Paying Attention to Emotion in ADHD

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Nosological History of Emotional Symptoms in Attention Deficit Disorders

DSM II, III, III R, IV, IV TR: Associated traits
- “low frustration tolerance”
- “temper outbursts”
- “mood lability”
  (DSM-IV TR, APA, 2000)

Utah Criteria for Adult ADHD: Core traits:
- “affective lability”
- “hot temper”
- “stress intolerance”
  (Wender, 1995)

Studies of Emotion in Adult ADHD

ADHD Clinic Subjects
60% of ADHD & < 15% of non-ADHD were:
- impatient, quick to anger, easily frustrated, overreacted emotionally easily excited
  (Barkley et al, 2008)

Elevated Wender-Utah WRAADS emotional items:
- Moderate elevations in temper, affective lability, overreactivity:
  mood fluctuation
  brief periods of depression
  problems with temper control
  overreaction to stress
  frequent frustration

32% of >500 Atomoxetine adult registration trial subjects:
  (Reimherr et al, 2005)
40% of 47 OROS-mph trial subjects:
  (Reimherr et al, 2007)

Is Emotion in Adult ADHD due to Comorbidity?

Limited assessment of comorbidity contribution to emotional symptoms to date

Types of Subsyndromal Mood Disturbances

- Severe Mood Disturbance  (Leibenluft et al., AJP 2003)
- Temper Dysregulation Disorder (DSM V proposal)
- ODD emotional items (DSM IV)
- Emotional Lability (many authors)
- Emotional Lability (many uses)
- Deficient Emotional Self-Regulation (Barkley, JARD, 2010)

Deficient Emotional Regulation (DESR)

(Barkley, JARD, 2010; Gottman & Katz, Devel Psychol, 1989)
- Difficulty with emotional regulation skills:
  – Inhibition of inappropriate behavior related to strong negative or positive emotion
  – Self-soothing physiological arousal that the strong affect has induced
  – Refocusing attention from strong emotions
  – Organizing subsequent behavior in the service of an external goal

Courtesy of Stephen Farace
Deficient Emotional Self Regulation

- Difficulty with control of emotion:
  - Stopping inappropriate emotional behavior
  - Soothing physiologic emotional arousal
  - Refocusing attention from emotional thought
  - Sticking with goals when emotional

(Barkley, JARD, 2010; Gottman & Katz, Dev. Psychol, 1989)

DESRS vs. Other Conditions

- Mood Disorder:
  - Abnormal mood not required
  - Mood may not be extreme
  - Emotional, rapidly subsiding behavior
    - Outbursts, inappropriate responses, irrational choices

- Oppositional Defiant Disorder:
  - Does not require reaction to authority

DESRS vs. Irritability, Furiosity

- The irritable ODD child is hypersensitive to provoking stimuli from authorities and may or may not be able to self-regulate
- The furious mania patient is hypersensitive and experiences extremes of emotion that are impossible to self-regulate
- DESR is poor self-regulation of mood.

Family and Follow-up Study of DESR in ADHD Youth

Sample
- 197 children with ADHD, 224 without ADHD and 128 siblings.
- Followed up after a mean of 4.4 years.
- DESR Defined By CBCL Dysregulation Profile (aka AAA profile, aka Pediatric Bipolar Scale)
  - Sum of Anxiety/Depression, Aggression and Inattention subscales
  - DESR defined as Dysregulation Profile
    - > 180 (>average on each subscale)
    - < 210 (cutoff associated with bipolar in children)

(Biederman et al 2011, Spencer et al 2011)

Rate of DESR in ADHD, Control Youth

Deficient Emotional Self Regulation (DESR) in Adults with ADHD

Study Population
- 185 Adults with ADHD or ADHD NOS (late onset)
- Full/late-onset ADHD demonstrate similar correlates
- 117 Adults without ADHD

Study Methods
- Barkley’s Current Behavior Scale
- SCID / KSADS modules for Axis I disorders
- Quality of Life, Enjoyment, Satisfaction Scale-Short Form
- Social Adjustment Scale - Self Report
- Functional outcomes questionnaire

Courtesy of Stephen Faraone
Deficient Emotional Self Regulation (DESR) Items

- Internal Consistency
  Cronbach’s alpha: 0.90

- DESR score association with ADHD severity
  In ADHD subjects, correlation = 0.69 (p < 0.001)

- Proxy for Clinically Significant DESR
  > 95th percentile of mean total score of controls

Deficient Emotional Self Regulation Inventory Items

1. Quick to get angry or become upset
2. Easily Frustrated
3. Over-react emotionally
4. Easily excited by activities going on around me
5. Lose my temper
6. Argue with others
7. Am touchy or easily annoyed by others
8. Am angry or resentful

Severity: None (0), Sometimes (1) Often (2), Very Often (3)

Proportion of subjects endorsing DESR symptoms as “Often” or “Very Often.”

ADHD vs. non-ADHD p < 0.001 for each item

Study Subjects with DESR:

> 95th %ile inventory item frequency

(p < 0.001 ADHD vs non-ADHD)

Does ADHD predict DESR independent of current comorbidity?
Regression model included individual comorbid disorders and ADHD as DESR predictors

Bold indicates current comorbidities associated with DESR

ADHD remained associated with DESR when co-varied with each comorbidity

Current Comorbidities
- Oppositional Defiant Disorder
- Conduct Disorder
- Major Depression
- Panic Disorder
- Agoraphobia
- Social phobia
- Simple phobia
- Generalized Anxiety Disorder
- Alcohol Dependence
- Bipolar Disorder
- Substance Abuse
- Alcohol Abuse
- Substance Dependence

Past Comorbidities
- Oppositional Defiant Disorder
- Conduct Disorder
- Major Depression
- Panic Disorder
- Agoraphobia
- Social phobia
- Simple phobia
- Generalized Anxiety Disorder
- Alcohol Abuse
- Substance Dependence
- Bipolar Disorder
- Substance Abuse
- Alcohol Dependence

Does ADHD predict DESR independent of past comorbidity?
Regression model included individual comorbid disorders and ADHD as DESR predictors

Bold indicates past comorbidities associated with DESR

ADHD remained associated with DESR when co-varied with all comorbidities
Mean DESR Score by Number of Current Comorbid Disorders

DESR in ADHD Probands with/without Oppositional Defiant Disorder (ODD)

- DESR overlaps with ODD, but occurs independent of ODD in adults with ADHD
  - In ADHD probands: Current / past ODD associated with DESR (p < 0.05 / p < 0.01)
  - In ADHD probands with current / past ODD: 83.3% / 78.1% had DESR
  - In ADHD probands without lifetime ODD: ADHD was associated with DESR (p < 0.001)
  - In ADHD probands without current / past ODD: 59.0% / 52.5% had DESR

Correlation of Quality of Life Enjoyment and Satisfaction Questionnaire—Short Form Scores with DESR

Correlation of Social Adjustment Scale—Self-Report Scores with DESR in Adults with ADHD

Risk for Functional Impairment

- Marital status - Married 22.9% vs 34.7%
  Divorced 19.5% vs 8.9%

- Arrests, traffic accidents - p < 0.05 for both

Barkley’s Wisconsin ADHD Followup

Emotional Impulsivity Impacted 7 of 10 domains

ADHD symptoms did not account for EI Occupational, Educational, Criminal, Driving & Financial Impact

(Barkley & Fischer, JAACAP 2010)

Intellectual Functioning and DESR

Full Scale IQ

WRAT Arithmetic

WRAT Reading
Rates of Executive Function Disorder* in ADHD Adults with / without DESR

Family Risk Analysis
Clarifying DESR relationship to ADHD:
- Do ADHD and DESR share familial risk?
  OR
- Is association due to environmental factors?

Methods
- Subjects
  - 27 ADHD+DESR probands and 45 siblings
  - 23 ADHD probands and 40 siblings
  - 33 Control probands and 43 siblings
- Compared familial pattern to hypotheses

Deficient Emotional Self-Regulation and Adult Attention Deficit Hyperactivity Disorder: A Family Risk Analysis

1. ADHD and DESR are independent

   Expect to find:
   - ADHD and ADHD+DESR probands have high risk* of ADHD in relatives
   - ADHD+DESR probands have high risk of DESR in relatives
   - ADHD Relatives of ADHD+DESR probands are not at risk for DESR**

   * High risk = relative to relatives of control probands
   ** No cosegregation

2. Subtype/Independent Condition?

   Expect to find:
   - Same pattern of ADHD+DESR and ADHD in siblings as Hypothesis 1, except:
     Cosegregation:
     ADHD relatives of ADHD+DESR probands at risk for DESR

*Defined as 2 or more impaired EF tests vs controls

All p’s > .10

Objectives: A growing body of research suggests that deficient emotional self-regulation (DESR) is a common and marked among clinical ADHD, family studies provide a method of defining the environment of clinical behaviors, but is family density have not excluded ADHD and DESR. Methods: Pedigrees were created with 27 probands with ADHD and 50 siblings for the ADHD probands, and 27 probands with ADHD and 50 siblings for the ADHD+DESR probands. Genetic and environmental segregation analyses were used to test hypotheses about the familial relationship between ADHD and DESR.

Results: ADHD+DESR probands were at high risk of being related to a proband with ADHD, but were at high risk for DESR in the proband. The risk for DESE was created in siblings of ADHD+DESR probands but not in siblings of ADHD probands. ADHD and DESR cosegregated in ADHD+DESR probands, but did not in ADHD probands. The AD and DESR probabilities were consistent with evidence of genetic and environmental segregation in ADHD+DESR probands, but not in ADHD probands.

Conclusions: The pattern of inheritance of ADHD+DESR siblings suggests that DESR may be a familial subset of ADHD that does not suggest that DESR is an independent of other non-ADHD conditions or of environmental contributions to ADHD. The present study did not address the pattern of DESR in children of ADHD+DESR probands, but it does not support the hypotheses about the familial relationship between ADHD and DESR.

Surman et al, Am Jour Psych, 2011
3 & 4: ADHD + DESR is secondary to effect of other factors

3. Due to higher loading of familially transmitted etiologic factors?
   (eg. DESR is secondary to ADHD severity)
   - Expect risk for DESR present in relatives of ADHD probands

4. Nonfamilial environmental factor required for ADHD+DESR?
   - Expect ADHD and ADHD+DESR probands to have equal ADHD+DESR in relatives

5. DESR is due to another full or subsyndromal disorder?
   - Higher comorbidity in relatives of ADHD+DESR than of ADHD probands

Rates of ADHD in first-degree relatives

- * Compared to control siblings, ADHD more prevalent in siblings of probands with ADHD irrespective of DESR, p < .001

Rates of DESR in first-degree relatives

- * DESR was more prevalent in siblings of ADHD+DESR probands than siblings of Controls or ADHD probands, p < .01

Cosegregation Analysis

Is There Risk for DESR in ADHD siblings?:

- In ADHD+DESR probands: Yes
- In ADHD probands: No

Familial Risk Implications

- Supports Hypothesis 2:
  - ADHD+DESR is a distinct subtype of ADHD or independent familial condition
  - Could be genetically distinct form of ADHD
- DESR not explained by:
  - Non-familial environmental factors
  - Axis I DSM-IV disorders
  - ? non-Axis I disorder contribution
  - ? non-genetic intrafamilial factors
**DESR in Clinical Trials**

**Atomoxetine**  
n=529; 170 with WRAADS Emotional Dysregulation (ED)  
ED improved to same extent as ADHD  
ED predicted CAARS treatment response  
(Reimherr et al, 2005)

**OROS-mph, double-blind placebo controlled studies**  
1) n=41: 16 ADHD+ED  
18 ADHD+ED+ODD  
5 ADHD alone  
25% had 50% lower WRAADS  
50% *  
49% *  
(Reimherr et al, 2007)

2) n=87: No change in BRIEF-A Emotional subscale  
for “clinically improved” group (≥ 30% improved, CGI 1/2)  
(Biederman et al, 2007)

**Lisdexamfetamine trial**  
- WRAADS emotion effects not significant  
(Adler et al, under review)

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**Conclusions**

Evidence (to date) Suggests that DESR:

- Is a common challenge accompanying ADHD  
- Occurs independent of comorbidity in Adults  
- Is not due to executive function deficits  
- May occur as a familial subtype of ADHD

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**Conclusions**

Attention to Emotion in ADHD Will Help:

- Understand the neurobiology behind DESR  
- Identify efficient methods of identifying DESR  
- Clarify whether current treatment helps DESR  
- Develop therapies specifically for DESR