Autism and/or Eating Disorders

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Different approaches/similarities:

Are autism and anorexia nervosa related?
Prof C. Gillberg
1983 Sweden

Is anorexia female
Version of autism?
Prof J. Treasure
2009 UK
AN & ASD: Phenotypic similarities

- Behaviours
  - Repetitive behaviours
  - Narrow focus of interests
  - Food and eating problems in ASD
  - Insistence on sameness
  - Aloofness/Social Withdrawal
  - Cognitive and behavioural inflexibility
  - Attention to detail (WCC)

- Thinking Styles
  - Co-morbidity
  - ASD in AN

- Co-morbidity
“Triad in Autism”
By U. Frith, F. Happe and colleagues
no single explanation triad

Executive Functions:
Set Shifting

Attention to detail

Theory of Mind

ASD or AN? Both?

Lopez et al 2008

Tchanturia et al 2004, 2009

Tchanturia et al 2011, 2012

Charman et al 2011
Brain Research
Similarities in Cognitive styles

- e.g. good proof reading
  (Lopez et al 2008, 2009)

- e.g. choosing one strategy
  routine (Tchanturia et al 2012, 2011; Roberts et al 2007)

Measuring Central Coherence: Tasks

- Fragmented Picture Task
- Group Embedded Figures Task
- Rey-Osterreith Complex Figure Task
Embedded Figure Test (EFT) Example (Witkin 1971)
Embedded Figure Test (EFT)

Results: (Lopez, Tchanturia, Treasure 2008)

Univariate M-W test p < 0.05, ES = -0.52

Univariate M-W test p = 0.001, ES = -0.87
Rey-Osterrieth Figure
(Please copy this figure)
Rey-Osterrieth Figure
Example
Rey Figure: Detail and global drawing styles

Detail approach

Global approach

Harrison, Tchanturia, Treasure 2012
Wisconsin Card Sort Task (WCST)

Trail Making Task (TMT)

Set-shifting measures

Tchanturia et al 2012, 2011

Plos one

Brixton Task
Flexibility in HC and ED groups
Brixton task-example
(Tchanturina et al 2011, 2012 Plos One)
Emotional intelligence is lower than IQ in AN

(Lopez et al 2010 systematic review IQ; Hambrook et al; 2012 EQ)

Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT)
Social Anhedonia

(Tchanturia et al 2012 (N=149); Deborde et al 2006)

Deficits in the ability to experience pleasure from non physical stimuli such as other people, talking, exchanging expressions of feelings

Eckblad et al., 1982 (40 items)

Harrison et al in prep (N=271)
Where we see differences examples

• Importance of close friends
  “I Attach very little importance to having close friends”

• Choice to be with other people
  “I like to make long distance phone calls to friends and relatives”

• Preference to do no social things
  “I prefer watching television to going out with other people”

• Emotional involvement with other people
  “Although I know I should have affection for certain people, I don’t really feel it”
Measuring “hot” cognitions

- Reading the Mind in the Eyes Task
- Reading the Mind in the Films Task
- Expression of emotions
- Frustration Tolerance

For each set of eyes, please choose which word best describes what the person in the picture is thinking or feeling:

- alarmed
- shy
- hostile
- anxious
‘Please choose the word that best describes what the person in the picture is thinking or feeling’

joking  flustered

desire  convinced

Russell et al 2009 fist study in AN
“Hot” cognitions - eyes task (Russell et al 2009)

HC performed significantly better than AN group (p<0.05)
Oldershaw et al. (2010)

Reading the Mind in EYES

Reading the Mind in VOICE

Reading the Mind in FILMS

Reading Emotion in MUSIC
Emotion Recognition and High Level Mental State Inference in AN confirmed in further studies

Oldershaw et al., 2010
National Institute of Clinical Excellence (2004) in UK www. NICE. org, has concluded no grade A (reflecting strong empirical data) recommendation for treatment for AN and 49 C (expert opinion in absence of strong data). Further research in effective treatments was encouraged.

9 RCT-s for AN; drop out rates very high (between 30-65%)

<table>
<thead>
<tr>
<th></th>
<th>Level &quot;A&quot;</th>
<th>Level &quot;B&quot;</th>
<th>Level &quot;C&quot;</th>
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<tr>
<td>AN</td>
<td>0</td>
<td>1</td>
<td>49</td>
</tr>
<tr>
<td>BN</td>
<td>1</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>BED</td>
<td>2</td>
<td>5</td>
<td>2</td>
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<tr>
<td>EDNOS</td>
<td>0</td>
<td>0</td>
<td>1</td>
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AQ-10 screening
(Tchanturia et al 2013 Molecular Autism)

• The 10 item version of the Autism Quotient is a brief self-report instrument which measures autistic traits in adults.

• At a cut-point of 6, sensitivity = 0.88, specificity = 0.91, and positive predictive value (PPV) = 0.85.

Study Participants

Anorexia Nervosa

- Inpatients  (n = 54)
- Outpatients  (n = 15)

Healthy controls matched for age and IQ
-  (n = 53)
**AQ above threshold - 6**

**Pie Chart:**
- **High AQ:** 2%
- **Low AQ:** 98%

**Frequency of AQ scores of inpatients:**

- AQ scores: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
- Frequency: 1, 8, 2, 6, 9, 3, 5, 5, 2, 1

**AN IP:**
- **35%**
- **65%**
## AQ Items

Please tick one option per question only:

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<thead>
<tr>
<th></th>
<th></th>
<th>Definitely Agree</th>
<th>Slightly Agree</th>
<th>Slightly Disagree</th>
<th>Definitely Disagree</th>
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<tbody>
<tr>
<td>1</td>
<td>I often notice small sounds when others do not</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>I usually concentrate more on the whole picture rather than the small details</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>I find it easy to do more than one thing at once</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>If there is an interruption, I can switch back to what I was doing very quickly</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>I find it easy to ‘read between the lines’ when someone is talking to me</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6</td>
<td>I know how to tell if someone listening to me is getting bored</td>
<td></td>
<td></td>
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<tr>
<td>7</td>
<td>When I’m reading a story I find it difficult to work out the characters’ intentions</td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>I like to collect information about categories of things (e.g. types of car, types of bird, types of train, types of plant etc)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>9</td>
<td>I find it easy to work out what someone is thinking or feeling just by looking at their face</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>10</td>
<td>I find it difficult to work out people’s intentions</td>
<td></td>
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</table>
Main differences on item level

• I usually concentrate more on the whole picture, rather than the small details  → CENTRAL COHERENCE / ATTENTION TO DETAIL

• I find it easy to do more than one thing at once

• If there is an interruption, I can switch back to what I was doing very quickly  → COGNITIVE FLEXIBILITY / SET SHIFTING

• I like to collect information about categories of things  → ?

• I find it easy to ‘read between the lines’ when someone is talking to me  → THEORY OF MIND / EMOTION RECOGNITION
Clinical differences between High AQ and Low AQ

<table>
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<th>BMI</th>
<th>EDEQ</th>
<th>HADS</th>
<th>WSAS</th>
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<td>Low_AQ</td>
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<td></td>
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<tr>
<td>High</td>
<td></td>
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“Cold” Cognition-thinking style
Clinical Implications

Cognitive Characteristics

- Poor flexibility
- Poor abstract thinking
- Systematic review

CRT

Case series

RCT
Cognitive Remediation Therapy: ‘The how rather what of thinking’


• Manual based 10-session intervention, twice a week, for adult AN admitted to a specialist ED Unit

• Include exercises to:

  (1) Increase cognitive flexibility

  (2) See the ‘bigger picture’

  (3) Relate to real life
What CRT evaluation results tell us? Case Studies:
Replicated in case series Daga et al 2012

Good qualitative feedback
Changes in cognitive performance
Positive attribution to own thinking style

CRT vs TAU retrospective comparison

For summery of the findings before RCT-s
Tchanturia et al 2013 IJED
Findings in the Context of Clinical Practice

• Indicate the need for cognitive and emotion based therapy

• Cognitive Remediation Therapy (CRT) for anorexia

• Helps to improve flexibility and global integration

• Acceptable to patients (Whitney et al, 2008)

• Case study for an adolescent patient
  (Cwojdzińska et al, 2009)

Three RCT –s in progress for the review
Tchanturia et al 2013 Special issue of IJED
Framework for Development / Evaluation of RCTs for Complex Health Interventions

Theory

* Empirical evidence from ED
* Intervention tailored from psychosis

Pre-clinical

Modelling

• Case Series
  90 patients
• Qualitative feedback
  Patients / professionals
• Replication
• 7 papers

Phase I

Exploratory Trial

3 case series
CRT Testing in group settings

Phase II

Definitive RCT

Three RCTs
With positive Results from USA, Germany, Holland

Phase III

Long-term Implementation

Phase IV
First RCT – Stanford USA:


Stanford trial (N=46)

Does CRT help to keep patients in the treatment?
RCT from Heidelberg Germany

Training cognitive flexibility in patients with anorexia nervosa: A pilot randomized controlled trial of cognitive remediation therapy.

Heidelberg trial (N=40)

Does CRT improve flexibility of thinking better than NSCT?
Does CRT help to improve quality of life and eating pathology?
How do we know CRT works?
Drop out from the treatment (psychological and psychopharmacological 35-65% reported in the past studies before 2004)

From available evidence drop out from CRT is low! (0-15%)
Does cognitive performance improve? Previous study Tchanturia et al. 2004 negligible changes in SS.

New studies consistently show improvement on SS and some studies report CC improvements!
Anything else?

Quality of life more than symptoms improve in Schizophrenia what about AN? Evidence for QoL improvement from one case series and one RCT trial!
Cognitive Remediation and Emotion Skills Therapy for AN

“You always complain that I don’t know how to show my emotions, so I made these signs.”
“Hot” Cognition

Emotional processing

- Poor recognition of own
- Poor recognition of others
- Poor expression

Decision making

CREST

Positive emotions/communication

Case series
Thanks!

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Thank you for listening,
thanks to participants in our studies
to my collaborators on photos - home team:
at Maudsley…..

BRC- NIHR Biomedical Research Centre for Mental Health and
the National Institute of Health Research (NIHR)

Swiss Anorexia Nervosa Foundation

The Psychiatry Research Trust

Ariadne

South London and Maudsley NHS
NHS Foundation Trust
Baron-Cohen’s E-S Theory of Normal Sex Differences

- Majority of males (54%) show more advanced systemizing and less advanced empathy than females (S>E).
- Majority of females (44%) show advanced empathy but are less able to systemize than males (E>S).
- Outside of the norm, there are the ‘extremes’.

The main results of AN study EQ,SQ


- AN do not show evidence of advanced systemizing or impaired empathy on well-validated self-report scales.

- However, AN do report significantly higher scores on the AQ, suggesting similar impairments to ASD.
Thinking Style Spectrum

Global

Flexible

Focused

Detailed

AN
Expression and communication

• A tool for communicating information to others

  (Fridlund, 1994)

  Smiles ‘I want to get to know you’

• People associate smiling with positive intentions directed toward them (liking) and elicits positive responses

  (Floyd and Burgoon, 1999)

• Provides others with information about one’s needs thereby signalling trust which elicits responsiveness

  (Clark & Brissette, 2000)
Experimental Task

BASELINE
10 MINS

PANAS

PANAS

PANAS
Expression of emotion in AN:
No coordination between expressive and experiential aspects
AN express less positive and avoid negative emotional content

What is non-expression telling us?

- Back off, leave me alone
- I don’t know what I feel
- I don’t want to (know how to) take a position in this situation
- I don’t want to even begin to feel anything
- I’m ashamed of showing you how I feel

Exercise from the Cognitive Remediation and Emotion Skills Training (CREST) manual

Words:
- bitter
- discontented
- lost
- bad
- depressed
- furious
- scared
- insensitive
- incensed
- understood
- gentle
- brilliant
- relaxed
- mindful
- tranquil
- interested
- merry
Faulty compass?

• Emotions can point us in the right direction:

“gut feelings” can help with good decisions, good choices, learning new strategies.

Emotion cognition feedback loops are important if it does not work. It is like faulty compass.
Shifting from medical recovery model to more flexible definition of recovery, creates new challenges both for people with ED and clinicians.

Darcy et al 2010; Mondt et al 2012;
Implicit Facial Emotion Recognition Task

Implicit facial emotion processing Task
20 neutral/20 happy (100%) / 20 morphed (50%)
 Participants requested to decide upon the gender of each face and press one of two buttons

(Surguladze et al 2003)
Implicit Emotion Processing; Gender Judgement

70 participants were tested. 35 =AN; 35 HC; There was no significant difference in gender judgment (accuracy).

The AN group was slower across all conditions, but the groups showed a different pattern across conditions.

<table>
<thead>
<tr>
<th></th>
<th>AN=3</th>
<th>HC=3</th>
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<tbody>
<tr>
<td></td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Mean Global Reaction Time</td>
<td>1.15s (.17)</td>
<td>.96s (.14)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>88.1%</td>
<td>88.9%</td>
</tr>
</tbody>
</table>

Mean RT in seconds and accuracy per group across the task

Mean RT in milliseconds (ms) for both groups along the neutral-happy continuum (p<0.05)
Implicit Emotion Processing

Linear increase in activation in AN to faces of increasing happiness within the right fusiform gyrus, extending into the occipital cortex.

(Fonville et al in prep)
‘Triad’ of autistic symptoms

Deficits in Social Reciprocity

Impaired Social Communication

Repetitive & Stereotypic Behavior
Levels of analysis

Self evaluation
Psychosocial functioning/wellbeing measure

Work and Social Adjustment Scale (WSAS)
5 questions!!!
(Marks I;1986, Mundt JC; 2002)

Current impact of disorder on daily and life functioning

0 (not impaired)  →  8 (severely impaired)

For example:

“Because of my disorder, my social leisure activities (with other people, such as parties, bars, clubs, outings, visits, dating, and home entertainment) are impaired”. 
Problem areas in addition to ED symptoms

(Tchanturia et al 2012; Turner et al; 2010)
Baron-Cohen’s *Extreme Male Brain* Theory of ASD
Empathy (E) and Systemizing (S)

• **E** = Capacity to correctly identify others’ emotions, thoughts, intentions, and to respond with an appropriate emotion.

• **S** = Desire to build, investigate, and evaluate ‘systems’ in non-social domains. System as something that takes inputs and delivers outputs.
Empathy (E) and the ‘Female Brain’

• Females ‘hard-wired’ for empathy:
  – Female newborns prefer to look at social stimuli (faces/eyes) than mechanical stimuli (mobiles)
  – Spontaneous female toy preferences in infancy - Dolls
  – Female advantage in language skills (earlier, more advanced VIQ)
  – Female advantage on ToM tasks
  – Females score higher on EQ and other E questionnaires
  – Female preponderance in caring professions
Systemizing (S) and the ‘Male Brain’

• Males ‘hard-wired’ to systemize
  
  – Male newborns stare longer at toys which indicate systemizing
  – Early preferences for toys which are open to being ‘systemized’
    – vehicles, weapons, building blocks
  – Male advantage in systemizing academic subjects (Maths, Science, Technology)
  – Male disadvantage on eToM tasks but advantage on tests of systemizing
  – Male preponderance in jobs that require systemizing (Science, Engineering, Construction)
Experimental paradigms related to Empathy

Basic emotion identification *may be* impaired in AN?

Small proportion of AN struggle with ‘cold’ ToM

AN worse than HCs

Ekman faces

Happe ToM

Baron Cohen RMET
F. Happe ToM cartoon task

What’s going on here… why funny?
NMSToM

“Just back up little dear, so you won’t cut my head off.”
ToM
ToM cartoon task – Tchanturia et al 2004

AN = 20
HC = 20
Replication of the pilot


HC performed significantly better than AN group (p<0.001)
Performance on emotional theory of mind tasks

Anova participants significantly poorer than HCs (p<0.01)

* AN participants significantly poorer than HCs (p<0.01)
Summary

• Reading other peoples emotional states with (affective component) is difficult for people with AN

• It is not clear whether it is state or trait related (studies in progress)

• Anatomic correlates of emotional processing using neuropsychological component needs focus
“Cold Cognition” – logic based
(Chan et al 2008)

The term “executive functions” is an umbrella term comprising of a wide range of cognitive processes and behavioural competencies which include verbal reasoning, problem-solving, planning, sequencing, the ability to sustain attention, resistance to interference, utilization of feedback, multitasking, cognitive flexibility, and the ability to deal with novelty.
“Hot” cognitions

Executive functions involving more “emotional”, “belief” or “desires” such as the experience of reward and punishment, regulation of one’s own social behaviour, and decision-making involving emotional and personal interpretation, are regarded as “hot” components.
Cognitive Style (Cold)

- Neuroscience could inform new avenues of research and clinical practice in eating disorders (ED)

- Two systematic reviews have identified EDs to be associated with a focus for detail (Lopez et al, 2008) and an inflexible (Roberts et al, 2007) cognitive style

- These areas are intensively studied and successful translations to clinical practice are underway (Tchanturia et al 2008, 2010)
Cognitive Remediation Therapy as an Intervention for Acute Anorexia Nervosa: A Case Report

Helen Davies and Kate Tchanturia*
Institute of Psychiatry, King’s College, University of London, UK

The aim of this case report is to illustrate how cognitive remediation therapy (CRT) can be used as part of the treatment programme in acute anorexia nervosa (AN) to stimulate mental activities and improve thinking skills and information-processing systems when other therapies, for example cognitive behavioural therapy (CBT), may be too complex and intense for the patient to engage in. Furthermore, we hypothesize that CRT may be an effective tool in improving flexibility of thinking in AN, as previous neuropsychological findings have proved that rigidity is one of the maintaining factors in AN. Copyright © 2005 John Wiley & Sons, Ltd and Eating Disorders Association.
First study nonrandomised
(Tchanturia et al 2008 Psych Med)

Maudsley first study (N=45)

Baseline 1 → TAU (N=22) Tchanturia et al 2004 → Post

10 session format 2 drop outs (10%)

CRT (N=23) Tchanturia et al 2008
Significant improvement in flexibility test performance after cognitive training in AN

Ns
Tchanturia et al 2004

P=0.01 two tailed
Tchanturia et al 2008
Excessive attention to detail

- Normal tendency to examine context of information, link together items of information to understand the “broad picture” (U. Frith 1991)

- Individuals with autistic spectrum disorders have weak central coherence and are not able to see “wood for trees” (F. Happe 1996)
Both poor flexibility and extreme attention to detail is replicated

- Roberts et al 2007 summarised findings on set shifting concluding that poor set shifting is robustly replicated in AN.
- Lopez et al 2008 summarised findings in the literature concluding that extreme attention to detail was found consistently in AN, as well as BN and recovered from AN.
- BN -”Neurocognition in bulimic eating disorders: a systematic review” (Van den Eynde et al submitted) – No clear conclusions!!!!
Expression in Eating Disorders

• Difficulties with social functioning (Zucker, 2007; Oldershaw, 2009)
• Impoverished relationships & social isolation (Striegel-Moore et al, 1993)
• Inhibition of expression of negative feelings in order to preserve relationships and reduce conflict (Geller, 2000; Ioannou and Fox, 2009)
• Positive emotion expression also inhibited (Jänsch et al, 2009; Wildes et al, 2009)
Findings in the Context of Clinical Practice

• Indicate the need for cognitive and emotion based therapy
• Cognitive Remediation Therapy (CRT) for anorexia
• Helps to improve flexibility and global integration
• Acceptable to patients (Whitney et al, 2008)
• Case study for an adolescent patient
  (Cwojdzińska et al, 2009)
• Maudsley model of treatment (Schmidt and Treasure, 2006)
  involves work addressing cognition and emotions
What about emotions problems with social cognition?
CREST

- Treatment manual comprising of 10 sessions.
- The aim is to help patients to identify their thinking styles, recognise, tolerate and express emotion.
- This is achieved through the use of visual material, simple exercises and homework tasks.
- It is a collaborative exploration of the patient’s thinking and emotional processing style providing an emotion vocabulary and skills to work on their emotions.
- The focus is on everyday emotional skills.
Discrepancy between **how we feel** and **what we express**?

Ask patient to decorate the outside of the box to portray how they want to be seen and what they show the world and in the box to decorate and show how they feel on the inside.
Cognitive Style (Cold)

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• These areas are intensively studied and successful translations to clinical practice are underway (Tchanturia et al 2008,2010)
Fragmented Perseverative

Social Emotional Difficulties

Global Flexible

Combination of COLD and HOT Cognitive tasks

Harrison et al 2011

Eating Disorder
Recovered
Healthy Control
To summarise

• Findings support models of EDs which propose cognitive style and social emotional difficulties are involved in the maintenance of EDs

(Southgate, Tchanturia and Treasure, 2005; Schmidt and Treasure, 2006; Kaye, 2008; Fox and Power, 2009)

• Cognitive and emotional functioning are psychometrically separated

(Burnette et al, 2005; South et al, 2007; Dworzynski et al, 2009)
The Maudsley Maintenance Model

Cognitive
- Perfectionism/
  Cognitive rigidity
- Attention to detail

Emotional
- Avoidance
- Experience
- Expression

Interpersonal:
- Striving for acceptance
- Of others; Carers’ role

Pro-anorectic
- Beliefs:
  - Related to nutrition

Low intensity brief treatments for AN inpatients

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<th>CRT group</th>
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<tr>
<td>Cognitive Outcome</td>
<td>+</td>
<td>-</td>
<td>+</td>
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<tr>
<td>Qualitative Feedback</td>
<td>+</td>
<td>+</td>
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<td>BMI</td>
<td>weekly w/gain</td>
<td>Drop out</td>
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BMI relative to CRT or CREST participation

![Bar chart showing average weekly weight gain (kg) for different CRT and CREST participation levels: Both individual and group CRT, individual CRT only, group CRT only, and no CRT.](chart1.png)

![Bar chart showing mean weekly weight gain (kg) for different levels of CREST exposure: Both individual and group CREST, individual CREST only, group CREST only, and no CREST.](chart2.png)
Low intensity brief treatments for AN inpatients

- CRT individual
- CREST individual
- CRT group
- CREST group

Cognitive Outcome
- +
- +

Qualitative Feedback
- +
- +

BMI

Drop out 20%
WG 0.6
To summarize

- AN find hard to identify own emotions
- AN have high scores in AQ
- AN find “hot” ToM tasks hard
- Poor “gut feelings”
- Mixed findings on emotion perception experiments
Measures

Three self-report questionnaires:

- **The Empathy Quotient (EQ)**
  (Baron-Cohen and Wheelwright, 2004)

- **The Systemising Quotient (SQ)**
  (Baron-Cohen, Richler, Bisarya, Gurunathan, & Wheelwright, 2004)

- **The Autism-Spectrum Quotient (AQ)**
  (Baron-Cohen, Wheelwright, Skinner, Martin & Clubley, 2001)

  **AQ Subscales:**
  - Social Skills
  - Attention Switching
  - Attention to Detail
  - Communication
  - Imagination
REY-OSTERRIETH COMPLEX FIGURE

Central coherence indices

ORDER

STYLE

(Osterrieth, 1944; Booth, 2006)
Attention to detail (experimental evidence) in AN

Southgate, Tchanturia, Treasure 2008

Error Bars show 95.0% CI of Mean
Bars show Means

MFFT: Matching to sample task
Outcomes after the inpatient treatment
When is CRT helpful?

- Cognitive
- Behavioural
- Motivational
- Dynamic

Coaching cognitive
Emotional processing
Expressing emotions

CRT

Severe Chronic cases

AN severity

* Sig. tendency for AN to score in the ‘Above average’ and ‘Very High’ range ($p < .0001$)