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The neurocognitive basis of insight into illness in anorexia nervosa: A pilot metacognitive study



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ABSTRACT

The primary goal of the present study was to explore the neuropsychological basis of insight into illness in anorexia nervosa by evaluating its differential and joint links with cognitive vs. metacognitive performance. Participants in the study were 25 women with anorexia nervosa (AN) and 25 healthy comparisons (HC). All participants completed a computerized version of the Wisconsin Card Sorting Task (WCST) and the Computerized Body-Size Discrimination task (CBSD). In addition to the standard administration of the tasks, subjects were also asked to rate their level of confidence in the correctness of each sort and to choose whether they wanted each sort to be “counted” toward their overall performance score on the test. Insight into illness in the AN group was assessed with the Scale of Unawareness of Mental Disorder (SUMD). Prediction of poor insight was significantly improved when adding the new, free-choice metacognitive measures to the conventional measures in both tasks, but not the other way around. These preliminary results suggest that metacognition might be an important mediator between basic cognitive deficits and poor insight and that it might be even more relevant to poor insight than cognitive deficits per se.

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1. Introduction

Poor insight into illness in patients who suffer from anorexia nervosa (AN) is a well-recognized phenomenon (Bruch, 1985; Vitousek and Watson, 1998; American Psychiatric Association, 2000; Vandereycken, 2006a, 2006b) that has received abundant theoretical interest over the past two decades. However, surprisingly, only a few studies on the subject have been conducted. These studies highlight the importance of insight into illness in anorexia nervosa and have led to exciting advances in understanding its clinical and cognitive correlates. Results of these studies show that insight into illness in anorexia nervosa (1) is not an “all-or-nothing” phenomenon or a unitary construct, but rather an amalgam of modality-specific, overlapping dimensions or awareness systems that range from insight into having a disorder and its consequences (Konstantakopoulos et al., 2011) to delusionality of body image (Bruch, 1973; Steinglass, 2007; Konstantakopoulos et al., 2012); (2) is a distinct aspect of psychopathology that is related, but not reducible, to other symptoms (Konstantakopoulos et al., 2012); (3) is a trait

characteristic that remains relatively stable over time (Greenfeld et al., 1991); (4) is associated with restrictive eating pathology, early onset of symptoms, and body dissatisfaction, but not with age, education, duration of illness, current and lowest lifetime BMI, co-morbid depression and/or anxiety (Konstantakopoulos et al., 2011, 2012); and (5) is associated with better long-term outcome measures (Greenfeld et al., 1991; Saccamani et al., 1998).

Notwithstanding the important contribution of these studies, one of the most important questions remaining open relates to the possible causes of poor insight in anorexia nervosa. A variety of models have been proposed as possible explanations of poor insight in anorexia nervosa (Vandereycken, 2006a, 2006b) and other psychiatric disorders (Wells, 2000; Beck et al., 2004). Two main underlying theoretical approaches characterize these models. The first, often referred to as “motivational,” considers lack of insight to be the outcome of a psychological defense mechanism. The second approach, commonly referred to as the “deficit” hypothesis, views poor insight as the direct result of neuropsychological deficits in brain systems that mediate self-awareness (Amador and Kronengold, 1998). Bruch (1977) has already suggested the possibility that the poor insight into illness found in women with anorexia nervosa reflects a broader introspective impairment. However, the possibility of a neurocognitive cause

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for such poor insight has thus far not been adequately explored. This possibility is implicitly supported both by studies showing impairments in neuropsychological function and by studies identifying abnormalities in brain structure and biochemical activity among women with anorexia nervosa (for a further review, see Roberts et al., 2007; Kaye et al., 2009; Hay and Perminder, 2011). Moreover, a pioneer study using functional MRI found that impaired cognitive-behavioral flexibility in anorexia nervosa seems to be associated with specific brain activity patterns (Zastrow et al., 2009). Direct support for the possible relationships between insight and neurocognitive functioning was recently obtained from a pioneer study that found a connection between lacks of insight and impaired set shifting, but not general IQ or other domains, in patients with eating disorders (Konstantakopoulos et al., 2011).

These findings are in line with previous studies showing that impairment in set shifting contributes to poor insight in patients with schizophrenia (Morgan and David, 2004; Aleman et al., 2006). However, in contrast to findings in eating disorders, these studies revealed a small, but statistically significant, positive relationship between insight and general cognitive functioning. It is important to note that although the general trend in psychotic spectrum disorders is indicative of a relationship between insight and neurocognitive domains, the connections are rather modest and fit no particular explanatory pattern (Koren et al., 2004; Aleman et al., 2006). Moreover, because most of these studies were not designed to test clear hypotheses about the nature of this relationship, almost nothing is known about the mechanisms that may mediate between basic neurocognitive deficits and poor insight (Drake and Lewis, 2003).

Our perspective is that the hypothesis suggesting a relationship between performance on executive tests of neuropsychological function and impaired insight is overly simplistic. The current study was motivated by the view that the major limitation of previous studies on the subject (for a further review, see David et al., 2012) stems from their failure to address deficits at a metacognitive level of functioning.

Metacognition is a term used to distinguish between a person's cognitive abilities and that individual's awareness or knowledge regarding those abilities. Metacognitive abilities can vary independently of cognitive skills and have important consequences above and beyond those skills. We believe that the metacognitive level of functioning, which reflects one's monitoring and the ensuing regulation of one's performance, may mediate between basic-level cognitive deficits and the observed clinical phenomenon of poor insight.

According to our analysis, metacognitive deficits have been overlooked in these studies, in part because of their overreliance on standardized forced responding tasks that do not allow patients the freedom to decide whether to volunteer or withhold their answers. Consequently, they fail to take into account the role of subjects' control over their performance, which is common in real-life phenomena such as insight into illness. This assumption is supported by pioneering study in schizophrenia (Koren et al., 2004), but to our knowledge has never been examined until now in anorexia nervosa.

Two important aspects of metacognitive functioning are monitoring and control. *Monitoring* refers to the mechanism used to subjectively assess the correctness of potential responses. *Control* refers to the mechanism that determines whether or not to volunteer the best available output. Such output is volunteered if it passes the threshold, but is otherwise withheld. The threshold is set on the basis of competing incentives for both quantity and accuracy, that is, the gain for providing correct information relative to the cost of providing incorrect information. Findings from studies in schizophrenia using similar methods suggest that impaired insight is more strongly related to measures of *performance accuracy*,

which depend on metaexecutive skills of monitoring and control, than to measures of *performance quantity*, which depend exclusively on executive functioning (Koren et al., 2004).

With the foregoing considerations in mind, the primary goal of this study was to further explore the neuropsychological basis of insight into illness in anorexia nervosa by evaluating its differential and joint links with cognitive vs. metacognitive performance. Based on the theoretical considerations and preliminary empirical findings from schizophrenia reviewed above, we hypothesized that (1) impaired insight would be less strongly related to conventional measures of how much the person knows ("performance quantity") than to measures of how much this knowledge can be trusted ("performance accuracy"), which depend on metacognitive processes of self-monitoring and self-directed action; (2) the level of cognitive and metacognitive functioning in anorexia nervosa would be impaired relative to that of the healthy participants.

2. Method

2.1. Participants

Participants were 25 female patients with anorexia nervosa (AN), including 15 (60%) diagnosed with anorexia nervosa, 10 (40%) diagnosed with Eating Disorder Not Otherwise Specified-Anorexia Nervosa (EDNOS-AN), and a comparison group of 25 healthy participants (HC). The EDNOS-AN diagnosis was given to those patients who met the criteria of anorexia nervosa at the time of admission and still were in the acute phase of the illness, but had a temporary weight gain at the specific time of data collection due to nutritional and psychotherapy intervention. Ten of the AN group patients (40%) had binge-purging behaviors. A consensus research diagnosis of anorexia nervosa, using the criteria outlined in the fourth edition of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2000), was reached by experienced psychiatrists via standard clinical interview procedures (Sheehan et al., 1998).

Individuals in the AN group were recruited from the Outpatient Clinic of the Psychiatric Department of Rambam Medical Center in Haifa, Israel. The patients were personally recruited by the directors of the eating disorders clinic, based on the aforementioned inclusion criteria. Of the 36 patients who were asked to participate in the study, only four refused and three more withdrew their consent prior to data collection. Exclusion criteria were any documented history of psychotic disorder or bipolar disorder, neurological disease, brain damage, sensory impairment, substance abuse or dependency, or any chronic medical condition with cognitive consequences. The comparison group consisted of 25 women recruited through local advertising at the University of Haifa. The exclusion criteria for healthy participants were any history of psychiatric illness, consumption of psychotropic medications, knowledge of the tests, a BMI greater than 26, or first-degree relatives with eating disorders. The study was approved by the Institutional Review Boards of the two institutes. Prior to enrollment, all participants provided written informed consent after receiving a detailed explanation of the study.

Clinical and socio-demographic variables for the two groups are summarized in Table 1.

As can be seen in Table 1, the two groups were found to be well matched with respect to age, education level, and IQ. As expected, there was a significant difference between the groups on BMI.

2.2. Instruments

2.2.1. Insight into illness

Awareness of having anorexia nervosa was assessed using Amador and Strauss's Scale for Unawareness of Mental Disorder (SUMD) (Amador et al., 1993). The SUMD is a semi-structured interview originally developed to assess insight into illness among patients who suffer from schizophrenia. Amador and colleagues (1993) showed the SUMD to be reliable and valid in two independent studies when administered to psychotic patients, and they suggested that the SUMD can be adapted to any illness or clinical condition. The SUMD contains four scales. Three general scales are aimed at assessing the patient's insight into (1) having a mental disorder; (2) the need for treatment; and (3) the consequences of the patient's clinical state. The fourth scale includes specific items targeted at assessing the patient's self-awareness of having common signs of mental disorder. For the current study, we used only the first three general scales, all of which were scored on a five-point scale ranging from 1="full awareness" to 5="unawareness." We calculated a total score of "overall insight" as the average between the

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