The development of the Schedule for the Assessment of Insight in Eating Disorders (SAI-ED): Dimensions and associations of insight in anorexia nervosa and bulimia nervosa

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Abstract

Objective: The present study aimed to examine the reliability, validity and internal structure of the newly developed, interview-based Schedule for the Assessment of Insight in Eating Disorders (SAI-ED), the differences in the level of insight between eating disorders (EDs), and the relationships of insight with demographic and clinical characteristics in EDs.

Method: Ninety-four female patients – 44 with anorexia nervosa (AN) and 50 with bulimia nervosa (BN) – were assessed with SAI-ED. The Brown Assessment of Beliefs Scale was used to evaluate convergent validity of SAI-ED. Hierarchical cluster analysis and multidimensional scaling were used to identify insight components and assess their inter-relationships.

Results: The final 8-item SAI-ED demonstrated good psychometric properties. Three subscales of SAI-ED were identified which measure major insight components: awareness of illness, awareness of symptoms, and treatment compliance. Moreover, the multidimensional scaling disclosed two underlying dimensions within the insight construct, representing the degree of 'insight specificity' and a spectrum of 'self-reflection'. Patients with AN had significant lower total and all item scores on SAI-ED than patients with BN. Impaired insight was associated with lower current and lowest lifetime BMI and more severe dietary restrain in AN. In BN insight was negatively associated with illness duration and severity of overall ED symptoms, body-related concerns and obsessionality.

Discussion: Our results indicate that insight is a multidimensional construct in EDs, associated with different clinical aspects in AN and BN. The SAI-ED is a valid and reliable tool for the assessment of insight in EDs patients.

KEYWORDS

insight, anorexia nervosa, bulimia nervosa, treatment compliance, clinical assessment

INTRODUCTION

Patients with anorexia nervosa (AN) very often deny their emaciation and are unaware of their illness. Lack of insight is present in most of AN patients, at least in the early phase of the illness, contributing to difficulties in assessment, avoidance of treatment, poor adherence to treatment, and high rates of drop-out and relapse (Vitousek 1998). Many patients with bulimia nervosa (BN) also have poor insight into illness; they do not recognize their distorted beliefs about body weight and shape and they value the function of binge-purge behaviour (Vitousek et al., 1991).

Although impaired insight is a common feature of eating disorders (EDs) and of great clinical importance, there was no specific clinical tool for its assessment until recently. Evidence on illness awareness in EDs derived from studies that classified patients as deniers or admitters of illness by clinical assessment (Halmi, 1974; Fisher et al., 2001) or based on low scores on self-report symptom questionnaires (Vanderdeycken and Vanderlinden, 1983; Newton et al., 1988; Couturier and Lock, 2006; Viglione et al., 2006). Other studies investigated associations of insight with outcome and other clinical aspects of EDs using the denial subscales of clinical instruments (Morgan and Russell, 1975; Casper et al., 1979; Goldberg et al., 1979; Halmi et al., 1979; Eckert et al., 1982; Steinhausen, 1986; Casper and Heller, 1991; Sunday et al., 1995; Saccomani et al., 1998; Bizeul et al., 2001). Widely discrepant rates of denial of the illness in AN (from 15% to 80%) were found in these studies, indicating that the methods used to identify patients as denying or insightful are probably insufficient.

More recent studies assessed delusionality of body image beliefs in EDs using the Brown Assessment of Beliefs Scale (BABS) (Eisen et al.,1998) and identified a significant minority of patients as delusional, i.e. lacking insight (10-28,8% in AN)

while many of them (26-30% in AN) had poor insight (overvalued ideas) (Steinglass et al., 2007; Konstantakopoulos et al., 2012; Hartmann et al., 2013; McKenna et al., 2014; Mountjoy et al., 2014). Not surprisingly, a strong association between delusionality and awareness of having a mental disorder was found (Konstantakopoulos et al., 2012). Noteworthy, the BABS is suggested as the measure to assess the insight specifier for obsessive-compulsive disorder, body dysmorphic disorder, hoarding disorder, and olfactory reference syndrome in the latest edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013).

Studies in psychosis have shown that insight is a multidimensional phenomenon and consists of several partially overlapping dimensions, including the ability to recognize that one has a mental illness, the capacity to re-label mental experiences as pathological and compliance with treatment (David, 1990). Many multidimensional scales for the assessment of insight in psychosis have been developed, such as the Schedule for the Assessment of Insight - Expanded version (SAI-E) (Kemp and David, 1997) and the Scale to Assess Unawareness of Mental Disorder (SUMD) (Amador et al., 1993). Disorder-specific scales for the assessment of insight in mood disorders have been developed by modifying items from scales already used in schizophrenia (Sturman and Sproule, 2003; Olaya et al., 2012). Similarly, a disorder-specific multidimensional scale could facilitate further research on the role of insight deficits in ED.

Two studies assessed insight in patients with AN with multidimensional scales already used in psychosis. Greenfeld and colleagues using a structured interview found that insight was correlated with a variety of positive outcome measures (severity of symptoms, body mass index [BMI], social functioning) in AN patients 1-10 years after hospitalization (Greenfeld et al., 1991). The second study used SUMD in AN patients

and found that 54% of them exhibited good and 46% poor insight into their illness (Arbel et al., 2014). None of these studies reported data on dimensions of insight.

Only one tool for the assessment of insight in EDs has been developed so far, the Schedule for the Assessment of Insight in Eating Disorders (SAI-ED) (Konstantakopoulos et al., 2011). It is a short, self-report instrument based on the content of SAI-E, a semi-structured interview for the multi-dimensional assessment of insight in psychosis (Kemp and David, 1997). The SAI-ED contains items on main components of insight, such as recognition of nervous/psychological condition and eating-related symptoms, but not on compliance with treatment, which could not be reliably evaluated solely on the basis of the self-reports. Furthermore, separate items on the need for physical and psychological treatment are included due to the specific nature of the EDs.

In a first small-scale study, the SAI-ED was administered to patients with AN and BN (Konstantakopoulos et al., 2011). Only a subgroup of AN patients (24%) demonstrated severe impairment of insight, although the level of insight varied among both AN and BN patients. Moreover, patients with the restricting type of AN had poorer overall insight than patients with the binge-purge type of the disorder. A more recent and larger study used SAI-ED in 193 patients with AN recruited from a French network of ED treatment centres and found that only 12% of the patients had low level of insight (Gorwood et al., 2019). However, insight impairment might be underestimated in these studies because of the self-report ratings, the dichotomous scoring and other psychometric shortcomings of SAI-ED.

Although the internal consistency of SAI-ED was high, two of the items, namely ‘awareness of need for physical treatment’ and ‘hypothetical contradiction’, were distant from the other items in multidimensional scaling analysis. It was also found that

more patients in both the AN and BN groups gave negative answers to these two questions compared to the remaining items of the SAI-ED. It is probable that the term 'physical treatment' has a variety of meanings to patients with EDs, such as medication, refeeding, or treatment for their physical condition. Therefore, many patients may answer negative in order to refuse certain treatment options although they recognize problems in their physical health. The 'hypothetical contradiction' item (how do you feel when people think you are overly preoccupied with your weight, shape, eating?) evaluates patient's capacity to take into account another person's perspective (Brett-Jones et al., 1987). Patients aware of their mental disorder and symptoms might disagree with a hypothetical other because they are reluctant to express this awareness to others in order to maintain control over their eating behavior or to avoid stigma. If this is the case, 'hypothetical contradiction' could be useful for the differentiation between deliberate denial and a lack of awareness of the illness. However, in SAI-ED there is no mention of 'mental disorder' or 'eating disorder' and the general term 'eating-related symptoms' is used in the question about awareness of symptoms. The acceptance of having a nervous/psychological condition and eating-related symptoms may not necessarily mean awareness of having an eating disorder, i.e. AN or BN. Therefore, some of the patients that gave positive answers in these questions, were not aware of their preoccupation with body weight and shape or eating.

Based on the above remarks, we developed the interview-based version of the SAI-ED. We anticipated that a clinician-rated instrument may be more accurate in assessing dimensions of insight, especially through questions on morbid experiences, e.g. the body image distortion, eating behaviours. Moreover, compliance with treatment rated by therapists can be included in the scale. Therefore, the new SAI-ED may better reveal distinct insight components. Finally, possible misunderstandings of the questions

and biases in response to them could be avoided through the interview process. For example, the use of the semi-structured interview form potentially reduces the 'over-compliance' effect (the confounding effect of patients' eagerness to please resulting to 'pseudo-agreement') which is more possible using self-report instrument, especially in patients with EDs (Vitousek et al., 1991).

The objectives of this study were: (a) to examine the reliability, validity and internal structure of the interview-based version of SAI-ED, (b) to estimate differences in the level of insight (overall and its dimensions) between AN and BN as well as between AN-R and AN-BP, and (c) to investigate the relationships of insight with demographic and clinical characteristics in EDs.

METHODS

Construction of the SAI-ED

The following considerations drove our decisions regarding the content and the format of SAI-ED. First, the scale needed to assess multiple aspects of insight in EDs, including the three major components identified in other psychiatric disorders (recognition of mental illness, awareness of symptoms, treatment compliance). Second, it should be easily administered and scored by a clinician who is aware of patient's symptomatology and compliance with treatment. Third, it needed to assess awareness and relabeling of the specific core ED symptoms that the patient has: (a) symptoms related to body image (weight loss, fear of fatness, preoccupation with body weight and shape) and (b) abnormal eating behaviours (restrictive eating, avoidance of fats and/or carbohydrate, binge eating, purgative behaviours, excessive exercise). Finally, other items of the self-report version of SAI-ED were included in the interview except the item on the need for physical treatment. Instead of this rather ambiguous item, a

question about the awareness of the physical consequences of abnormal eating was included in the scale.

The initial version of SAI-ED included the following items: (1) awareness of psychological changes, (2) awareness of having a nervous/psychological condition, (3) recognition of mental illness, (4) awareness of the psychosocial consequences of the condition, (5) awareness of the physical health consequences of the condition, (6) awareness of the need for treatment, (7a) awareness of weight loss and/or body image disturbances, (7b) ability to relabel weight loss and/or body image disturbances as pathological, (8a) awareness of abnormal eating behaviours, (8b) ability to relabel abnormal eating behaviours as pathological, (9) patient's capacity to take into account another person's perspective ('hypothetical contradiction' item), (10) compliance with treatment – a supplementary item rated by patient's therapist. The formulation and the scoring of the items was adapted from the SAI-E. Items 1-6 are rated from 0 to 2, while items 7a-9 are rated from 0 to 4, with higher scores indicating better insight. Treatment compliance is rated from 0 (complete refusal) to 5 (active participation).

Participants

Ninety-four female patients with AN or BN were consecutively recruited following referral to the Eating Disorders Unit of the Eginition University Hospital. Forty-four patients had AN – 21 the restricting type (AN-R) and 23 the binge-purge type (AN-BP) – and 50 patients suffer from BN according to DSM-5 criteria (American Psychiatric Association, 2013). All patients were native Greek speakers, aged 18-45. Exclusion criteria for participation in the study were: mental retardation, concurrent comorbidity with substance abuse-related disorders, chronic obsessive-compulsive disorder, body dysmorphic disorder, current mood episode and a history of psychosis. A total of 111

patients were invited to participate in the study, but 9 refused participation and 8 were not eligible for participation due to exclusion criteria.

Measures

The *Eating Disorder Examination Questionnaire (EDE-Q) 6.0* (Fairburn and Beglin, 2008) measures the severity of EDs symptomatology. The EDE-Q consists of four subscales, with 28 items in total, which assess Restraint of food intake, Concern about Eating, Concern about Shape and Concern about Weight. Items are scored in a range from 0 to 6, where higher scores imply higher severity of eating disorder symptoms. Each subscale's score is presented as a mean score, and Global EDE-Q score is calculated as the mean score of all the four subscales. The Greek version of EDE-Q 6.0 is a reliable tool with good psychometric properties (Pliatskidou et al., 2015).

The *Hospital Anxiety and Depression Scale (HADS)* (Zigmond and Snaith, 1983) is a self-report scale consisting of two 7-item subscales that measure current Anxiety and Depression. The Greek version of HADS has been shown with good psychometric properties (Michopoulos et al., 2008). The *Maudsley Obsessive–Compulsive Inventory (MOCI)* (Hodgson & Rachman, 1977) was used to measure obsessionality. It is a self-report 30-item instrument, including four subscales: Checking, Cleaning, Doubting and Slowness. The scale has been adjusted and validated in Greek by research groups at the University of Athens (Palermou et al., 2009).

The *Brown Assessment of Beliefs Scale* (BABS) (Eisen et al., 1998) was used in this study as criterion variable in order to assess the convergent validity of SAI-ED. BABS has been repeatedly used in EDs for the assessment the delusionality of current body image beliefs (Steinglass et al., 2007; Konstantakopoulos et al., 2012; Hartmann et al., 2013; McKenna et al., 2014; Mountjoy et al., 2014). It is a semi-structured interview which estimates dimensionally the degree of delusional thinking during the

past week related to a dominant belief and also provides cutoff points to categorize beliefs as *delusional* (lacking insight) and non-delusional with *poor insight (overvalued ideas)* or with *intact insight*. The following components of belief delusionality are assessed: (1) conviction, (2) perception of others' views, (3) explanation of differing views, (4) fixity of the belief, (5) attempt to disprove the belief, (6) insight into the symptomatic nature of the belief. Each item is rated from 0 to 4, with higher scores indicating poorer insight and are summed to reach a total score, ranging from 0 to 24. In a previous sensitivity-specificity analysis of the BABS in EDs, the threshold for delusional beliefs was set at a total score ≥ 18 plus a score of 4 on item 1, and for overvalued was set at a total score ≥ 13 plus score ≥ 3 on item 1 (Konstantakopoulos et al., 2012). Moreover, the same study found a strong association between body image delusionality and reduced awareness of mental illness in EDs.

Procedures

The study protocol was approved by the Eginition University Hospital Ethics Committee and all participants provided written consent. All clinical assessments were performed by the same physician rater (G.G.) with the exception of SAI-ED which was independently administered by the first author (G.K.). For the evaluation of SAI-ED interrater reliability, the 20 initial interviews were audiotaped and independently rated by three other authors (G.G., F.G., and I.M.). The SAI-ED was re-administered to one half of the participants by the same interviewer one week later in order to evaluate test-retest reliability.

Statistical analysis

Intraclass correlations (ICCs) were used to evaluate interrater and test-retest reliability of the and Pearson's product moment coefficient r was used to determine inter-item correlations and correlations between each item and the total score minus that item.

Cronbach's alpha was estimated in order to examine the internal consistency of the SAI-ED and its subscales.

The convergent validity was examined through the Spearman's rho values between SAI-ED and BABS total scores. Furthermore, criterion validity was assessed using Area-Under-the-Curve (AUC) statistics resulting from receiver operating characteristic (ROC) curves that examine sensitivity and specificity of the SAI-ED in identifying cases with delusional beliefs (lack of insight) versus no-delusional patients and subjects with impaired (delusional or overvalued ideas) versus intact insight. Patients were dichotomously categorized as delusional or non-delusional and as having impaired or intact insight according to their BABS scores. The ROC curves were also used to determine the optimal cutoff points (simultaneously maximizing both sensitivity and specificity) of SAI-ED for lack of insight and for poor insight (Carter et al., 2016).

We used hierarchical cluster analysis (HCA) and multidimensional scaling (MDS) to assess the internal structure of the SAI-ED. HCA and MDS can produce heuristic illustrations of the relationships between diverse items giving useful information unattainable through the statistical techniques based on correlations, such as factor analysis (Kemmler et al., 2002; Chang et al., 2009).

The aim of HCA was to clarify the non-overlapping cluster structure of the SAI-E. Therefore, Ward's method was used, which is designed to optimize the minimum variance within clusters, and is advantageous in the conditions of cluster overlap over other clustering techniques. The optimal number of clusters was determined according to the 'elbow' criterion in the percentage of variance explained by the clusters, plotting the agglomeration coefficient against the number of clusters (Everitt, 1993).

MDS analysis was also used to examine the potential components of insight and their interrelationships. MDS converts the degree of dissimilarity between two items into the geometric distance between two points in a space of a given number of dimensions (Kruskal and Wish, 1978), which we shall refer to as an MDS 'map'. MDS solutions can provide the most parsimonious model with the least possible dimensions. The location of the items on the MDS map can be used for the detection of clusters of items or individual items (Kemmler et al., 2002). Moreover, the dimensions of the MDS map might reflect features of the construct under study that underlie the structure of the scale. We used the MDS proximity scaling (PROXSCAL) procedure and the Euclidean distance as a measure of (dis)similarities. In order to select the optimal number of dimensions, the normalised raw stress was used as a badness-of-fit measure and the Tucker's φ coefficient of congruence as a goodness-of-fit measure (Borg and Groenen, 1997). The SAI-ED item scores were entered in both HCA and MDS after z transformation.

Normality was assessed with the Kolmogorov–Smirnov test, kurtosis values and relevant plots. Because the great majority of the examined variables did not follow a normal distribution, non-parametric tests were used for comparisons and correlation. Mann-Whitney U tests were performed for comparisons between groups. Spearman's coefficients rho were computed in order to assess strength of associations between insight – overall and extracted components – and other variables. The alpha level was set at 0.05. Statistical analyses were performed using IBM SPSS Statistics version 25.0.

RESULTS

Sample characteristics

Table 1 shows the demographic and clinical characteristics of the sample. No statistically significant differences were found between AN and BN groups with respect

to age, years of education and disease duration. As was to be expected, the current and the lowest lifetime BMI were significantly lower in AN than BN patients. AN patients scored significantly higher than BN patients on the Restrain and the Weight Concern subscales of EDE-Q, and the HADS – Anxiety. AN-R patients had significantly lower current BMI ($z = 2.02$, $p = 0.043$), EDE-Q Shape Concerns ($z = 2.13$, $p = 0.033$), Weight Concerns ($z = 2.99$, $p = 0.003$) and Global score ($z = 2.43$, $p = 0.015$) compared to AN-BP patients.

As shown in Table 1, the mean BABS total score was significantly higher in patients with AN than BN patients. There was no significant difference between AN-R and AN-BP patients in BABS total score ($z = 1.32$, $p = 0.186$). According to BABS cutoffs, 22.7% of AN patients had delusional body image beliefs (lack of insight) and 29.5% had overvalued ideas (poor insight). None of BN patients was classified as delusional while 34% of them had poor insight. These differences in frequencies between AN and BN were statistically significant ($\chi^2 = 12.87$, $p = 0.002$). Delusional beliefs were more frequent in AN-R than AN-BP (33.3% versus 13%) and overvalued ideas were found in 28.6% of AN-R patients and 30.4% of AN-BP patients. These differences between AN subgroups were not significant ($\chi^2 = 2.78$, $p = 0.249$)

[Table 1]

SAI-ED reliability and validity

The initial 12-item SAI-ED had high internal consistency (Cronbach's alpha = 0.85). However, three items – 'awareness of psychological changes', 'awareness of nervous/psychological condition', and 'awareness of the psychosocial consequences' – correlated weakly with the total score ($r = 0.23 – 0.39$) and the correlation of one item, namely 'awareness of consequences in physical health', with total score was very weak

(r = 0.14). The correlations of all other items with total score were moderate to strong (r = 0.52 – 0.77). The four aforementioned items also had very weak correlations (r = 0.00 – 0.19) with several other items, whereas the inter-item correlations of the remaining 8 items ranged from weak to strong (r = 0.35 – 0.78). Based on these results, we anticipated that the four items with very weak inter-item correlations may have a notable ceiling effect or may not be representative to the insight construct in EDs (i.e. the responses on these items may be inconsistent with awareness of mental illness and ED symptoms). Indeed, the mean scores on three of these items (on awareness of psychological changes, the psychosocial consequences and the consequences in physical health) were too close to the upper limit (= 2), ranging from 1.72 ± 0.54 to 1.79 ± 0.44. For the above reasons, these four items were excluded, leaving an 8-item instrument.

The Cronbach's alpha of the final version of SAI-ED was 0.88 indicating a high level of internal consistency. Alpha coefficients if each of the items was deleted were 0.84 – 0.87. The item – total correlations ranged from 0.51 (recognition of illness) to 0.80 (relabeling of eating pathology). The interrater reliability was good as the ICCs for the individual item scores ranged from 0.75 to 0.90 and for the total score was 0.89. The test-retest ICCs ranged from 0.77 to 0.92 for the individual items and for the total score was 0.91 indicating high test-retest reliability of the SAI-ED.

Regarding the convergent validity, SAI-ED total score was strongly correlated with the total score of BABS in the total sample (rho = - 0.86, $p < 0.001$), as well as separately, in the AN group (rho = - 0.88, $p < 0.001$) and the BN group (rho = - 0.75, $p < 0.001$). The results of the ROC analysis also showed high criterion-related validity of SAI-ED. The AUC statistics indicated that the SAI-ED total score has excellent rates (~ 97%) to correctly identify patients as delusional versus non-delusional (AUC =

0.973) and very good rates (~ 79%) to correctly identify patients as having impaired versus intact insight (AUC = 0.791). The best cutoff point indicating lack of insight was a SAI-ED total score of 16.5, which had a sensitivity of 90% and specificity of 94%. The optimal cutoff point for identifying impaired insight was 23.5, which had a sensitivity of 83% and specificity of 70%.

Internal structure of SAI-ED

The HCA solution is displayed as dendrogram in *Figure 1*. The elbow criterion suggested that the optimal number of clusters was three. The first cluster included the items on recognition and relabeling of the symptoms and the hypothetical contradiction item. Compliance with treatment was the only item in the second cluster. The third item included the items on recognition of having a mental disorder and awareness of the need for treatment.

[Figure 1]

The internal structure of the SAI-ED, as determined on the MDS map, is shown in *Figure 2*. The solution of the MDS procedure turned out to be two-dimensional. The normalised raw stress was 0.010 and the Tucker's φ was 0.995, indicating the solution identified was robust. Along the first dimension of the MDS map (dimension 1), we can clearly identify the three clusters revealed by the HCA. Moreover, the two dimensions revealed by MDS are amenable to interpretation. Dimension 1 represents the degree of specificity of insight components: from the generic awareness of illness to the more specific relabeling of symptoms and treatment compliance. Dimension 2 could be considered as reflecting patients' self-evaluation processes regarding their mental condition. There is a distance between aspects of insight related to patients'

agreement with clinicians' opinions and recommendations (diagnosis of and treatment for mental disorder) and aspects related to self-reflection (relabeling of symptoms and hypothetical contradiction), i.e. self-evaluation after introspection or taking the perspective of other people.

[Figure 2]

According to the results of HCA and MDS, in the following analysis we used three subscales of SAI-ED: 'Awareness of illness', 'Awareness of symptoms', and 'Treatment compliance'. The Cronbach's alpha for the 'Awareness of illness' and the 'Awareness of symptoms' subscales was 0.67 and 0.92, respectively (the coefficient cannot be computed for the 'Treatment compliance' dimension since it consists of only one item). All the subscales were retained since values of alpha less than 0.7 are common and acceptable for scales with small number of items (Cortina, 1993). The correlation between 'Awareness of illness' and 'Awareness of symptoms' was the strongest observed between insight dimensions (rho = 0.72, $p < 0.001$). The correlation of 'Treatment compliance' with 'Awareness of illness' and 'Awareness of symptoms' was moderate to strong (rho = 0.55, $p < 0.001$ and rho = 0.61, $p < 0.001$, respectively).

Insight and its associations of with demographic and clinical characteristics in AN and BN

Table 2 displays the differences between AN and BN patients in SAI-ED total and item scores. AN patients scored significantly lower than BN patients in overall insight and all the SAI-ED items. AN-R patients scored significantly lower than AN-BP patients in relabeling of eating pathology ($z = 2.17$, $p = 0.030$) and compliance with treatment ($z = 2.16$, $p = 0.031$). There was no significant difference between AN-R and AN-BP groups in SAI-ED total score and the remaining items.

[Table 2]

As shown in *Table 3*, the level of insight was not significantly correlated with age or education neither in AN nor in BN patients. In the AN group, the SAI-ED total score was correlated with higher current and lowest lifetime BMI and with lower EDE-Q Restraint score. The strength of these correlations was moderate. In the BN group, the SAI-ED total score was positively correlated with duration of illness and negatively with the global, Shape Concern and Weight Concerns scores of EDE-Q, and the MOCI total score. The correlations with duration of illness and MOCI were weak and with EDE-Q scores were moderate.

[Table 3]

DISCUSSION

Impaired insight is an important feature of EDs with great impact on the therapeutic process, yet to date there is no satisfactory tool for the assessment of insight and its components in these disorders. Such a measure would be valuable in the clinical assessment of patients and could also provide important information on their response to treatment. Obviously, it could also be very useful in further investigation of insight impairment in EDs. To this end, we developed the 8-item, clinician-rated SAI-ED and we evaluated its psychometric properties.

The internal consistency of the final version of SAI-ED was high and the item-total and inter-item correlations sufficiently strong. Moreover, we examined the inter-rater and test-retest reliability of SAI-ED and found that both of them were very good. The strong correlation between SAI-ED score and the independent ratings of the BABS indicates that is a valid measure of insight in patients with EDs. Body image

delusionality assessed with BABS is a core aspect of insight in EDs and has shown strong association with illness unawareness (Konstantakopoulos et al. 2012). Using the BABS to define lack of insight and impaired versus intact insight, the ROC analysis revealed that a cutoff point of 16.5 on the SAI-ED best identified lack of insight and a cutoff point of 23.5 best predicted poor insight with high sensitivity and specificity.

Although the internal consistency of the initial 12-item scale was high, four items correlated weakly with the total score: 'awareness of psychological changes', 'awareness of the psychosocial consequences', 'awareness of consequences in physical health' and 'awareness of nervous/psychological condition'. Moreover, the first three of these items had a notable ceiling effect. It seems that almost all patients with EDs recognize that they experience psychological difficulties with negative consequences on their functioning and physical health. However, many of them did not recognize their eating behavior and body-related concerns as pathological and they did not believe that they suffer from a mental disorder. Therefore, these items would not sufficiently contribute to differentiation between intact and poor insight and were excluded. With the exception of the 'awareness of consequences in physical health', these items are included in the 7-item self-report SAI-ED. This might result in underestimation of impaired insight when assessed with self-report SAI-ED, especially as there is no explicit mention of 'mental disorder' or 'eating disorder' in this questionnaire.

Using HCA and MDS we detected clusters of SAI-ED in accordance with the main components of insight proposed for patients with psychosis, awareness of illness, awareness of symptoms and treatment compliance (David, 1990). The items on recognition of mental illness and need for treatment incorporated into the awareness of illness component. Treatment compliance showed high degree of dissimilarity with other items and can be considered as a separate component of insight. The 'hypothetical

contradiction' item was included into the awareness of symptoms component, indicating a link between the ability to take into account the views of the others and the ability to relabel the symptoms as pathological. The relationship between these two reasoning abilities was revealed from the analysis with HCA and MDS of the original SAI-E in a sample of schizophrenia patients (Konstantakopoulos et al. 2013). Taking the perspective of others is a theory of mind (ToM) ability and many studies have shown that ToM deficits may substantially contribute to insight impairment in schizophrenia (Bora, 2017). Interestingly, a recent study found a significant contribution of ToM dysfunction to delusionality of body image beliefs in AN (Konstantakopoulos et al., 2019).

Two underlying dimensions within the insight construct were disclosed by MDS. The first dimension may be interpreted as a continuous transition from more 'generic' to more 'specific' insight, from mere acceptance of having a mental illness to relabeling of specific experiences and behaviours and to compliance with treatment. The second dimension may be considered to represent a spectrum of reflective processes underlying insight. Closer to one pole is patients' attitude towards illness and symptoms that relies mainly on self-reflection, i.e. self-evaluation either after introspection or taking the perspective of other people. Closer to the other pole are the aspects of insight influenced by patients' agreement with clinicians' opinions and recommendations, such as the clinician-explained diagnosis and need for treatment and the proposed treatment.

The mean total and all item scores on SAI-ED were significantly lower in patients with AN than patients with BN, in agreement with the findings of previous studies that compared the level of insight between AN and BN using self-report SAI-ED (Konstantakopoulos et al., 2011) and BABS (Konstantakopoulos et al. 2012). AN-

R patients had significantly lower relabeling of eating pathology and compliance with treatment than AN-P patients but the difference between the two groups in overall insight was no significant. Lower levels of insight in AN-R compared to AN-BP were found in previous studies (Konstantakopoulos et al., 2011; Konstantakopoulos et al. 2012). In our sample the differences between AN subgroups in body image delusionality were not statistically significant, although delusional beliefs were much more frequent in AN-R than AN-BP (33.3% versus 13%). Taking into account previous and current results, it seems that restrictive eating pathology is associated specifically with poor insight into body image beliefs and abnormal eating behaviours and with poor treatment compliance.

Insight impairment was associated with lower current and lowest lifetime BMI and more severe dietary restrain in AN. Previous studies with self-report SAI-ED also found significant associations of insight with current and lowest lifetime BMI in AN (Gorwood et al., 2019) and with current BMI in a mixed EDs sample (Konstantakopoulos et al., 2011). Greenfeld and colleagues (1991) using another insight scale found similar associations of insight with BMI and severity of AN symptoms. On the contrary, Arbel and colleagues (2014) using SUMD did not find significant association between insight and current BMI. In BN insight was associated with longer illness duration and less severe overall ED symptoms and body-related concerns and lower obsessionality. None of the previous studies using insight scales reported data specifically in BN patients. In line with the present findings, delusionality of body image beliefs in BN was correlated with shorter illness duration and more intense dieting behaviours (Konstantakopoulos et al., 2012). Moreover, in a qualitative study on help-seeking process patients with EDs described a gradual shift from denial to increased awareness of illness (Schoen, et al. 2012). On the other hand, a longitudinal

study showed that insight remains consistent over time in patients with AN (Greenfeld et al., 1991). In line with this, there was no significant correlation between insight and illness duration in AN patients in the present study.

No association of insight with depression and anxiety was found in both AN and BN. This is in agreement with the findings of previous studies which used the self-report SAI-ED (Konstantakopoulos et al., 2011; Gorwood et al., 2019) or SUMD (Arbel et al., 2014) to assess insight in EDs. An association between insight and depression was found in many other disorders from schizophrenia to Alzheimer's disease (Gilleen et al. 2010; Murri et al., 2012). This relationship may be explained in both causal directions: either awareness that one is suffering from a serious psychiatric disorder is depressing or depression is resulting in more realistic self-evaluation, including one's own mental health (David, 2018). However, this evidently does not apply to ED patients. Unlike schizophrenia and other disorders, many patients with EDs value some aspects of their disorder (Vitousek et al. 1998; Schmidt & Treasure, 2006). Even insightful EDs patients perceive both psychosocial benefits and costs stemming from their illness (Serpell et al. 1999).

Our findings could have some important implications. Using SAI-ED in future studies could shed light on the nature and the clinical importance of insight and its components in EDs. Insight impairment may crucially contribute to avoidance of treatment, difficulties to be engaged in treatment and high rates of drop-out and relapse. Evidence from previous studies suggests that impaired insight is an important predictor of poor long-term outcome in patients with AN (Greenfeld et al., 1991; Saccomani et al., 1998). Improvement in insight may constitute an important marker of EDs patients' response to treatment and therefore the investigation of treatment efficacy in EDs should include the regular assessment of insight. The SAI-ED is a reliable, valid,

relative short tool for the multidimentional and disorder-specific assessment of insight in EDs, without some weaknesses of previously used methods and self-report instruments.

Some limitations of this study should be noted. We used a measure of delusionality to examine convergent validity, sensitivity and specificity, whereas SAI-ED assesses multiple dimensions of insight. Due to relatively small sample size we did not run factor analysis of SAI-ED and some potentially important subgroup differences, between AN-R and AN-BN, did not reach statistical significance. On the other hand, HCA and MDS can provide useful and valid information on the internal structure of clinical scales, unattainable through the statistical techniques based on correlations, such as factor analysis (Kemmler et al., 2002; Chang et al., 2009). Finally, most of our study participants were help-seekers, whereas patients lacking insight often refuse any contact with mental health services. Therefore, the level of insight in EDs may be lower in community and significant associations might not be detected due to lower variance of insight in our study.

Our results indicate that the SAI-ED is a valid and reliable tool that can be used to measure the level of, and changes in insight in EDs patients. Similarly to psychosis, multiple dimensions of insight were identified in EDs. Insight appears to be associated with different clinical aspects in AN and BN. Future research focusing on insight deficits in EDs may offer evidence crucial in developing new therapeutic interventions to improve treatment adherence and outcome.

REFERENCES

Amador, X.F., Strauss, D.H., Yale, S.A., Flaum, M.M., Endicott, J., Gorman, J.M. 1993. Assessment of insight in psychosis. Am. J. Psychiatry 150, 873-9. doi: 10.1176/ajp.150.6.873

American Psychiatric Association. 2013. Diagnostic and Statistical Manual of Mental Disorders (5th edition). Washington DC; American Psychiatric Association.

Arbel, R., Latzer, Y., Koren, D. 2014. Revisiting poor insight into illness in anorexia nervosa: true unawareness or conscious disagreement? J. Psychiatr. Pract. 20, 85-93. doi: 10.1097/01.pra.0000445243.00683.30

Bizeul, C., Sadowsky, N., Rigaud, D. 2001. The prognostic value of initial EDI scores in anorexia nervosa patients: a prospective follow-up study of 5-10 years. Eur. Psychiatry 16, 232-238. doi: 10.1016/S0924-9338(01)00570-3

Bora, E. 2017. Relationship between insight and theory of mind in schizophrenia: A meta-analysis. Schizophrenia Res. 190, 11-17. doi: 10.1016/j.schres.2017.03.029

Borg, I., Groenen, P.J.F. 1997. Modern Multidimensional Scaling: Theory and Applications. Springer Verlag, New York.

Brett-Jones, J., Garety, P., Hemsley, D. 1987. Measuring delusional experiences: a method and its application. Br J Clin Psychol 26, 257-265. doi: 10.1111/j.2044-8260.1987.tb01359.x

Carter, J.V., Pan, J., Rai, S.N., Galandiuk, S. 2016. ROC-ing along: Evaluation and interpretation of receiver operating characteristic curves. Surgery 159, 1638-1645. doi: 10.1016/j.surg.2015.12.029.

Casper, R.C., Halmi, K.A., Goldberg, S.C., Eckert, E.D., Davis, J.M. 1979. Disturbances in body image estimation as related to other characteristics and outcome in anorexia nervosa. Br. J. Psychiatry 134, 60-66. doi: 10.1192/bjp.134.1.60

Casper, R.C., Heller, W. 1991. 'La douce indifference' and mood in anorexia nervosa: neuropsychological correlates. Prog. Neuropsychopharmacol. Biol. Psychiatry 15, 15-23. doi: 10.1016/0278-5846(91)90037-2

Chang, J.S., Ahn, Y.M., Yu, H.Y., Park, H.J., Lee, K.Y., Kim, S.H., Kim, Y.S. 2009. Exploring clinical characteristics of bipolar depression: internal structure of the bipolar depression rating scale. Aust. N. Z. J. Psychiatry. 43, 830-837. doi: 10.1080/00048670903107666.

Cortina, J.M. 1993. What is coefficient alpha? An examination of theory and applications. J. Appl. Psychol. 78, 98-104. doi:10.1037/0021-9010.78.1.98

Couturier, J.L., Lock, J. 2006. Denial and minimization in adolescents with anorexia nervosa. Int. J. Eat. Disord 39, 212-216. doi: 10.1002/eat.20241

David, A.S. 1990. Insight and psychosis. Br. J. Psychiatry 156, 798-808. doi: 10.1192/bjp.156.6.798

David, A.S. 2018. Insights on insight. Schizophrenia Res. 197, 61-62. doi: 10.1016/j.schres.2017.10.048

Eckert, E.D., Goldberg, S.C., Halmi, K.A., Casper, R.C., Davis, J.M. 1982. Depression in anorexia nervosa. Psychol. Med. 12, 115-122. doi: 10.1017/s003329170004335x

Eisen, J.L., Phillips, K., Baer, L., Beer, D., Atala, K., Rasmussen, S. 1998. The Brown Assessment of Beliefs Scale: reliability and validity. Am. J. Psychiatry 155, 102-108. doi: 10.1176/ajp.155.1.102

Everitt, B.S. 1993. Cluster Analysis. Edward Arnold, London.

Fairburn, C.G., Beglin, S.J., 2008. Eating Disorder Examination Questionnaire (EDE-Q 6.0). In C. G. Fairburn (Ed.), Cognitive behavior therapy and eating disorders (pp. 309–314). New York, NY: The Guilford Press.

Fisher, M., Schneider, M., Burns, J., Symons, H., Mandel, F.S. 2001. Differences between adolescents and young adults at presentation to an eating disorders program. J. Adolesc. Health. 28, 222-227. doi: 10.1016/s1054-139x(00)00182-8

Gilleen, J., Greenwood, K., David, A.S. 2010. Anosognosia in schizophrenia and other neuropsychiatric disorders: similarities and differences. In The Study of Anosognosia (ed. G. P. Prigatano), pp. 255–290. Oxford University Press: New York.

Goldberg, S.C., Halmi, K.A., Eckert, E.D., Casper, R.C., Davis, J.M., Roper, M. 1979. Attitudinal dimensions in anorexia nervosa. J. Psychiatr. Res. 15, 239-251. doi: 10.1016/0022-3956(79)90015-3

Gorwood, P., Duriez, P., Lengvenyte, A., Guillaume, S., Criquillion, S., & FFAB network. 2019. Clinical insight in anorexia nervosa: Associated and predictive factors. Psychiatry Res. [Epub ahead of print]. doi: 10.1016/j.psychres.2019.112561

Greenfeld, D., Anyan, W., Hobart, M., Quinlan, D., & Plantes, M. (1991). Insight into illness and outcome in anorexia nervosa. Int. J. Eat. Disord. 10, 101-109. doi: 10.1002/1098-108X(199101)10:1<101::AID-EAT2260100111>3.0.CO;2-7

Halmi, K.A. 1974. Anorexia Nervosa: Demographic and Clinical Features in 94 Cases. Psychosom. Med. 36, 18-26. doi: 10.1097/00006842-197401000-00002

Halmi, K.A., Goldberg, S.C., Casper, R.C., Eckert, E.D., Davis, J.M. 1979. Pretreatment predictors of outcome in anorexia nervosa. Br. J. Psychiatry. 134, 71-78. doi: 10.1192/bjp.134.1.71

Hartmann, A.S., Thomas, J.J., Wilson, A.C., Wilhelm, S. 2013. Insight impairment in body image disorders: delusionality and overvalued ideas in anorexia nervosa versus body dysmorphic disorder. Psychiatry Res. 210, 1129-1135. doi: 10.1016/j.psychres.2013.08.010

Hodgson, R.J., Rachman, S. 1977. Obsessional-compulsive complaints. Behav. Res. Ther. 15, 389-395. doi:10.1016/0005-7967(77)90042-0

Kemmler, G., Holzner, B., Kopp, M., Dunser, M., Greil, R., Hahn, E., Sperner-Unterweger, B. 2002. Multidimensional scaling as a tool for analysing quality of life data. Qual. Life Res.11, 223-233.

Kemp, R., David, A. 1997. Insight and compliance. In: Blackwell, B. (Ed), Treatment compliance and the therapeutic alliance. Harwood, Amsterdam, pp. 61-84.

Konstantakopoulos, G., Ioannidi, N., Patrikelis, P., Gonidakis, F. 2019. The impact of theory of mind and neurocognition on delusionality in anorexia nervosa. Submitted for publication.

Konstantakopoulos, G., Tchanturia, K., Surguladze, S. A., David, A. S. 2011. Insight in eating disorders: clinical and cognitive correlates. Psychol. Med. 41, 1951-1961. doi: 10.1017/S0033291710002539

Konstantakopoulos, G., Varsou, E., Dikeos, D., Ioannidi, N., Gonidakis, F., Papadimitriou, G., Oulis, P. 2012. Delusionality of body image beliefs in eating disorders. Psychiatry Res. 200, 482-488. doi: 10.1016/j.psychres.2012.03.023

Konstantakopoulos, G., Ploumpidis, D., Oulis, P., Soumani. A., Nikitopoulou, S., Pappa, K., et al. 2013. Is insight in schizophrenia multidimensional? Internal structure and associations of the Greek version of the Schedule for the Assessment of Insight-Expanded. Psychiatry Res. 209, 346-352. doi: 10.1016/j.psychres.2013.02.016

Kruskal, J. P., Wish, M. 1978. Multidimensional scaling. Sage, Newbury Park, CA.

McKenna, G., Fox, J.R., Haddock, G. 2014. Investigating the 'jumping to conclusions' bias in people with anorexia nervosa. Eur. Eat. Disord. Rev. 22, 352-359. doi: 10.1002/erv.2310

Michopoulos, I., Douzenis, A., Kalkavoura, C., Christodoulou, C., Michalopoulou, P., Kalemi, G., et al. 2008. Hospital anxiety and depression scale (HADS): Validation in a Greek general hospital sample. Ann. Gen. Psychiatry 7, 1–5. doi: 10.1186/1744-859X-7-4.

Morgan, H.G., Russell, G.F.M. 1975. Value of family background and clinical features as predictors of long-term outcome in anorexia nervosa: four-year follow-up study of 41 patients. Psychol. Med. 5, 355-371. doi: 10.1017/s0033291700056981

Mountjoy, R.L., Farhall, J.F., Rossell, S.L. 2014. A phenomenological investigation of overvalued ideas and delusions in clinical and subclinical anorexia nervosa. Psychiatry Res. 220, 507-512. doi: 10.1016/j.psychres.2014.07.073

Murri M.B., Respino, M., Innamorati, M., Cervetti, A., Calcagno, P., Pompili, M., et al. 2015. Is good insight associated with depression among patients with schizophrenia? Systematic review and meta-analysis. Schizophr. Res. 162, 234-247. doi: 10.1016/j.schres.2015.01.003

Newton, T., Butler, N., Slade, P. 1988. Denial of symptoms and self-report in eating disorders. British Review of Bulimia and Anorexia Nervosa 2, 55-59.

Olaya, B., Marsà, F., Ochoa, S., Balanzá-Martínez, V., Barbeito, S., García-Portilla, M.P., et al. 2012. Development of the insight scale for affective disorders (ISAD): modification from the scale to assess unawareness of mental disorder. J. Affect. Disord. 142, 65-71. doi: 10.1016/j.jad.2012.03.041

Palermou, B., Efstathiou, G., Kalantzi–Azizi. A. 2009. The responsibility schema in obsessive compulsive checking and washing. Psychiatriki 20, 239-244.

Pliatskidou, S., Samakouri, M., Kalamara, E., Papageorgiou, E., Koutrouvi, K., Goulemtzakis, C., et al. 2015. Validity of the Greek Eating Disorder Examination Questionnaire 6.0 (EDE-Q-6.0) among Greek adolescents. Psychiatriki 26, 204-216.

Saccomani, L., Savoini, M., Cirrincione, M., Vercellino, F., Ravera, G. 1998. Long-term outcome of children and adolescents with anorexia nervosa: study of comorbidity. J. Psychosom. Res. 44, 565-571. doi: 10.1016/s0022-3999(97)00210-9

Schoen, E.G., Lee, S., Skow, C., Greenberg, S.T., Bell, A.S., Wiese, J.E., Martens, J.K. 2012. A retrospective look at the internal help-seeking process in young women with eating disorders. Eat. Disord. 20,14-30. doi: 10.1080/10640266.2012.635560

Schmidt, U., Treasure, J. 2006. Anorexia nervosa: valued and visible. A cognitive-interpersonal maintenance model and its implications for research and practice. Br. J. Clin. Psychol. 45, 343-366. doi: 10.1348/014466505X53902

Serpell, L., Treasure, J., Teasdale, J., Sullivan, V. 1999. Anorexia nervosa: friend or foe? Int. J. Eat. Disord. 25, 177-186. doi: 10.1002/(sici)1098-108x(199903)25:2<177::aid-eat7>3.0.co;2-d

Steinglass, J., Eisen, J., Attia, E., Mayer, L., Walsh, B. 2007. Is anorexia nervosa a delusional disorder? An assessment of eating beliefs in anorexia nervosa. J. Psychiatr. Pract. 13, 65-71. doi: 10.1097/01.pra.0000265762.79753.88

Steinhausen, H.C. 1986. Attitudinal dimensions in adolescent anorexic patients: an analysis of the Goldberg Anorectic Attitude Scale. J. Psychiatr. Res. 20, 83-87. doi: 10.1016/0022-3956(86)90026-9

Sturman, E.D., Sproule, B.A. 2003. Toward the development of a Mood Disorders Insight Scale: modification of Birchwood's Psychosis Insight Scale. J. Affect. Disord. 77, 21-30. doi: 10.1016/s0165-0327(02)00102-7

Sunday, S.R., Halmi, K.A., Einhorn, A. 1995. The Yale-Brown-Cornell Eating Disorder Scale: a new scale to assess eating disorder symptomatology. Int. J. Eat. Disord. 18, 237-245. doi:10.1002/1098-108X(199511)18:3<237::AID-EAT2260180305>3.0.CO;2-1

Vanderdeycken, W., Vanderlinden, J. 1983. Denial of illness and the use of self-reporting measures in anorexia nervosa patients. Int. J. Eat. Disord. 2, 101-107. doi: 10.1002/1098-108X(198322)2:4<101::AID-EAT2260020417>3.0.CO;2-U

Viglione, V., Muratori, F., Maestro, S., Brunori, E., Picchi, L. 2006. Denial of symptoms and psychopathology in adolescent anorexia nervosa. Psychopathology 39, 255-260. doi: 10.1159/000094723

Vitousek, K., Watson, S., Wilson, G.T. 1998. Enhancing motivation for change in treatment-resistant eating disorders. Clin. Psychol. Rev.18, 391-420. doi: 10.1016/S0272-7358(98)00012-9

Vitousek, K. B., Daly, J., Heiser, C. 1991. Reconstructing the internal world of the eating-disordered individual: Overcoming denial and distortion in self-report. Int. J. Eat. Disord. 10, 647-666. doi: 10.1002/1098-108X(199111)10:6<647::AID-EAT2260100604>3.0

Zigmond, A.S., Snaith, R.P. 1983. The Hospital Anxiety and Depression Scale. Acta Psychiatr. Scand. 67, 361–370. doi:10.1111/j.1600-0447.1983.tb09716.x.