

Executive functioning in anorexia nervosa: Exploration of the role of obsessionality, depression and starvation

Alexandra Wilsdon, Tracey D. Wade *

School of Psychology, Flinders University, GPO Box 2100, Adelaide, SA 5001, Australia

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Abstract

Cognitive deficits related to executive functioning have been previously identified in anorexia nervosa (AN). Currently, there is limited knowledge about the degree to which other variables related to AN or executive function may influence the observed relationships. The present study examined three groups of participants, women with AN ($n = 22$), and two control groups: women who were high in obsessionality ($n = 20$) and women who were low in obsessionality ($n = 21$). Women reporting disordered eating over the previous 4 weeks were screened out of the control groups. Executive function was measured using the Wisconsin card sorting test (WCST) and the uses of common objects test (UCOT). In addition, depression, obsessionality and body mass index were measured. Initial analyses showed no significant differences between the groups on executive function, but moderate effect sizes were obtained for performance on UCOT total perseverations and WCST total trials. When controlling for either depression or obsessionality, the group differences on the UCOT total perseverations became significant and in the case of depression attained a large effect size. Both the AN and high obsessional groups showed significantly more perseverations than the low obsessional group. Depression appeared to suppress variance that was irrelevant to the prediction of perseverance thus enhancing the importance of group membership. It is recommended that variables strongly associated with AN be investigated in future research as this may clarify the relationship between AN and executive function.

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1. Introduction

People with anorexia nervosa (AN) typically display reduced cognitive functioning across a range of domains, including executive functioning, visual–spatial ability, attention, learning and memory (Lena et al., 2004). Whilst it has often been suggested that the deficits associated with AN are caused by starvation or the effects of malnutrition (e.g., Lauer et al., 1999), it has been recently suggested that such deficits may be present from early childhood and constitute risk factors for the

development of disordered eating (Lena et al., 2004). Consistent with such a suggestion is a finding that executive functioning continued to be impaired in people who had recovered from AN, indicating that the deficits were at least partially independent of nutritional status (Tchanturia et al., 2004b).

Arguably the most clinically relevant deficits associated with AN are related to executive function or mental flexibility (Cooper and Fairburn, 1992; Fassino et al., 2002; Green et al., 1996; Tchanturia et al., 2004a; Tchanturia et al., 2004b). Rigidity and lack of flexibility are core characteristics of the behaviour of people with AN (Vitousek et al., 1998). This characteristic lack of flexibility reduces the ability to fully engage in therapy, which impinges on the recovery of the patient

* Corresponding author. Tel.: +61 8 8201 3736; fax: +61 8 8201 3877.

E-mail address: tracey.wade@flinders.edu.au (T.D. Wade).

(Tchanturia et al., 2004a). Given that AN is associated with one of the highest risks for premature death of all psychiatric illnesses (Harris and Barraclough, 1998) and 10–20% remain chronically ill (Löwe et al., 2001; Steinhausen, 2002), such deficits can have serious consequences.

Overall, studies show poorer executive functioning for people with AN compared to controls (Lena et al., 2004). However, most investigations show significant associations between AN and only some measures of executive functioning. Of the most recent studies published, two studies have used the Wisconsin card sorting test to investigate the frontal lobe functioning of AN patients. Both of these studies showed that the AN population experienced difficulty in developing new rules, thereby exhibiting significantly higher number of errors than a control group (Fassino et al., 2002; Koba et al., 2002). However there was no significant difference in perseveration (Fassino et al., 2002). Using alternative tests of mental flexibility, Tchanturia et al. (2004a) found that women with AN performed significantly more poorly than controls on 6 of their 14 tests of mental flexibility. One study failed to find significant differences between people with AN and controls on a test of abstract problem solving (Palazidou et al., 1990).

Such inconsistency across different measures of executive functioning may occur for a variety of reasons. First, there is an ongoing difficulty in establishing the “purity” of tasks used to measure executive functioning, stemming from a lack of clear definitions of the concept (Bryan and Luszcz, 2000). This may result in a large degree of variability between studies that use different measures of executive function. Second, few studies of the relationship between AN and executive functioning have also examined variables that can be expected to be highly correlated with either AN or cognitive flexibility, variables that can potentially obscure the nature of the relationship between AN and executive function. Starvation is one such example, but difficulties in mental flexibility have been observed with respect to other traits such as obsessiveness (Cox et al., 1989; Fontanelle et al., 2001; Lucey et al., 1997), and depression (Austin et al., 2001; Clark et al., 2002; Degl’Innocenti et al., 1998). Numerous investigations have shown people with AN to be highly obsessive (Jacobi et al., 2004; The Price Foundation Collaborative Group, 2001) with obsessiveness considered to predispose people to risk of AN (Bellodi et al., 2001; Lilienfeld et al., 1998). Depression is a commonly co-morbid disorder with eating disorders, where people with AN have been found to be significantly more depressed than controls and extreme dieters (Wilksch and Wade, 2004). However, unlike obsessiveness, depression is not necessarily premorbid to AN and can be secondary to the effects of starvation (Keys et al., 1950).

One recent study (Tchanturia et al., 2004a) examined the relationship between some of the clinical features of AN, including obsessiveness and depression, and performance on neuropsychological tests. Their primary aim was to examine differences in cognitive flexibility between groups with AN, bulimia nervosa and a non-disordered eating control group. They found that AN group showed significantly more difficulty with tests of cognitive flexibility that related to simple alternation and perceptual shift than the control group but that there was no difference with respect to tests of perseveration or mental flexibility. The AN group also had a significantly lower body mass index (BMI) than the controls, and scored significantly higher on the Maudsley Obsessional Compulsive Inventory (MOCI; Hodgson and Rachman, 1977) and the depression measure than the control condition. When obsessiveness, depression and BMI were entered separately as covariates, the contribution of group membership to performance on the tests of cognitive flexibility remained significant. This suggests that group differences observed with respect to executive functioning were independent of both obsessiveness and depression.

The central aim of the present study was to further investigate the existence of any differences in executive functioning between women with AN and two control groups, people low in obsessiveness and people high in obsessiveness. Further, variables that can be expected to confound or obscure the relationship between cognitive flexibility and AN (i.e., obsessiveness, depression and starvation) will also be investigated.

2. Materials and methods

2.1. Participants

There were three groups of participants in the present study. The first two groups were obtained by screening 110 female undergraduate students using the Vancouver Obsessional Compulsive Inventory (VOCI; Thordarson et al., 2004) that assesses levels of obsessiveness, and the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn and Beglin, 1994) that assesses disordered eating over the previous four weeks. Participants ($n = 24$, 22%) were excluded if they reported either, or both, of the following: (a) binge eating at least once a week accompanied by loss of control and clinical levels of weight and shape concerns (scoring 4–6 on a 0–6 Likert scale) and/or (b) purging or fasting (e.g., not eating for at least eight waking hours for the purpose of influencing weight or shape) at least once a week.

Of the remaining participants, those scoring in the top 25% and bottom 25% on the VOCI were selected, respectively, as the high obsessiveness group ($n = 20$) and the low obsessiveness group ($n = 21$). The mean

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