.

Dias, V. V., Brissos, S., Frey, B. N., Kapczinski, F. , 2008. Insight, quality of life and cognitive functioning in euthymic patients with bipolar disorder. J. Affect Disord. 110(1-2), 75-83.

Garner, D. M., Garfinkel, P. E. , 1979. The Eating Attitudes Test: an index of the symptoms of anorexia nervosa. Psychol. Med. 9(2), 273-279.

Gerretsen, P., Mulsant, B. H., Liu, A. Y., Granholm, E., Menon, M., Graff-Guerrero, A., Rajji, T. K. , 2013. Insight into illness in late-life schizophrenia: a function of illness severity and premorbid intellectual function. Schizophr. Res. 150(1), 217-222.

Ghaemi, S. N., Boiman, E., Goodwin, F. K. , 2000. Insight and outcome in bipolar, unipolar, and anxiety disorders. Compr. Psychiatry. 41(3), 167-171.

Ghaemi, S. N., Rosenquist, K. J. , 2004. Is insight in mania state-dependent?: A meta-analysis. J. Nerv. Ment. Dis. 192(11), 771-775.
Goldberg, R. W., Green-Paden, L. D., Lehman, A. F., Gold, J. M. , 2001. Correlates of insight in serious mental illness. J. Nerv. Ment. Dis. 189(3), 137-145.
Gunderson, J. G., Frank, A. F., Katz, H. M., Vannicelli, M. L., Frosch, J. P., Knapp, P. H., 1984. Effects of psychotherapy in schizophrenia: II. Comparative outcome of two forms of treatment. Schizophr Bull. 10(4), 564-598.
Harwood, D. G., Sultzer, D. L., Wheatley, M. V. , 2000. Impaired insight in Alzheimer disease: association with cognitive deficits, psychiatric symptoms, and behavioral disturbances. Neuropsychiatry Neuropsychol. Behav. Neurol. 13(2), 83-88.
Haynos, A. F., Berg, K. C., Cao, L., Crosby, R. D., Lavender, J. M., Utzinger, L. M., . . . Crow, S. J., 2017. Trajectories of higher- and lower-order dimensions of negative and positive affect relative to restrictive eating in anorexia nervosa. J. Abnorm. Psychol. 126(5), 495-505.
Jeong, S.H., Chung, I.W., Jung, H.Y., Hwang, S.S., Kim, S.H., Youn, T., Chung, J.K., Kim, Y.S., 2017. Comparison of clinician-rated and self-report insight in Korean patients with schizophrenia using VAGUS insight scale. Psychiatry Res. 258, 93-100.
Kao, Y. C., Liu, Y. P. , 2010. Compliance and schizophrenia: the predictive potential of insight into illness, symptoms, and side effects. Compr. Psychiatry. 51(6), 557-565.
Karjalainen, L., Rastam, M., Paulson-Karlsson, G., Wentz, E. , 2019. Do autism spectrum disorder and anorexia nervosa have some eating disturbances in common? Eur. Child Adolesc. Psychiatry. 28(1), 69-78.
Karow, A., Pajonk, F.G., Reimer, J., Hirdes, F., Osterwald, C., Naber, D., Moritz, S., 2008. The dilemma of insight into illness in schizophrenia: self- and expert-rated insight and quality of life. Eur Arch Psychiatry Clin Neurosci. 258(3):152-9.
Konstantakopoulos, G., Tchanturia, K., Surguladze, S. A., David, A. S. , 2011. Insight in eating disorders: clinical and cognitive correlates. Psychol. Med. 41(9), 1951-1961.
Lasègue, C. , 1873. De l'anorexie hystérique. Archives Générales de Médecine. i. 385–403.
Leichner, P., Steiger, H., Puentes-Neuman, G., Perreault, M., Gottheil, N. , 1994. Validation d'une échelle d'attitudes alimentaires auprès d'une population québécoise francophone. Revue can. de psychiatrie. 39(1), 49-53.
Macdonald, P., Hibbs, R., Corfield, F., Treasure, J. , 2012. The use of motivational interviewing in eating disorders: a systematic review. Psychiatry Res. 200(1), 1-11.
Mackinnon, A., Mulligan, R. , 2005. [The estimation of premorbid intelligence levels in French speakers]. encephale. 31(1 Pt 1), 31-43.
Mintz, A. R., Dobson, K. S., Romney, D. M. , 2003. Insight in schizophrenia: a meta-analysis. Schizophr. Res. 61(1), 75-88.
Moeller, S. J., Maloney, T., Parvaz, M. A., Alia-Klein, N., Woicik, P. A., Telang, F., Goldstein, R. Z. , 2010. Impaired insight in cocaine addiction: laboratory evidence and effects on cocaine-seeking behaviour. Brain. 133(Pt 5), 1484-1493.
Mundt, J. C., Marks, I. M., Shear, M. K., Greist, J. H. , 2002. The Work and Social Adjustment Scale: a simple measure of impairment in functioning. Br. J. Psychiatry. 180, 461-464.
Murray, S. B., Quintana, D. S., Loeb, K. L., Griffiths, S., Le Grange, D. , 2018. Treatment outcomes for anorexia nervosa: a systematic review and meta-analysis of randomized controlled trials. Psychol. Med. 1-10.
Nair, A., Palmer, E. C., Aleman, A., David, A. S. , 2014. Relationship between cognition, clinical and cognitive insight in psychotic disorders: a review and meta-analysis. Schizophr. Res. 152(1), 191-200.

Ouzir, M., Azorin, J.M., Adida, M., Boussaoud, D., Battas, O., 2012. Insight in schizophrenia: from conceptualization to neuroscience. Psychiatry Clin Neurosci. 66(3), 167-79.
Owen, G. S., David, A. S., Richardson, G., Szmukler, G., Hayward, P., Hotopf, M. , 2009. Mental capacity, diagnosis and insight in psychiatric in-patients: a cross-sectional study. Psychol. Med. 39(8), 1389-1398.
Penn, D. L., Meyer, P. S., Evans, E., Wirth, R. J., Cai, K., Burchinal, M. , 2009. A randomized controlled trial of group cognitive-behavioral therapy vs. enhanced supportive therapy for auditory hallucinations. Schizophr. Res. 109(1-3), 52-59.
Powers, P., Simpson, H., T., M. , 2005. Anorexia nervosa and psychosis. Primary Psychiatry. 12, 39-45.
Rozalski, V., McKeegan, G.M., 2019. Insight and Symptom Severity in an Inpatient Psychiatric Sample. Psychiatr Q. 90(2), 339-350.
Seidel, M., King, J. A., Ritschel, F., Boehm, I., Geisler, D., Bernardoni, F., Ehrlich, S. , 2018. The real-life costs of emotion regulation in anorexia nervosa: a combined ecological momentary assessment and FMRI study. Transl. Psychiatry. 8(1), 28.
Sergi, M.J., Rassovsky, Y., Widmark, C., Reist, C., Erhart, S., Braff, D.L., Marder, S.R., Green, M.F., 2007. Social cognition in schizophrenia: relationships with neurocognition and negative symptoms. Schizophr Res. Feb;90(1-3):316-24.
Solmi, M., Collantoni, E., Meneguzzo, P., Degortes, D., Tenconi, E., Favaro, A., 2018. Network analysis of specific psychopathology and psychiatric symptoms in patients with eating disorders. Int. J. Eat Disord. 51(7), 680-692.
Starcevic, V., Brakoulias, V. , 2014. New diagnostic perspectives on obsessive-compulsive personality disorder and its links with other conditions. Curr. Opin Psychiatry. 27(1), 62-67.
Tchanturia, K., Anderluh, M. B., Morris, R. G., Rabe-Hesketh, S., Collier, D. A., Sanchez, P., Treasure, J. L. , 2004. Cognitive flexibility in anorexia nervosa and bulimia nervosa. J Int. Neuropsychol. Soc. 10(4), 513-520.
Tchanturia, K., Harrison, A., Davies, H., Roberts, M., Oldershaw, A., Nakazato, M., Treasure, J., 2011. Cognitive flexibility and clinical severity in eating disorders. PLoS One. 6(6), e20462.
Trevisi, M., Talamo, A., Bandinelli, P. L., Ducci, G., Kotzalidis, G. D., Santucci, C., Tatarelli, R., 2012. Insight and awareness as related to psychopathology and cognition. Psychopathology. 45(4), 235-243.
Uher, R., Perlis, R.H., Placentino, A., Dernovšek, M.Z., Henigsberg, N., Mors, O., Maier, W., McGuffin, P., Farmer, A., 2012. Self-report and clinician-rated measures of depression severity: can one replace the other? Depress Anxiety. 29(12), 1043-9.
van der Werf-Eldering, M. J., van der Meer, L., Burger, H., Holthausen, E. A., Nolen, W. A., Aleman, A. , 2011. Insight in bipolar disorder: associations with cognitive and emotional processing and illness characteristics. Bipolar Disord. 13(4), 343-354.
Vaskinn, A., Sundet, K., Ueland, T., Agartz, I., Melle, I., Andreassen, O.A., 2013. Social cognition and clinical insight in schizophrenia and bipolar disorder. J Nerv Ment Dis, 201(6), 445-51.
Vitousek, K., Watson, S., Wilson, G. T. , 1998. Enhancing motivation for change in treatment-resistant eating disorders. Clin Psychol Rev. 18(4), 391-420.
Williamson, D. A., Cubic, B. A., Gleaves, D. H. , 1993. Equivalence of body image disturbances in anorexia and bulimia nervosa. J Abnorm Psychol. 102(1), 177-180.
Yen, C. F., Chen, C. S., Yang, S. J., Ko, C. H., Yen, J. Y., Huang, C. F. , 2007. Relationships between insight and psychosocial adjustment in patients with bipolar I disorder. Bipolar Disord. 9(7), 737-742.

Yen, C. F., Hsiao, R. C., Chen, C. C., Lin, H. C., Yen, C. N., Ko, C. H., Chen, C. S. , 2009. The role of insight to alcohol use disorders in insight to schizophrenia. Compr. Psychiatry. 50(1), 58-62.

Zanetti, O., Vallotti, B., Frisoni, G. B., Geroldi, C., Bianchetti, A., Pasqualetti, P., Trabucchi, M. , 1999. Insight in dementia: when does it occur? Evidence for a nonlinear relationship between insight and cognitive status. J Gerontol B Psychol Sci Soc Sci. 54(2), P100-106.

Zigmond, A. S., Snaith, R. P., 1983. The hospital anxiety and depression scale. Acta. Psychiatr. Scand. 67(6), 361-370.

Table 1: Social and clinical characteristics of 193 patients with anorexia nervosa with different level of insight

| | Good insight (N=171) | | | Poor insight (N=22) | | | Statistics | | |
|---|---|---|---|---|---|---|---|---|---|
| | Average | | | Average | | | Fisher exact test | U | p-value |
| | Value | Rank | % | Value | Rank | % | | | |
| Age | 25,86 | 102,44 | | 18,82 | 50,64 | | | 861,0 | **<.001** |
| Education (High) | | | 40,48% | | | 18,18% | 4,108 | | 0,060 |
| Working (presently) | | | 22,29% | | | 7,69% | 1,533 | | 0,304 |
| Familial history of eating disorder (positive) | | | 30,41% | | | 13,64% | 3,072 | | 0,215 |
| Subtype (restrictive) | | | 65,81% | | | 50,00% | 1,921 | | 0,216 |
| Age at onset (eating disorder) | 17,41 | 100,80 | | 14,27 | 63,30 | | | 1139,5 | **0,003** |
| Age at onset (binging) | 19,45 | 42,84 | | 16,70 | 27,95 | | | 224,5 | 0,06 |
| Age at onset (purging) | 20,05 | 47,03 | | 14,36 | 19,41 | | | 147,5 | **0,001** |
| BMI (baseline) | 15,58 | 96,25 | | 15,56 | 102,82 | | | 1753,0 | 0,604 |
| Lifetime minimal BMI | 13,46 | 90,54 | | 13,55 | 94,68 | | | 1536,5 | 0,333 |
| Lifetime maximal BMI | 21,69 | 92,59 | | 20,34 | 78,20 | | | 1354,0 | 0,247 |
| Subjective ideal BMI | 17,58 | 96,37 | | 15,69 | 49,74 | | | 755,0 | **<.001** |
| NART | 26,18 | 102,40 | | 20,50 | 50,93 | | | 867,5 | **<.001** |
| BRIXTON | 32,44 | 96,33 | | 34,18 | 102,23 | | | 1766,0 | 0,641 |
| EAT Total | 33,79 | 95,41 | | 37,05 | 109,34 | | | 1609,5 | 0,271 |
| EAT Dieting | 17,80 | 94,95 | | 21,27 | 112,91 | | | 1531,0 | 0,156 |
| EAT Bulimia | 7,85 | 97,31 | | 7,73 | 94,57 | | | 1827,5 | 0,828 |
| EAT Oral | 8,13 | 97,42 | | 8,05 | 93,70 | | | 1808,5 | 0,768 |
| HADS Anxiety score | 13,10 | 97,40 | | 12,45 | 93,89 | | | 1812,5 | 0,781 |
| HADS anxiety-syndrome (present) | | | 18,71% | | | 27,27% | 0,392 | | 0,245 |
| HADS Depression score | 8,96 | 98 | | 8,23 | 89,2 | | | 1709,5 | 0,485 |
| HADS depression-syndrome (present) | | | 45,03% | | | 40,91% | 0,821 | | 0,448 |
| PANAS Positive | 28,23 | 97,68 | | 27,64 | 91,68 | | | 1764,0 | 0,635 |
| PANAS Negative | 32,63 | 98,01 | | 31,50 | 89,14 | | | 1708,0 | 0,483 |
| Self rated silhouette | 4,30 | 93,96 | | 5,64 | 120,61 | | | 1361,5 | **0,034** |
| WSAS | 22,84 | 99,71 | | 18,45 | 75,93 | | | 1417,5 | 0,06 |

The quality if insight was based on the SAI-ED score below 3 included (poor insight) versus 4 and over (good insight)

BMI=Body mass index, NART=National Adult Reading Test, EAT=Eating Attitudes Test, HADS=Hospital and Anxiety Depressive Scale, PANAS=Positive and Negative Affect Schedule, Silhouette, WSAS=Work and Social Adjustment Scale.

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Table 2: Factors correlated to, or associated with, the level of insight in 193 patients with anorexia nervosa

| Patients' baseline characteristics | SAI-ED total score | | |
|---|---|---|---|
| | U | Rho (Spearman) | p |
| Age | | 0,303 | **<0,001** |
| Education (High) | 3405,5 | | **0,018** |
| Working (presently) | 2142,5 | | 0,288 |
| Familial history of eating disorder (positive) | 3004,5 | | **0,029** |
| Subtype (restrictive) | 3367,0 | | 0,607 |
| Age at onset (eating disorder) | | 0,114 | 0,114 |
| Age at onset (binging) | | 0,195 | 0,167 |
| Age at onset (purging) | | 0,274 | **0,045** |
| BMI | | -0,213 | **0,003** |
| Lifetime minimal BMI | | -0,278 | **<0,001** |
| Lifetime maximal BMI | | -0,002 | 0,975 |
| Subjective ideal BMI | | 0,173 | **0,020** |
| NART | | 0,383 | **<0,001** |
| BRIXTON | | 0,007 | 0,925 |
| EAT Total | | 0,039 | 0,586 |
| EAT Dieting | | -0,083 | 0,251 |
| EAT Bulimia | | 0,212 | **0,003** |
| EAT Oral | | 0,193 | **0,007** |
| HADS Anxiety score | | 0,106 | 0,144 |
| HADS anxiety-syndrome (present) | 2854,5 | | 0,763 |
| HADS Depression score | | 0,014 | 0,850 |
| HADS depression-syndrome (present) | 4496,0 | | 0,779 |
| PANAS (Positive) | | 0,024 | 0,744 |
| PANAS (Negative) | | 0,039 | 0,588 |
| Self rated silhouette | | -0,217 | **0,002** |
| WSAS | | 0,171 | **0,017** |

BMI=Body mass index, NART=National Adult Reading Test, EAT=Eating Attitudes Test, HADS=Hospital and Anxiety Depressive Scale, PANAS=Positive and Negative Affect Schedule, Silhouette, WSAS=Work and Social Adjustment Scale.

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Table 3: Clinical characteristics of 114 patients with anorexia nervosa seen three months apart

| Clinical characteristics | Before follow-up | | | | After follow-up | | | | Statistics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average | | | | Average | | | | U (MW) | Fisher exact test | p-value |
| | Average | sd | Rank | % | Average | sd | Rank | % | | | |
| Insight (SAI-ED) | 5,5203 | 1,32659 | 165,549 | | 5,17073 | 1,5025 | 150,16 | | 10895 | | 0,13377 |
| BMI | 15,304 | 1,80071 | 148,187 | | 16,3247 | 2,30557 | 187,822 | | 9879 | | 0,0002 |
| Lifetime minimal BMI | 13,329 | 1,7232 | 149,102 | | 14,4475 | 5,70117 | 159,868 | | 10516,5 | | 0,29543 |
| Lifetime maximal BMI | 21,192 | 3,40094 | 159,97 | | 22,2679 | 7,87168 | 144,132 | | 10141,5 | | 0,12376 |
| Subjective ideal BMI | 17,47 | 1,96226 | 145,382 | | 17,8523 | 1,83025 | 160,779 | | 9806,5 | | 0,13374 |
| BRIXTON | 33,374 | 10,8586 | 143,762 | | 37,6585 | 10,3645 | 184,873 | | 9025 | | <0,001 |
| EAT Total | 34,553 | 16,5728 | 176,959 | | 26,0488 | 17,4553 | 134,024 | | 8886 | | <0,001 |
| EAT Dieting | 18,382 | 10,4768 | 174,378 | | 14,0407 | 10,3301 | 137,976 | | 9384 | | 0,00057 |
| EAT Bulimia | 7,7398 | 4,39418 | 174,715 | | 5,98374 | 4,88555 | 137,46 | | 9319 | | 0,0004 |
| EAT Oral | 8,4309 | 4,77542 | 175,948 | | 6,02439 | 4,68248 | 135,571 | | 9081 | | 0,00013 |
| HADS Anxiety score | 13,211 | 4,1375 | 170,197 | | 11,6016 | 4,68121 | 142,984 | | 9998 | | 0,00977 |
| HADS anxiety-syndrome (present) | | | | 78,90% | | | | 65,90% | | 7,673 | 0,004 |
| HADS Depression score | 9,0407 | 3,76001 | 172,448 | | 7,39024 | 4,08242 | 139,508 | | 9563,5 | | 0,00175 |
| HADS depression-syndrome (present) | | | | 47,20% | | | | 30,10% | | 5,75 | 0,011 |
| PANAS Positive | 29,228 | 6,73845 | 147,06 | | 30,6911 | 7,04334 | 178,708 | | 9661,5 | | 0,00269 |
| PANAS Negative | 35,927 | 7,8669 | 158,14 | | 32,4878 | 9,45946 | 161,6 | | 11800 | | 0,74292 |
| Self rated silhouette | 4,1951 | 2,57561 | 150,578 | | 5,07317 | 2,57405 | 173,276 | | 10340,5 | | 0,03044 |
| WSAS | 23,577 | 8,20037 | 169,308 | | 19,2114 | 10,4366 | 142,956 | | 9976,5 | | 0,01243 |

585 BMI=Body mass index, NART=National Adult Reading Test, EAT=Eating Attitudes Test, HADS=Hospital and Anxiety Depressive Scale,
586 PANAS=Positive and Negative Affect Schedule, Silhouette, WSAS=Work and Social Adjustment Scale.

**Table 4**: Characteristics of 123 patients with anorexia nervosa who improved (versus did not) their level of insight after (in average) 4 months of care in eating disorders specialized care centers

| Baseline characteristics | Stable or decreased insight (N=96) | | | | Improved insight (N=27) | | | | Statistics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | sd | Average rank | % | Mean | sd | Average rank | % | U (Mann-Whitney) | Fisher exact test | p |
| AGE | 24,92 | 8,80 | 62,71 | | 26,19 | 15,78 | 61,79 | | 1324,0 | | 0,905 |
| Education (High) | | | | 45,7% | | | | 25,0% | | 3,838 | 0,079 |
| Working (presently) | | | | 22,6% | | | | 14,3% | | 0,704 | 0,553 |
| Familial history of eating disorder (positive) | | | | 69,5% | | | | 78,6% | | 0,879 | 0,476 |
| Subtype (restrictive) | | | | 65,1% | | | | 61,5% | | 0,111 | 0,817 |
| Age at onset (eating disorder) | 17,24 | 4,65 | 63,87 | | 16,74 | 5,53 | 59,98 | | 1273,5 | | 0,615 |
| Age at onset (binging) | 19,45 | 5,06 | 27,09 | | 19,62 | 8,37 | 26,75 | | 269,5 | | 0,944 |
| Age at onset (purging) | 19,82 | 5,33 | 28,63 | | 18,92 | 8,14 | 26,14 | | 261,0 | | 0,615 |
| BMI | 15,23 | 1,87 | 60,80 | | 15,56 | 1,55 | 70,63 | | 1144,5 | | 0,206 |
| Lifetime minimal BMI | 13,14 | 1,76 | 54,07 | | 14,02 | 1,42 | 72,14 | | 771,5 | | **0,017** |
| Lifetime maximal BMI | 21,28 | 3,51 | 58,40 | | 20,86 | 3,00 | 56,56 | | 1089,0 | | 0,807 |
| Subjective ideal BMI | 17,53 | 1,71 | 59,36 | | 17,24 | 2,74 | 50,88 | | 947,0 | | 0,257 |
| NART | 26,20 | 6,35 | 66,24 | | 23,70 | 5,78 | 51,79 | | 1044,0 | | 0,062 |
| BRIXTON | 33,66 | 10,96 | 64,12 | | 32,37 | 10,65 | 59,13 | | 1249,5 | | 0,520 |

**Table 4** (continued): Characteristics of 123 patients with anorexia nervosa who improved (versus did not) their level of insight after (in average) 4 months of care in eating disorders specialized care centers

| Baseline characteristics | Stable or decreased insight (N=96) | | | | Improved insight (N=27) | | | | Statistics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EAT Total | 33,80 | 16,17 | 61,24 | | 37,22 | 18,00 | 69,09 | | 1187,5 | | 0,312 |
| EAT Dieting | 17,77 | 10,27 | 60,74 | | 20,56 | 11,12 | 70,82 | | 1139,0 | | 0,194 |
| EAT Bulimia | 7,58 | 4,35 | 61,64 | | 8,30 | 4,58 | 67,70 | | 1226,5 | | 0,434 |
| EAT Oral | 8,45 | 4,84 | 62,78 | | 8,37 | 4,61 | 63,75 | | 1337,0 | | 0,901 |
| HADS anxiety score | 12,89 | 4,21 | 60,57 | | 14,37 | 3,69 | 71,43 | | 1122,0 | | 0,161 |
| HADS anxiety-syndrome (present) | | | | 76,3% | | | | 89,3% | | 2,228 | 0,188 |
| HADS depression score | 9,03 | 3,67 | 62,57 | | 9,07 | 4,12 | 64,48 | | 1316,5 | | 0,805 |
| HADS depression-syndrome (present) | | | | 47,4% | | | | 46,4% | | 0,009 | 0,999 |
| PANAS (Positive) | 29,02 | 6,92 | 61,78 | | 29,96 | 6,13 | 67,23 | | 1239,5 | | 0,482 |
| PANAS (Negative) | 35,27 | 8,10 | 60,25 | | 38,26 | 6,61 | 72,52 | | 1091,5 | | 0,114 |
| Self rated silhouette | 4,20 | 2,58 | 62,68 | | 4,19 | 2,62 | 64,13 | | 1326,5 | | 0,851 |
| WSAS | 23,80 | 7,82 | 63,59 | | 22,78 | 9,57 | 60,96 | | 1301,0 | | 0,735 |
| Between visits delay | 126,4 | 84,9 | 64,13 | | 111,7 | 62,5 | 54,44 | | 1092,0 | | 0,212 |

587 BMI=Body mass index, NART=National Adult Reading Test, EAT=Eating Attitudes Test, HADS=Hospital and
588 Anxiety Depressive Scale, PANAS=Positive and Negative Affect Schedule, Silhouette, WSAS=Work and Social
589 Adjustment Scale.

Table 5: Factors covarying with the level of insight between two visits of 123 patients with anorexia nervosa in specialized treatment centers

| Variables | Statistics | | |
|---|---|---|---|
| | rho | U (MW) | p |
| Age | -,129 | | ,157 |
| BMI (difference) | -,094 | | ,302 |
| Subjective ideal BMI (difference) | ,131 | | ,192 |
| Brixton (difference) | ,011 | | ,907 |
| Brixton score (improved) | | 1518,5 | ,314 |
| EAT Total (difference) | ,084 | | ,357 |
| EAT Dieting (difference) | ,053 | | ,558 |
| EAT Bulimia (difference) | -,119 | | ,190 |
| EAT Oral (difference) | ,075 | | ,412 |
| HADS anxiety (difference) | ,212 | | **,019** |
| Anxiety (in remission) | | 789 | **,015** |
| HADS depression (difference) | ,190 | | **,036** |
| Depression (in remission) | | 1139,5 | **,041** |
| PANAS negative (difference) | ,116 | | ,200 |
| PANAS negative (improved) | | 1416 | ,212 |
| PANAS positive (difference) | -,177 | | **,050** |
| PANAS positive (improved) | | 1403 | **,025** |
| Self rated silhouette (difference) | ,029 | | ,747 |
| Self rated silhouette (improved) | | 1690,5 | ,301 |
| WSAS (difference) | ,164 | | ,700 |
| WSAS (improved) | | 1349 | ,065 |
| Between visits delay | -,031 | | ,731 |

BMI=Body mass index, NART=National Adult Reading Test, EAT=Eating Attitudes Test, HADS=Hospital and Anxiety Depressive Scale, PANAS=Positive and Negative Affect Schedule, Silhouette, WSAS=Work and Social Adjustment Scale.

595 **Appendices**

Table 1' (appendix): Social and clinical characteristics of 163 adult patients with anorexia nervosa with different level of insight

| | Good insight (N=152) | | | Poor insight (N=11) | | | Statistics | | |
|---|---|---|---|---|---|---|---|---|---|
| | Average | | | Average | | | Fisher exact test | U | p-value |
| | Value | Rank | % | Value | Rank | % | | | |
| Age | 26,576 | 83,5 | | 23 | 61,2 | | | 607 | 0,129 |
| Education (High) | | | 45,27% | | | 36,36% | 0,334 | | 0,402 |
| Working (presently) | | | 23,29% | | | 10,00% | 1,121 | | 0,298 |
| Familial history of eating disorder (positive) | | | 32,21% | | | 9,09% | 3,153 | | 0,097 |
| Subtype (restrictive) | | | 62,77% | | | 27,27% | 5,276 | | **0,024** |
| Age at onset (eating disorder) | 17,727 | 82,5 | | 15,636 | 68,0 | | | 682 | 0,321 |
| Age at onset (binging) | 19,647 | 38,8 | | 18 | 30,0 | | | 182 | 0,306 |
| Age at onset (purging) | 20,108 | 43,7 | | 15,375 | 21,4 | | | 135,5 | **0,012** |
| BMI (baseline) | 15,641 | 80,5 | | 16,248 | 103,0 | | | 605 | 0,126 |
| Lifetime minimal BMI | 13,391 | 75,6 | | 13,938 | 91,1 | | | 512,5 | 0,306 |
| Lifetime maximal BMI | 21,73 | 76,8 | | 20,581 | 71,1 | | | 594,5 | 0,702 |
| Subjective ideal BMI | 17,501 | 80,0 | | 16,233 | 56,0 | | | 505 | 0,104 |
| NART | 26,993 | 84,2 | | 22,636 | 44,4 | | | 422,5 | **0,006** |
| BRIXTON | 32,457 | 82,6 | | 30,273 | 73,3 | | | 740,5 | 0,527 |
| EAT Total | 34,629 | 80,3 | | 43,545 | 105,8 | | | 574,5 | 0,084 |
| EAT Dieting | 18,166 | 80,1 | | 24,455 | 107,7 | | | 553 | 0,061 |
| EAT Bulimia | 8,1656 | 80,7 | | 10,273 | 99,5 | | | 643,5 | 0,201 |
| EAT Oral | 8,298 | 81,7 | | 8,8182 | 85,9 | | | 793,5 | 0,778 |
| HADS Anxiety score | 13,199 | 80,9 | | 14,818 | 97,5 | | | 666 | 0,259 |
| HADS anxiety-syndrome (present) | | | 82,12% | | | 90,91% | 0,641 | | 0,401 |
| HADS Depression score | 9,1523 | 82,3 | | 8,6364 | 78,0 | | | 792 | 0,77 |
| HADS depression-syndrome (present) | | | 47,02% | | | 45,45% | 0,01 | | 0,586 |
| PANAS Positive | 28,132 | 83,1 | | 25,636 | 66,4 | | | 664,5 | 0,256 |
| PANAS Negative | 32,642 | 81,6 | | 34,182 | 87,7 | | | 773 | 0,677 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Self rated silhouette | 4,3311 | 79,9 | 6,2727 | 110,7 | 520 | **0,035** |
| WSAS | 23,338 | 83,0 | 20,273 | 68,6 | 688 | 0,327 |

The quality if insight was based on the SAI-ED score below 3 included (poor insight) versus 4 and over (good insight).
BMI=Body mass index, NART=National Adult Reading Test, EAT=Eating Attitudes Test, HADS=Hospital and Anxiety Depressive Scale, PANAS=Positive and Negative Affect Schedule, Silhouette, WSAS=Work and Social Adjustment Scale.

596

Table 2' (appendix): Factors correlated to, or associated with, the level of insight in 163 patients with anorexia nervosa

| Patients' baseline characteristics | SAI-ED total score | | |
|---|---|---|---|
| | U | Rho (Spearman) | p |
| Age | | 0,156 | **0,047** |
| Education (High) | 2823 | | 0,232 |
| Working (presently) | 1941 | | 0,437 |
| Familial history of eating disorder (positive) | 2193,5 | | **0,036** |
| Subtype (restrictive) | 2436 | | 0,380 |
| Age at onset (eating disorder) | | -0,009 | 0,914 |
| Age at onset (binging) | | 0,096 | 0,412 |
| Age at onset (purging) | | 0,218 | **0,049** |
| BMI | | -0,270 | **0,000** |
| Lifetime minimal BMI | | -0,335 | **0,000** |
| Lifetime maximal BMI | | -0,064 | 0,432 |
| Subjective ideal BMI | | 0,103 | 0,200 |
| NART | | 0,333 | **0,000** |
| BRIXTON | | 0,079 | 0,317 |
| EAT Total | | -0,019 | 0,808 |
| EAT Dieting | | -0,152 | 0,052 |
| EAT Bulimia | | 0,157 | **0,045** |
| EAT Oral | | 0,158 | **0,044** |
| HADS Anxiety score | | 0,038 | 0,628 |
| HADS anxiety-syndrome (present) | 2972,5 | | 0,244 |
| HADS Depression score | | -0,056 | 0,481 |
| HADS depression-syndrome (present) | 4496 | | 0,779 |
| PANAS (Positive) | | 0,074 | 0,351 |

| | | |
|---|---|---|
| PANAS (Negative) | -0,047 | 0,552 |
| Self rated silhouette | -0,238 | **0,002** |
| WSAS | 0,117 | 0,136 |

BMI=Body mass index, NART=National Adult Reading Test, EAT=Eating Attitudes Test, HADS=Hospital and Anxiety Depressive Scale, PANAS=Positive and Negative Affect Schedule, Silhouette, WSAS=Work and Social Adjustment Scale.

Table 3' (appendix): Clinical characteristics of 106 adult patients with anorexia nervosa seen three months apart

| Clinical characteristics | Before follow-up | | | | After follow-up | | | | Statistics | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average | | | | Average | | | | U (MW) | Fisher exact test | p-value |
| | Average | sd | Rank | % | Average | sd | Rank | % | | | |
| Insight (SAI-ED) | 5,625 | 1,2818 | 142,06 | | 5,292 | 1,413 | 124,137 | | 7487,5 | | 0,057 |
| BMI | 15,679 | 2,324 | 123,01 | | 16,538 | 2,285 | 159,813 | | 6685 | | **0,000** |
| Lifetime minimal BMI | 13,42 | 1,997 | 123,39 | | 14,687 | 5,876 | 137,119 | | 7127,5 | | 0,146 |
| Lifetime maximal BMI | 21,694 | 4,649 | 133,65 | | 22,269 | 8,074 | 123,547 | | 7425 | | 0,285 |
| Subjective ideal BMI | 17,419 | 1,873 | 124,06 | | 17,786 | 1,782 | 137,814 | | 7108 | | 0,148 |
| BRIXTON | 32,214 | 11,74 | 122,00 | | 37,140 | 10,954 | 156,051 | | 6521,5 | | **0,000** |
| EAT Total | 35,343 | 16,308 | 150,17 | | 27,401 | 17,306 | 113,15 | | 6329 | | **0,000** |
| EAT Dieting | 18,674 | 10,168 | 147,77 | | 14,700 | 10,377 | 116,799 | | 6719,5 | | **0,001** |
| EAT Bulimia | 8,319 | 4,5956 | 148,18 | | 6,4672 | 4,972 | 116,182 | | 6653,5 | | **0,001** |
| EAT Oral | 8,3496 | 4,864 | 148,86 | | 6,233 | 4,594 | 115,136 | | 6541,5 | | **0,001** |
| HADS Anxiety score | 13,325 | 3,888 | 144,27 | | 11,934 | 4,637 | 120,731 | | 7126,5 | | **0,015** |
| HADS anxiety-syndrome (present) | | | | 82,82 % | | | | 31,13 % | | 7,005 | **0,006** |
| HADS Depression score | 9,13 | 4,085 | 146,96 | | 7,584 | 4,084 | 116,60 | | 6689 | | **0,002** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 3 | | | | 4 | | | |
| HADS depression-syndrome (present) | | | | 47,24 % | | | | 31,13 % | 6,996 | **0,006** |
| PANAS Positive | 27,938 | 7,5683 7 | 123,89 | 30,632 | 7,111 | 152,08 5 | 6828 | | | **0,004** |
| PANAS Negative | 32,809 | 8,5833 3 | 132,21 8 | 33,292 | 9,205 | 139,27 8 | 8185,5 | | | 0,467 |
| Self rated silhouette | 4,484 | 2,7852 3 | 83,398 8 | 5,037 | 2,589 | 214,86 9 | 228 | | | **0,000** |
| WSAS | 23,147 | 8,9926 1 | 144,45 4 | 19,723 | 10,262 | 119,04 8 | 6935 | | | **0,009** |

602 BMI=Body mass index, NART=National Adult Reading Test, EAT=Eating Attitudes Test, HADS=Hospital and Anxiety Depressive Scale,
603 PANAS=Positive and Negative Affect Schedule, Silhouette, WSAS=Work and Social Adjustment Scale.

Table 4' (appendix): Characteristics of 106 patients with anorexia nervosa who improved (versus did not) their level of insight after (in average) 4 months of care in eating disorders specialized care centers

| Baseline characteristics | Stable or decreased insight (N=83) | | | | Improved insight (N=23) | | | | Statistics | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | sd | Average rank | % | Mean | sd | Average rank | % | U (Mann-Whitney) | Fisher test | | p |
| AGE | 26,493 | 8,332 | | | 29,173 | 16,372 | | | 922,5 | | | 0,806 |
| Education (High) | | | | 29,63% | | | | 14,29% | | 3,575 | | 0,050 |
| Working (presently) | | | | 22,78% | | | | 14,29% | | 0,774 | | 0,301 |
| Familial history of eating disorder (positive) | | | | 15,63% | | | | 25,00% | | 1,186 | | 0,212 |
| Subtype (restrictive) | | | | 18,97% | | | | 26,32% | | 0,716 | | 0,273 |
| Age at onset (eating disorder) | 17,674 | 4,682 | | | 17,956 | 6,335 | | | 927,0 | | | 0,832 |
| Age at onset (binging) | 19,878 | 4,815 | | | 20,928 | 9,425 | | | 244,5 | | | 0,759 |
| Age at onset (purging) | 20,062 | 5,159 | | | 20,923 | 9,393 | | | 246,5 | | | 0,780 |
| BMI | 15,316 | 1,937 | | | 15,741 | 1,573 | | | 815 | | | 0,285 |
| Lifetime minimal BMI | 13,122 | 1,825 | | | 14,217 | 1,595 | | | 515 | | | 0,023 |
| Lifetime maximal BMI | 21,438 | 3,520 | | | 21,381 | 3,413 | | | 770 | | | 0,999 |
| Subjective ideal BMI | | | | | | | | | 769 | | | 0,669 |
| NART | 27,301 | 5,807 | | | 25,173 | 4,867 | | | 724 | | | 0,076 |
| BRIXTON | 33,180 | 11,468 | | | 32,304 | 11,210 | | | 927,5 | | | 0,836 |
| EAT Total | 35,626 | 14,812 | | | 39,695 | 17,874 | | | 824,5 | | | 0,319 |
| EAT Dieting | 18,626 | 9,629 | | | 21,869 | 11,410 | | | 790,5 | | | 0,208 |
| EAT Bulimia | 8,132 | 4,140 | | | 9,130 | 4,475 | | | 823,5 | | | 0,313 |
| EAT Oral | 8,867 | 4,940 | | | 8,695 | 4,138 | | | 948,5 | | | 0,963 |
| HADS anxiety score | 13,156 | 4,097 | | | 15,173 | 2,886 | | | 702,5 | | | 0,053 |
| HADS anxiety-syndrome (present) | | | | 5,26% | | | | 25,29% | | 4,662 | | 0,044 |
| HADS depression score | 9,277 | 3,686 | | | 9,608 | 3,893 | | | 899,5 | 0,672 | | |
| HADS depression-syndrome (present) | | | | 20,75% | | | | 22,64% | | | 0,056 | 0,500 |
| PANAS (Positive) | 29,192 | 7,162 | | | 29,565 | 6,185 | | | 911,5 | | | 0,741 |
| PANAS (Negative) | 35,867 | 7,605 | | | 39,478 | 5,035 | | | 685 | | | 0,039 |
| Self-rated silhouette | 4,265 | 2,650 | | | 4,565 | 2,936 | | | 916 | | | 0,766 |
| WSAS | 24,313 | 7,920 | | | 24,260 | 8,291 | | | 945,5 | | | 0,945 |
| Between visits delay | 130,231 | 87,5149 | | | 117,227 | 68,218 | | | 764,5 | | | 0,273 |

Table 5' (appendix): Factors covarying with the levels of insight between two visits of 123 patients with anorexia nervosa in specialized treatment centers

| Variables | Statistics | | |
|---|---|---|---|
| | rho | U (MW) | p |
| Age | -0,059 | | 0,551 |
| BMI (difference) | -0,037 | | 0,711 |
| Subjective ideal BMI (difference) | 0,136 | | 0,208 |
| Brixton (difference) | 0,026 | | 0,792 |
| Brixton score (improved) | | 1165 | 0,446 |
| EAT Total (difference) | 0,127 | | 0,195 |
| EAT Dieting (difference) | 0,109 | | 0,267 |
| EAT Bulimia (difference) | -0,108 | | 0,269 |
| EAT Oral (difference) | 0,087 | | 0,373 |
| HADS anxiety (difference) | 0,220 | | **0,024** |
| Anxiety (got in remission) | | 525,5 | **0,011** |
| HADS depression (difference) | 0,197 | | **0,043** |
| Depression (got in remission) | | 773 | **0,012** |
| PANAS negative (difference) | 0,123 | | 0,209 |
| PANAS negative (improved) | | 1053,5 | 0,190 |
| PANAS positive (difference) | -0,179 | | 0,066 |
| PANAS positive (improved) | | 1039,5 | **0,032** |
| Self-rated silhouette (difference) | 0,025 | | 0,800 |
| Self-rated silhouette (improved) | | 1248,5 | 0,311 |
| WSAS (difference) | 0,159 | | 0,105 |
| WSAS (improved) | | 1008 | 0,103 |
| Between visits delay | -0,008 | | 0,932 |

BMI=Body mass index, NART=National Adult Reading Test, EAT=Eating Attitudes Test, HADS=Hospital and Anxiety Depressive Scale, PANAS=Positive and Negative Affect Schedule, Silhouette, WSAS=Work and Social Adjustment Scale