



Aspects of social cognition in anorexia nervosa: Affective and cognitive theory of mind

Tamara Anne Russell^a, Ulrike Schmidt^b, Liz Doherty^b, Vicky Young^b, Kate Tchanturia^{b,*}

^a Section of Neuroscience and Emotion, King's College London, Institute of Psychiatry, London, UK

^b Section of Eating Disorders, King's College London, Institute of Psychiatry, London, UK

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ABSTRACT

Although social functioning is clearly impaired in anorexia nervosa (AN), there has been limited empirical assessment of this domain in this illness. This study assesses social cognition in AN by examining performance on two 'theory of mind' (ToM) tasks; Baron-Cohen's "Reading the mind in the Eyes" task (RME) and Happé's cartoon task. These tasks probe affective and cognitive ToM, respectively. Forty-four female participants were recruited (AN $N=22$; healthy controls $N=22$) and completed both tasks, with concurrent clinical and intellectual functioning assessment. Compared with healthy controls, AN performed significantly worse on both the RME and the Cartoon task (both conditions). The mental state condition did not facilitate performance in the AN group, as it did in the healthy controls. The findings broadly replicate limited previous work [Tchanturia, K., Happé, F., Godley, J., Bara-Carill, N., Treasure, J., Schmidt, U., 2004. Theory of mind in AN. *European Eating Disorders Review* 12, 361–366] but in addition demonstrate abnormalities on a task requiring affective ToM interpretation. More detailed information about the components of ToM and the ToM difficulties demonstrated in AN sufferers may inform our understanding of the disorder as well as future social-cognitive based treatments.

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1. Introduction

There is converging evidence to suggest social functioning is substantially impaired in anorexia nervosa (AN) (Schmidt et al., 1995; Godart et al., 2004). In the acute phase of illness, the impairment may be attributable to the direct effects of starvation on the brain. Keys et al.'s (1950) experiment, during which 36 healthy males underwent a starvation phase of several months, illustrates the effects of starvation on social abilities. One participant stated "Social graces, interests, spontaneous activity and responsibility take second place to concerns of food. I lick my plate unashamedly at each meal even when guests are present. I don't like to sit near guests, for then it is necessary to entertain and talk with them. That takes too much energy and destroys some of the enjoyment that comes from my food". Neurodevelopmental abnormalities arising from starvation during critical periods of development (i.e. adolescence) might also contribute to social difficulties (Connan et al., 2003). Moreover, there is evidence that women with AN experience social difficulties pre-morbidly (Troop and Bifulco, 2002; Fairburn et al., 1999), and these persist after recovery (Wentz et al., 2001). Clinically, it is reported that patients with AN show fear and avoidance of intense emotions, and that they keep low body mass index to avoid feeling.

Given that social difficulties have been noted before, during, and after AN, it is surprising, and in stark contrast to other neurodevelopmental disorders such as schizophrenia (Pinkham and Penn, 2006) and autism (Baron-Cohen, 1995), that there has been little attempt to study social cognition in AN. Social cognition underpins social behaviour and has been defined as "the mental operations underlying social interactions, which include the human ability to perceive the intentions and dispositions of others" (Brothers, 1990) and "higher cognitive processes subserving ... diverse and flexible social behaviours" (Adolphs, 1999). Although the term "social cognition" encompasses a range of processes (including social perception and social knowledge, as well as relationship and group dynamics; see Green et al., 2008), the bulk of the empirical literature to date has examined emotion recognition and "theory of mind" (ToM; the ability to represent the mental states of others in terms of their intentions, desires and beliefs, and to use that representation to understand and predict behaviour). The focus of this work is on ToM, due to the limited literature on social cognition in AN, and our utilization of the affective and cognitive concepts of ToM.

1.1. Emotion recognition in AN

There are two reports of impaired recognition of facial emotions in AN relative to the performance of healthy individuals (Kucharska-Pietura et al., 2004; Zonnevijlle-Bender et al., 2002). One study reports decreased accuracy in recognising vocal emotion (Kucharska-Pietura

* Corresponding author. PO59, Section of Eating Disorders, Institute of Psychiatry, London SE5 8AF, UK. Tel.: +44 20 7848 0134; fax: +44 20 7848 0182.

E-mail address: k.tchanturia@iop.kcl.ac.uk (K. Tchanturia).

et al., 2004). In contrast, two studies found no difference in emotion labelling and expression intensity ordering, respectively (Kessler et al., 2006; Mendlewicz et al., 2005—both used the JACFEE stimulus set). The variety of presentation and response modes makes it hard to determine any patterns, or obtain a clear hypothesis as to these discrepant findings. Some abnormalities in emotion recognition are present, but the specifics of the problem are as yet unknown.

1.2. Theory of mind in AN

To date, only one study has examined ToM in AN (Tchanturia et al., 2004). This study used Happé's cartoon and story tasks (Happé et al., 1999). In both tasks, participants generate an explanation for cartoons or stories that require either the understanding of physical (control condition) or mental (experimental condition) states. Deficits on mental state items with no difficulties on physical items are indicative of a specific ToM impairment. Compared with healthy participants, AN participants performed less accurately and took longer to process both conditions for both tasks. However, additional analyses revealed that the proportion of AN participants performing worse on the combined mental state items than on the physical state items was greater than that seen for healthy participants. This suggests a sub-group of AN sufferers with specific ToM difficulties. Related to this, a recent study of self-report questionnaire data (Hambrook et al., 2008) demonstrated that AN and healthy participants are not distinguishable on empathizing domains. This is at odds, however, with the clinical presentation of AN patients, who are emotionally avoidant, detached, and report social difficulties, despite often having above average intellectual ability. This study aimed to explicate the discrepancy between self-report and clinical observation with the use of objective experimental paradigms tap ToM and, further, to use the concept of affective and cognitive ToM as a means to elucidate the social difficulties experienced by those with AN.

1.3. Affective and cognitive theory of mind

Recently, and in part driven by the explosion of the social cognitive neuroscience field and our understanding of the emotional brain, the concept of "hot" and "cold" ToM, originally posited by Brothers and Ring (1992), has been resurrected and renamed "affective" and "cognitive" ToM (Hynes et al., 2006; Shamay-Tsoory et al., 2006). This framework provides a way to untangle the complex relationship between emotion, empathy and ToM.

A number of interpretations of ToM have been proposed, predominantly stemming from the developmental literature. These include the "theory-theory" (Gopnik and Wellman, 1994); the "simulation theory" (Goldman, 2001); Leslie's "decoupling" theory (Leslie, 1987), and Baron-Cohen's modular structure ToM (Baron-Cohen, 1995). Central to most of these theories (except for Baron-Cohen's) is the meta-cognitive process "thinking about thinking". Although there is clearly an emotional component to "real world" ToM, there is a paucity of empirical investigations along these lines (Shamay-Tsoory et al., 2007). Baron-Cohen's (1995) model made the first steps towards addressing this limitation with the inclusion of modules for decoding eye gaze and processing shared attention. This was later extended to the concept of the "language of the eyes" and the Reading the Mind in the Eyes (RME) task (Baron-Cohen et al., 2001). The task involves the first stage of mental state attribution, the "unconscious, rapid and automatic" decoding of the "language" of the eyes, without the subsequent (more cognitive) requirement to deduce content (Baron-Cohen et al., 2001, p 241). This skill, used in concert with higher order reasoning skills, allows one to understand and interpret the behaviour of others (Sabbagh et al., 2004). Imaging data have confirmed that the RME task activates regions typically

associated with emotion processing, specifically the amygdalae, and an absence of activation in this region is seen in those with ToM difficulties (see Baron-Cohen et al., 1999; Shaw et al., 2005). In contrast, in a more "traditional" ToM task, such as Happé's cartoon task, "thinking about thinking" and deductive reasoning skills are required. These demands make this task a "cognitive" ToM probe, and it has been shown that performance of this task engages quite different brain regions (Happé et al., 1999; Gallagher et al., 2000).

It is beyond the scope of this report to describe in detail the current on-going debates related to the nature of ToM versus empathy versus emotion recognition [although see Coricelli (2004) for an integration of these concepts]; what is relevant is the consideration of both affective and cognitive components of a process as a means to further understand social cognitive deficits in psychiatric groups experiencing emotional and social difficulties (e.g. schizophrenia; see Shamay-Tsoory et al., 2007), particularly in a group such as AN where so little research has been conducted.

1.4. Aims and hypothesis

Although the typically high intellectual functioning in AN means that social functioning is possible (if not pleasant), it is not known whether the deficits in ToM in AN span both affective and cognitive domains of ToM. To extend our limited understanding of ToM in AN, two well-validated probes of affective (RME task) and cognitive (Happé's cartoon task) ToM were selected. While the differing psychometric properties of the tasks preclude direct statistical comparison, this approach adds a further level of understanding to a limited literature, and may have implications for therapeutic intervention. An IQ assessment was also included. Clinical information (depression, general functioning) was examined as these variables may affect task performance. On the basis of prior findings, the limited ToM research, and the associated emotion-recognition literature, we hypothesised that both affective and cognitive probes of ToM would be impaired in AN.

2. Method

2.1. Participants

Twenty-two white Caucasian women diagnosed with AN (DSM-IV; American Psychiatric Association, 1994) were recruited from the Eating Disorders Unit at the South London and Maudsley NHS Foundation Trust. Seventeen individuals had the restrictive sub-type, and five fell into the "binge-purge" category. Individuals with brain damage or psychosis were excluded. Experienced psychiatric staff at this tertiary service made the diagnosis. Twenty-two female healthy controls (HC) were recruited via advertisement. All participants were between 18 and 50 years old and were reimbursed for participation. Exclusion criteria for the HC group were Axis I mental disorder, neurological disease, history of head trauma and current use of psychotropic medication. All participants were native English speakers. The study was approved by the local research ethics committee (Institute of Psychiatry, London). All participants gave written informed consent after the procedures had been explained.

2.2. Materials

The National Adult Reading Test (Restandardised) was used to estimate pre-morbid IQ (Nelson and Willison, 1992). The self-report Hospital Anxiety and Depression Scale (HADS) (Zigmond and Snaith, 1983) was used to assess current anxiety and depression. Global functioning was measured using the DSM-IV's Global Assessment of Functioning (GAF) scale. Body mass index (BMI; kg/m²; normal range 20–25) was calculated on the day of study for all participants.

The RME (revised Version; Baron-Cohen et al., 2001) consists of 36 items (19 male eye pairs and 17 female eye pairs). For each item, the participant sees a photograph of a pair of eyes displaying a complex mental state and must select (from a target and three foils) which mental state word best describes the eyes. Participants have unlimited time to decide and a glossary is provided. A control task of 10 eye pairs required participants to identify gender. Normative data are reported in Baron-Cohen et al. (2001). While not dynamic or whole face, these stimuli provide some ecological validity by using real eyes.

Happé's Cartoon Task (Happé et al., 1999) consists of 12 single frame cartoons. Six cartoons make up the mental state inference condition (MS), requiring an understanding of the character's mental state/beliefs or intentions in order to provide an

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