IS ANOREXIA NERVOSA AN EATING DISORDER?
NEW INSIGHTS INTO PUZZLING SYMPTOMS

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Peterson Foundation, Price Foundation, Davis/Wismer Foundation
Overview

• Puzzling AN symptoms
• Neurocircuitry of behavior
• Altered appetite regulation
  • Too little “gas”
  • Too much “brake”
  • Anxiety not pleasure
  • Increased energy needs
• Treatment implications
Nervous Consumption”  
(Morton, 1689)

Mrs. Duke’s daughter, in the eighteenth year of her age, fell into a total suppression of her monthly courses from a multitude of cares and passions of her mind...from which time her appetite began to abate. She thus neglected herself for two full years. Never did I see one conversant with the living, so much wasted, yet there was no fever, no distemper of the lungs, or signs of preternatural expence of the nutritious juices. Only her appetite was diminished.
Anorexia Nervosa

• Many women diet in our culture
• Relatively few develop anorexia nervosa
• Are there susceptibility factors that make some women vulnerable to dieting, weight loss?
New Understandings of AN

- **Family studies** (Kendler, 1991; Walters 1995; Lilenfeld, 1998; Strober, 2000)
  - Increased rate of AN, BN, ED NOS in first degree relatives
- **Twin studies** (Kendler, 1991; Treasure 1994; Berrettini, 2000; Bulik, 2006; Steinglass, 2004)
  - Approximately 50 to 80% heritable risk
  - Genes more powerful than culture
- **Genes cause childhood (pre-morbid) behaviors** (Anderluch 2003; Stice 2002; Lilenfeld 2006)
  - Anxiety, harm avoidance, perfectionism, inhibition, drive for thinness, altered interoceptive awareness, obsessive personality
Childhood Symptoms of Obsessive-Compulsive Personality Traits: Percentage of Individuals With Traits

## Anxiety Disorders (AD) Lifetime and Premorbid Rates

<table>
<thead>
<tr>
<th>Study</th>
<th>ED</th>
<th>n</th>
<th>Lifetime AD</th>
<th>AD before ED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep 95</td>
<td>AN</td>
<td>24</td>
<td>68%</td>
<td>58%</td>
</tr>
<tr>
<td>Bulik 97</td>
<td>AN</td>
<td>68</td>
<td>60%</td>
<td>54%</td>
</tr>
<tr>
<td>Bulik 97</td>
<td>BN</td>
<td>116</td>
<td>57%</td>
<td>54%</td>
</tr>
<tr>
<td>Godart 00</td>
<td>AN</td>
<td>29</td>
<td>83%</td>
<td>62%</td>
</tr>
<tr>
<td>Godart 00</td>
<td>BN</td>
<td>34</td>
<td>71%</td>
<td>62%</td>
</tr>
<tr>
<td>Kaye 04</td>
<td>AN,BN</td>
<td>672</td>
<td>64%</td>
<td>61%</td>
</tr>
</tbody>
</table>

- 23% OCD
- 13% social phobia
Temperament, Personality, and Course of AN

Stice 2002
Anderluh 2003
Connan 2003
Lilenfeld 2006
Kaye, Fudge, Paulus 2009

Increases dysphoria
decreases dysphoria
Puzzling AN Symptoms

- Reduced food intake, weight loss
- Body image distortions
- Anxious, obsessive, perfectionistic temperament
  - Over concern with consequences
- Increased exercise
  - Stereotypic, fidgety, relentless
- Resistance to treatment
  - Ego syntonic symptoms
- Lack of response to normally rewarding stimuli
Overview

- Psychiatric disorders are syndromes
- How are behaviors coded in neuronal circuits?
- How can we use neurobiology to improve treatment?
What do we know?

- Anorexia Nervosa
- Extreme Dieting
- Increased Satiety ??
  - Decreased Reward??
- Limbic, Hypothalamic??
- 5HT, DA receptors??
- 5HT, DA genes ???

Bilder Neuroscience 2009

- Syndrome
- Symptom
- Phenotype
- Neural System
- Cellular, Signaling Pathway
- Proteome
- Genome

Neurobiology

- Loss of use of a leg
- Function coded in neural path (gait)
- Pathway that modulates Function (motor activity)
- Cell machinery (sugar, oxygen metabolized for energy)
- Genes code for proteins
- 23,000+ genes

BRAIN IMAGING

Genotyping
Background

Neural Circuitry 101
Subjects Studied
Feeding
Reproduction
Territory
Limited learning

Emotions guide behaviors needed for preservations
• Language, speech
• Anticipation, planning, inhibition
• Altruism, empathy
• Abstract thinking
• Greater memory

Maternal care, communication, play
• Some ability to learn, reason, error correct

Triune Brain – P. MacLean
<table>
<thead>
<tr>
<th>Name</th>
<th>Limbic</th>
<th>Associative (cognitive, executive)</th>
<th>Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cortex (human)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Striatum (BG), brain stem (reptile)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td>Emotional significance</td>
<td>Consequences, inhibition</td>
<td>Action of muscles</td>
</tr>
</tbody>
</table>

Cortical Striatal Loops
Fundamental motifs of cerebral organization
Yin and Knowlton 2005
## Neural Systems for Emotional Perception

**Phillips, Drevets, Rauch, Lane Biological Psychiatry 2003**

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<th>Dorsal system</th>
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</tr>
<tr>
<td>Anterior ventral striatum</td>
<td>Dorsal caudate, hippocampus, parietal, dorsal lateral prefrontal and ACC</td>
</tr>
<tr>
<td>OFC, amygdala, anterior ACC</td>
<td></td>
</tr>
<tr>
<td>Emotional significance of environmental stimuli, produce affective states</td>
<td>Effortful regulation of resulting affective states</td>
</tr>
<tr>
<td>Reward, emotion</td>
<td>Plans, consequences, selective attention</td>
</tr>
<tr>
<td>Here and now</td>
<td>Future consequences</td>
</tr>
</tbody>
</table>
How can we avoid confounding effects of malnutrition?

- **Subjects**: Women recovered from “restricting-type” AN > 1 y

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Age</th>
<th>BMI</th>
<th>Harm Avoidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rec AN</td>
<td>16</td>
<td>26 ± 5</td>
<td>21 ± 3</td>
<td>18 ± 7</td>
</tr>
<tr>
<td>CW</td>
<td>16</td>
<td>27 ± 6</td>
<td>23 ± 2</td>
<td>10 ± 6</td>
</tr>
</tbody>
</table>
Appetite and Weight Regulation
Homeostasis Time Scale

- Pain – immediate
- Oxygen – minutes
- Water – hours to days
- Food – days to weeks
Short-Term Obesity Therapy Does Not Result in Long-term Weight Loss

Wadden et al Int J Obesity 1989
76 obese women, average weight of 106 kg

Comparison of obesity and anorexia nervosa

Weight Loss in Anorexia Nervosa

<table>
<thead>
<tr>
<th>Years</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Loss (kg)</td>
<td>110</td>
<td>100</td>
<td>90</td>
<td>80</td>
<td>70</td>
<td>60</td>
</tr>
</tbody>
</table>

Change in Weight (kg)

-20 -15 -10 -5 0 5 10 15 20

Combined Therapy
Behavior Therapy
Diet Alone
We do not understand Eating Behaviors in AN

• Typical symptoms
  – Self-restriction to few hundred calories per day
  – Vegan – like; avoids fats, red meats, desserts
  – Unusual combinations of food
  – Obsessed with food, counts calories, cooks for others
  – Not sure if hungry, fear can’t stop eating
  – AN: Anxiety reducing character to dietary restraint
    \(\text{(Strober, 1995; Vitousek, 1994; Kaye 2003)}\)

• Cause?
  – Secondary to body image disturbances?
  – Secondary to obsessionality or anxiety?
  – Primary disturbance of appetite regulation?
Systems Determining Food and Weight Regulation

CNS Factors
- Limbic, cognitive circuits
- Hypothalamic-brain stem System

Blood-Brain Barrier

Peripheral Factors
- Adipose tissue
- Pancreas
- GI Tract

Cognitive Control
- Pleasure & Motivation
- Energy Balance

Appetite & Food Intake

Metabolic Signals
Top Down Regulation of Feeding
Alterations of Central Limbic and Dorsal Cognitive Circuits
Persists After Recovery
Rolls 2005; Berthoud 2006

• Humans can override hypothalamic energy balance signals
  – Obese overeat despite sufficient energy stores
  – AN restrict eating although emaciated
• Hunger
  – Food becomes more pleasurable
  – Increased motivation to eat
• Satiety
  – ‘Habituate’ to same foods
• Food can be aversive
• REC AN fMRI and pictures of food (Uher 2003): Altered response in limbic circuits
Testing Top Down Influences Using A Taste of Sucrose

Kaye, Fudge, Paulus
Nat Rev Neurosci 2009

Wagner et al 2007

Ventral limbic ROI

Dorsal Cognitive ROI
INSULA - OFC – STRIATUM PATHWAY

CODES A SIGNAL FOR

SENSORY – PLEASURE INCENTIVE – MOTIVATION
## Evidence that Hunger, Satiety Associated With Sensory-Hedonic Signal

Hunger Activates (↑) the Insula and OFC Regions When Compared to Satiety

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Image</th>
<th>Insula</th>
<th>OFC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>2001</td>
<td>PET</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>Tataranni</td>
<td>1999</td>
<td>PET</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Moris</td>
<td>2001</td>
<td>PET</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Kringelbach</td>
<td>2003</td>
<td>fMRI</td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>Uher</td>
<td>2006</td>
<td>fMRI</td>
<td>↑</td>
<td></td>
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Understanding Appetite
Incentive Motivational Drive to Seek and Consume Food


Energy balance, metabolism
Sensory, hedonic, motivation
Ability to favor alternatives to eating

Hypothalamus
Ventral limbic
Dorsal Cog/Assoc

Food consumption

++ - -
+++ - -
---
Brain Imaging (fMRI) functional magnetic resonance imaging

- Powerful magnetic fields
  - Iron in red blood cells
  - Different energy states with/without oxygen
- Indirect measure of activation of neurons
  - Neurons use more oxygen when activated
- Need a task to activate neurons
- + Safe in living humans, mm of resolution
- - Each mm brain contains millions neurons
Left Insula/OFC Response to Sucrose

Wagner 2008 Neuropsychopharm
CW vs. AN $p = .003$
Left ventral putamen
Response to Sucrose

*Wagner 2008 Neuropsychopharmac. CW vs. AN p = .002*

Similar differences throughout dorsal and medial caudate
Diminished Anterior Insula (AI), Striatal Response in REC AN

**Sensory-Hedonic-Motivational Pathway**

- **AI decreased signal**
  - Primary (sensory) gustatory cortex (Rolls 2005)
  - Food blindness?
- **Striatum decreased signal**
  - Reduced reward, motivation to approach food
- **AI projections to ventral putamen** (Fudge et al, 2005)
  - Pathway mediates hedonic, aversive aspects of taste (Small 2003), particularly highly palatable, high energy foods. (Kelley et al, 2002)
- **Is there a reduced drive (sensory-interoceptive-hedonic-motivation) in response to hunger**
  - Does this contribute to pursuit of emaciation to the point of death?
Insula (and connected regions) Play a Role in Interoceptive Information – The Sense of the Physiological Condition of the Entire Body

*Craig, 2002; Paulus and Stein 2006*

- Self-awareness of body states: temperature, touch, muscular and visceral sensations, vasomotor flush, air hunger, hunger and satiety, etc.
- Signal – change in body state. Link between cognitive and affective processes and the current body state
- Is only taste involved, or is there an alteration of all interoceptive stimuli?
  - Role in distorted body image?
  - Lack of recognition of the symptoms of malnutrition?
  - Altered insight and motivation to change?
Understanding Appetite in AN
Incentive Motivational Drive to Seek and Consume Food


Energy balance, metabolism
Sensory, hedonic, motivation
Ability to favor alternatives to eating

Hypothalamus
Ventral limbic
Dorsal Cog/Assoc

++ --
+
--

Food consumption
Reward and Anorexia Nervosa
Which Would You Rather Have?

But what if the Consequence was:
# Neural Systems for Emotional Perception

**Phillips, Drevets, Rauch, Lane Biological Psychiatry 2003**

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How does the brain compute this balance?

Immediate gratification

Long term consequences
Altered “balance” in AN?
Premorbid temperament and personality

Immediate gratification

Food, drugs, sex, rock n roll

Long term consequences

Perfectionism; over-control, inhibited; worry about mistakes, exactness, rules
Delayed Discounting

People tend to favor larger over smaller rewards, and rewards received sooner rather than later (Hariri, 2006)

- 8 REC AN and 11 CW
- Series of choices between early monetary rewards and later monetary rewards
  - Monetary percent differences for 1 was 3%, for 2 was 5%-25%, for 3 was 35%
- Results
  - CW preferred more early responses compared to REC AN (F(1, 1) = 10.23, p < .0025)
  - Each of the 3 comparisons was significant, p < 0.05.
Brain Dopamine (DA) Optimal Response to Stimuli
Schultz 1997; Horvitz 2000; Berridge 1996; Kelly 2004

• DA mediates learning and reinforcement mechanisms associated with positive rewards (food in hungry animal)
• Role not selective for food but rather for signaling salience of a variety of potential rewards, or cues that predict rewards
• DA encodes motivation and appropriate choices (goal directed)
• ? Contribute to altered reward, motivation, motor activity in AN (Barry & Klawans 1976)
Evidence for altered striatal Dopamine (DA) in AN

- Reduced DA in brain (metabolite homovanillic acid (HVA) in cerebrospinal fluid)
  - Ill AN (Kaye 1988)
  - REC AN (Kaye 1999)
- Altered DA gene for D2 receptor (Bergen 2005)
- REC AN Increased DA D2/D3 receptor binding (Frank 2005)
## Neural Systems for Emotional Perception

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### Emotional significance
- Emotional significance of environmental stimuli, produce affective states
- Reward, emotion
- Here and now

### Effortful regulation
- Effortful regulation of resulting affective states
- Plans, consequences, selective attention
- Future consequences
How to AN respond to reward? fMRI - guessing game task

- How do subjects respond to winning and losing?
- Participants guess whether the value of a hidden card is greater or less than ‘5’.
- Participants are given $5.00 at the start.
  - Correct guess: WIN $2.00
  - Incorrect guess: LOSE $1.00
  - No response: lose $0.50
- 13 recovered restricting AN and 13 CW
fMRI Analysis Methods
Wagner 2007 AJP

- 3T Signa scanner (GE Medical Systems)
- NeurolImaging Software (NIS) and Automated Image Registration (AIR) and Analysis of Functional NeuroImages (AFNI)
- Region of Interest (ROI) based analysis:
  - Right caudate (-12, 15, 7), left caudate (11, 16, 7), left ventral striatum (-10,6,-5) and right ventral striatum (10,6,-5) (Delgado 2000,2003)
  - Mean signal was extracted in a 3.2 mm/1 voxel radius and centered around Talairach coordinates
Left Ventral Striatum (immediate)
CW: wins vs losses p < .001
AN: wins vs losses p ns
Wagner 2007, Am J Psych
Left Caudate (future consequences)
CW vs. REC RAN p < .0001
Wagner 2007 Am J Psych
Relationship between trait anxiety and % fMRI signal change in dorsal striatum
Wagner 2007 Am J Psych

ANXIETY

ANXIETY
Altered balance in AN?
Contribute to difficulty learning from experience?

LIMBIC
Immediate
Gratification

EXEC/
ASSOCIATIVE
Long term
consequences

Difficulty in distinguishing positive and negative aspects of stimuli
Altered ability to code, scale, or response to reward?

Overconcern with future consequences
Both positive and negative consequences associated with anxiety

Similar findings in malnourished AN (Zastrow AJP 2009)
Understanding Appetite in AN
Incentive Motivational Drive to Seek and Consume Food


Hypothalamus
- Energy balance, metabolism
- Ability to favor alternatives to eating

Ventral limbic
- Sensory, hedonic motivation
- Food consumption

Dorsal Cog/Assoc
- Ability to favor eating

When malnourished
++ --
Eating, or anticipation of food, is associated with anxiety.

Not just diminished motivation.
Dorsal Striatum (cognitive/exec system) 
Dopamine D2/D3 receptor binding and harm avoidance  
(Frank 2005, submitted)

Circles indicates REC RAN, triangles indicates REC BAN  
Y-axis values reflect DA-D2/D3 binding potential (BP)
Increase in DA in striatum induced by food and by amphetamines in rodents
Volkow and Wise 2005
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**Amphetamine induced release of DA measured by brain imaging**

**Controls**
- DA release causes euphoria

**AN**
- DA release causes anxiety
  - Bailer in press
Increase in DA in AVS (nucleus accumbens) induced by food and by amphetamines in rodents
Volkow and Wise 2005

• Anxiety reducing character to dietary restraint (Strober, 1995; Vitousek, 1994; Kaye 2003)

• Is there a paradoxical effect of palatable foods in AN. That is, anxiety, not pleasure?
Small scale studies suggest some atypicals may reduce anxiety, increase weight in AN

- Olanzapine (Bissada 2008) 34 patients, DBPC 10 week flexible dose day hospital study
  - Greater rate of increase in weight
  - Earlier achievement of target BMI
  - Greater decrease in obsessive symptoms

- Aripiprazole (Trunko 2010) 8 (5 AN, 3 AN-BN), 4 to 36 months open case reports
  - Reduced distress around eating
  - Fewer obsessional thoughts
  - Reduced core ED behaviors
  - Gradual weight restoration where appropriate.

- BUT AN very resistant to taking any medication
Energy Metabolism in AN

Increased caloric needs to gain weight
% Average Body Weight and Calories/kg per Day

- % Average Body Weight
- Cal/kg/day

DATE

January February March April May June July August
Comparison of weight gain in rats fed 21g food/day (control) and 10g food/day (experimental)

The daily evolution of BW of both Experimental (E) and Control (C) groups is shown in Fig. 1.

FIG. 1. Evolution of mean BW ± Standard deviation of the E and C groups. While the C consumed ad libitum approximately 21 g, the E were given 10g per day in the first phase and pair-fed in the second. Notice the changes of daily BW gains (or losses) as a function of the Es' depletion.
AN Become Hyperthermic During Weight Gain

![Graph showing circadian core temperature changes over time.

- The graph illustrates the core temperature variations in °F and °C over 24 hours.
- Different colored lines represent temperature data from various periods.
- The table below the graph lists weight gain, percentage changes, and daily and per kg calorie intake.

<table>
<thead>
<tr>
<th>Period</th>
<th>Weight (KG)</th>
<th>Percent</th>
<th>Kcal/DAY</th>
<th>Kcal/KG</th>
<th>Kcal/KG/DAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/15/81 TO 11/19/81</td>
<td>31.6</td>
<td>62%</td>
<td>1201</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>2/2/82 TO 2/4/82</td>
<td>41.2</td>
<td>81%</td>
<td>2906</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>3/1/82 TO 3/4/82</td>
<td>46.3</td>
<td>91%</td>
<td>4471</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>3/22/82 TO 3/25/82</td>
<td>46.1</td>
<td>90%</td>
<td>2208</td>
<td>48</td>
<td></td>
</tr>
</tbody>
</table>
Requirements for weight gain in anorexia nervosa
Excess calories (over maintenance) to gain 1 kg
Average 7500 kcal/kg or 3400 kcal/lb

<table>
<thead>
<tr>
<th>Study</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russell and Mezey. 1962</td>
<td>7525 ± 585</td>
</tr>
<tr>
<td>Walker et al 1979</td>
<td>6401 ± 1627</td>
</tr>
<tr>
<td>Dempsey et al 1984</td>
<td>9768 ± 4212</td>
</tr>
<tr>
<td>Forbes et al 1984</td>
<td>5340 ± 1850</td>
</tr>
<tr>
<td>Kaye et al 1988</td>
<td>8301 ± 2272</td>
</tr>
</tbody>
</table>
Correlation Between Mean Activity and Caloric Consumption Necessary for Gain of 1 kg Body Weight (n=11)

$r = .73$
$P < .02$

Bulimic
Non-Bulimic

Mean Activity (Counts/24 Hrs)

Caloric Consumption (kcal) Necessary to Gain 1 Kg
### Amount of Exercise Influences Caloric Needs

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Excess to Gain 1 Kg</th>
<th>Excess to Gain 1 Pound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>4000</td>
<td>1800</td>
</tr>
<tr>
<td>Average</td>
<td>7500</td>
<td>3400</td>
</tr>
<tr>
<td>High</td>
<td>12000</td>
<td>5500</td>
</tr>
</tbody>
</table>
Understanding Appetite in AN
Drive, Anxiety, and Caloric Needs
Confusing Signals (more so when underweight)

- Energy balance, metabolism
- Sensory, hedonic, motivation
- Ability to favor alternatives to eating

Hypothalamus
Ventral limbic
Dorsal Cog/Assoc

Food consumption

Anxiety (not pleasure)  Exaggerated caloric needs
Applying Neurobiology to Treatment
Practical Approach to Traits

• Change
  – Unlikely

• Identify
  – “psychoeducation”

• Modify
  – Medication
  – Constructive coping strategies
  – Family approach for adolescents
Psychoeducation Groups

• Meet with families twice (2 to 3 hours)
• Based on evidence-based understandings of behavior
• Part didactic and reading
• Part open discussion and group process
• Goal
  – AN adolescents
    • Describe symptoms, behaviors to families
  – Families
    • Empathy and understanding
    • More constructive management
Psychoed 101

- Identify premorbid anxiety etc
- Describe current anxiety symptoms
- Discuss normal pleasure of eating for family members
- AN anxiety
  - Increases with eating
  - Decrease with starvation
  - Reasonable short, poor long term solution
- Altered sense of hunger
- Increasing caloric needs with weight gain
- Weight restoration painful, difficult struggle
- Need to trust, rely on family
Psychoeducational Approach

- Premorbid traits exacerbated during puberty/adol
  - High level of ‘quiet’ anxiety – may make concentration, learning difficult
  - Sensitivity to uncertainty, heighten anticipation
  - Over concern with not making mistakes, consequences, perfection

- Worse
  - Uncertainty, novelty, decision making, stress

- Better
  - Distractions - school work
  - Exercise
### Transition from symptoms to understanding how brain makes decisions

<table>
<thead>
<tr>
<th>Normal</th>
<th>AN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stimuli, cues</strong></td>
<td><strong>Selective filtering</strong></td>
</tr>
<tr>
<td><strong>Good or bad for me now</strong></td>
<td><strong>Difficulty coding</strong></td>
</tr>
<tr>
<td><strong>Good or bad for me in the future</strong></td>
<td><strong>Overemphasis, with negative bias</strong></td>
</tr>
<tr>
<td><strong>Motor activity to accomplish goal</strong></td>
<td><strong>Dissociated exercise</strong></td>
</tr>
<tr>
<td><strong>Did I get what I needed/wanted</strong></td>
<td><strong>Was it perfect?</strong></td>
</tr>
<tr>
<td><strong>What did I learn – do different next time</strong></td>
<td><strong>Not considered</strong></td>
</tr>
</tbody>
</table>
Family understanding, involvement

- Anxiety, obsessionality, perfectionism
  - Parents tend to have these traits and have learned how to manage them
- Empathy, support, and constructive coping strategies
- Anxious intrusive background "voice"
- Synergistic exacerbation vs stabilizing and defusing
- Developmental regression – need for parents to do guided decision making
- Learning from mistakes important, perfection impossible
Vulnerabilities
Positive Aspects

• Many traits are positive
  – Precise, attention to detail, achievement oriented
  – Advantage in engineering, medicine, academics, etc
  – Beneficial and protective for ancestors

• Perhaps illness caused by
  – Excessive load of traits (overwhelms compensatory mechanisms)
  – Puberty (hormones) or brain changes during development
  – Environment influences: stress, culture, dieting, independence, abundant palatable food choices
Med-Psych Unit
Rady Children’s Hospital

• Open March 2011
• Medical stabilization adolescents and young adults with ED
• Integrated with UCSD Adolescent ED program
Imaging Research Volunteer Opportunities

- NIMH funded studies of appetite, reward, etc using fMRI
- Women recovered from AN, BN
- Women ill with AN
- Studies support travel to UCSD, housing, and participant payment
- (858) 534-8019 or edresearch@ucsd.edu.
- www.eatingdisorders.ucsd.edu