Cognitive and neural basis of emotion regulation in bipolar disorder

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WHEN A MAN IS PREY TO HIS EMOTIONS, HE IS NOT HIS OWN MASTER.

BARUCH SPINOZA
Review

The cognitive and neurophysiological basis of emotion dysregulation in bipolar disorder

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Emotion Regulation

Includes all the conscious and nonconscious strategies we use to increase, maintain, or decrease the components of an emotional response, in accord with our goals.
A process model of emotion regulation

Emotional Response Tendencies

Emotional Responses

Evaluation

Modulation

Gross, 1998
Emotion regulation

Gross, 2001, *Current Directions in Psychological Science*

Cognitive emotion regulation
Gross’ process model

- **Antecedent-focused** strategies are implemented *before* an emotional response has been fully activated
  Eg., **cognitive reappraisal**: PROBLEM-FOCUSED STRATEGY

- **Response-focused** strategies refer to things we do once an emotional reaction is underway
  Eg., **suppression**: EMOTION-FOCUSED STRATEGY
PROBLEM- Vs. EMOTION-Focused tendencies

- **Cognitive Reappraisal (Problem-focused)**
  - Most flexible and effective means of regulating negative emotion
  - Involves active re-construal of an emotion-eliciting event
  - Requires mental flexibility to generate alternative explanations, set-shifting (executive) capacities to view events from alternative perspectives
  - decreases experiential & behavioural responses, little effect on physiological responses

- **Suppression (Emotion-focused)**
  - Involves active inhibition of outward signs of emotion
  - Requires cognitive effort to inhibit pre-potent responses
  - decreases emotionally expressive behaviour but has no impact upon (sometimes increases) the emotional experience
  - Increases physiological response (e.g., heart rate, SCR, blood pressure, pulse, temperature)
  - Impairs memory for the emotional event (increased cognitive load of continual self-monitoring)
  - Decreases emotional support (less sharing of emotions with others)
Questionnaire Measurement

Emotion Regulation Questionnaire (ERQ)

– Gross & John, 2001
– Measures tendency to use cognitive reappraisal and suppression

1 strongly disagree 2 neutral 3 strongly agree

1. ____ I keep my emotions to myself.
2. ____ When I want to feel less negative emotion (such as sadness or anger), I change what I’m thinking about.
3. ____ When I am feeling positive emotions, I am careful not to express them.
4. ____ When I’m faced with a stressful situation, I make myself think about it in a way that helps me stay calm.
5. ____ I control my emotions by not expressing them.
When Trying Is Not Enough: Emotion Regulation and the Effort–Success Gap in Bipolar Disorder

Gruber, Harvey, & Gross, 2012.
Early studies in BD: “Coping Style” origins

  - Modified version of Nolen-Hoekeema’s Response Style Questionnaire (RSQ) – assesses responses to depressed mood
  - *Rumination, distraction, and engagement in dangerous activities* predicted hypomanic personality traits
  - *Rumination (only)* predicted depression

- Van Der Gucht (2009)
  - Clinical BD sample: RSQ *rumination* associated w/ depressive symptoms but not mania
Questionnaire Measurement

Difficulties in Emotion Regulation Scale (DERS)

– Graetz & Roemer, 2004

This scale was developed to assess emotion dysregulation. It consists of 40 items, chosen to reflect difficulties with:

– **Emotional Awareness**: “I am attentive to my feelings”
– **Emotional Clarity**: “I have difficulty making sense out of my feelings”
– **Goal-directed Behaviour**: “When I’m upset, I have difficulty concentrating”
– **Impulse control**: “I experience emotions as overwhelming and out of my control”
– **Access to strategies**: “When I’m upset, I believe I will end up feeling very depressed”
Questionnaire Measurement

Cognitive Emotion Regulation Questionnaire (CERQ)

- Garnefski, Kraaij, Spinhoven, 2002

36 items: 9 conceptually distinct subscales

- **Self-blame**: “I think that basically the cause must lie with myself”
- **Other-blame**: “I feel that others are responsible for this matter”
- **Rumination**: “I dwell upon the feelings the situation has evoked in me”
- **Catastrophizing**: “I keep thinking how terrible it is, this experience”
- **Putting into Perspective**: “I think it all could have been much worse”
- **Positive Refocusing**: “I think of something nice instead…”
- **Positive Reappraisal**: “I think I can learn something from the situation”
- **Accepting**: “I think that I must learn to live with it”
- **Refocus on Planning**: “I think about how to change the situation:

Depression symptoms consistently associated with increased self-blame, rumination, catastrophizing, decreased positive reappraisal (Garnefski et al., 2001, 2002, 2006)
CERQ strategies in BD (Green et al, 2012)

- Bipolar Disorder
- Unaffected Relatives
- Healthy controls
Rumination had the strongest associations with mood symptoms in BD

- Depression
- Anxiety
- Stress
- Hypomania
TASIT: The Awareness of Social Inference Test

Part 1 - Emotion Perception
28 vignettes assess emotion perception through facial expression, body language and vocal inflection.

Part 2 - Social Inference (Minimal)
15 vignettes assess the ability to comprehend sincere and sarcastic social exchanges. In simple sarcastic exchanges, the speaker means the opposite of what he/she is actually saying. In paradoxical exchanges the dialogue doesn’t make sense unless sarcasm is perceived.

Part 3 - Social Inference (Enriched)
15 vignettes assess the ability to detect lies and sarcasm, with additional contextual information given before or after the scene; requires integration of context information and inferences from different sources.
Adaptive associations between social cognition and emotion regulation are absent in schizophrenia and bipolar disorder (Rowland, et al. 2013)
Pathways between neurocognition, social cognition, and emotion regulation in bipolar disorder (Van Rheenan et al., 2014)
Potential neuropsychological contributions

Green, Cahill & Mahli, 2007, Journal of Affective Disorders

Rumination
Self Blame

Positive Reappraisal
Putting into Perspective
Positive Refocusing
Refocus on Planning

Inhibitory deficits: intrusive emotional stimuli, lack of inhibition of self perspective

Generation of alternative appraisals; Reappraisal of meaning & significance; Generation of new goals; Reallocation of attention.

– Consistent with known neuropsychological deficits in BD (e.g., Robinson et al., 2006)
  • Sustained & selective attention
  • Set shifting & mental flexibility
  • Inhibition
  • Working memory
  • Theory of Mind / “other” perspective taking
Common cognitive deficits in Sz & BD

A. Reichenberg *et al.*
Structural Neuropathology in BD

- Reduced volume of PFC & ACC (Subgenual prefrontal cortex)
- Enlarged striatum and amygdala

(Strakowski, 2005; Savitz, 2005; Goodwin & Jamison, 2007; Konarski, 2008)
Neural systems for emotion

Emotion processing

Executive control

Attentional control during emotion processing

OFC
VMPFC
Subgenual cingulate gyrus

VLPFC
DLPFC
DMPFC
Dorsal ACG

Hippocampus
Amygdala
Insula
Thalamus
Ventral striatum
Brainstem nuclei

Emotion identification
Affect generation

Emotion regulation

fMRI studies: cognitive reappraisal task

OBSERVE, OR DECREASE EMOTION

NEGATIVE OR NEUTRAL PHOTO

Strength of Affect Rating

Relax before next trial

2 secs | 10 secs | 4 secs | 4 secs

Instructional Cue | Online regulation | Affect Rating | Relax before next trial

Oschner et al., 2002, *Journal of Cognitive Neuroscience*
- Participants view emotional scenes designed to elicit negative affect
- 2 conditions: cognitive reappraisal Vs passive viewing
Neural mechanisms of cognitive reappraisal

Ochsner et al, 2002, JCN

Inhibitory role of Left Prefrontal Cortex Mediated by Medial Orbital Frontal Cortex With attenuated Amygdala
Previous study in depression

### Participants

<table>
<thead>
<tr>
<th></th>
<th>Healthy Adults (n =15)</th>
<th>Bipolar I (n =13)</th>
<th>Schizophrenia (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age (SD)</td>
<td>35 (2)</td>
<td>41 (3)</td>
<td>44 (3)*</td>
</tr>
<tr>
<td>Females</td>
<td>9</td>
<td>5</td>
<td>4</td>
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<tr>
<td>Years of Education (SD)</td>
<td>16 (1)</td>
<td>16 (1)</td>
<td>13 (1)*</td>
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<tr>
<td>Handedness (SD)</td>
<td>90 (4)</td>
<td>92 (5)</td>
<td>85 (5)</td>
</tr>
<tr>
<td>NART Premorbid IQ (SD)</td>
<td>114 (2)</td>
<td>118 (2)</td>
<td>109 (3)</td>
</tr>
<tr>
<td>Antipsychotic CPZ Equiv (mg)</td>
<td>--</td>
<td>168 (106)</td>
<td>352 (58)</td>
</tr>
<tr>
<td>Antidepressant IMI Equiv (mg)</td>
<td>--</td>
<td>--</td>
<td>132 (32)</td>
</tr>
<tr>
<td>DASS: Anxiety</td>
<td>2 (1)</td>
<td>12 (3)*</td>
<td>8 (2)*</td>
</tr>
<tr>
<td>DASS: Stress</td>
<td>6 (2)</td>
<td>18 (3)*</td>
<td>11 (3)</td>
</tr>
<tr>
<td>DASS: Depression</td>
<td>2 (1)</td>
<td>10 (3)*</td>
<td>8 (4)</td>
</tr>
<tr>
<td>PANSS: Positive</td>
<td>--</td>
<td>10 (1)</td>
<td>19 (2)^</td>
</tr>
<tr>
<td>PANSS: Negative</td>
<td>--</td>
<td>11 (1)</td>
<td>22 (2)^</td>
</tr>
<tr>
<td>PANSS: General</td>
<td>--</td>
<td>25 (2)</td>
<td>32 (2)^</td>
</tr>
</tbody>
</table>

* p < 0.05
Subjective AFFECT RATINGS

** = p < .01
* = p < .05
How do healthy brains downregulate emotion?

Downregulation of negative affect elicited bilateral prefrontal activity in the VLPFC, OFC, DLPFC and rostral ACC; The left IFG was inversely correlated with amygdala activation during downregulation of affect.
Down-regulation of negative affect in BD

BD > HC

Lack of IFG-amygdala coupling in BD
+
Heightened amygdala activity in BD only

*Correlation coefficient: $r = -0.76$
Lack of PFC and subjective ratings coupling in BD

(Morris, Sparks, Shannon-Weickert, Mitchell, Green, Trans Psychiatry, 2012.)
Lack of cortico-limbic coupling in bipolar disorder and schizophrenia during emotion regulation

RW Morris¹,², A Sparks³, PB Mitchell¹,³, CS Weickert¹,²,⁴ and MJ Green¹,²,³

ARCHIVAL REPORT Biological Psychiatry, 2013

Frontal-Amygdala Connectivity Alterations During Emotion Downregulation in Bipolar I Disorder

Jennifer D. Townsend, Salvatore J. Torrisi, Matthew D. Lieberman, Catherine A. Sugar, Susan Y. Bookheimer, and Lori L. Altshuler

doi:10.1017/S0033291715000434

Emotion regulation in bipolar disorder type I: an fMRI study

F. Corbalán¹, S. Beaulieu¹,² and J. L. Armony¹,²,³*
Emotion dysregulation BD –

**Functional** impairment

- absence or disruption of **capacity**
- disturbances in **integrity of regulatory processes**

  Potential mechanisms

- structural and functional brain abnormalities
- neuropsychological impairments in attention, inhibition, WM

**Process** impairment

- **Inappropriate implementation** of otherwise adaptive regulatory processes

  Potential Mechanisms

- Misuse of otherwise adaptive strategies
- Eg, out of context, in extreme form, due to misperception of other’s emotions/intentions, and the meaning of events

  - Kring and Werner, 2002
SUMMARY

Similar cognitive regulatory styles among BD and families

- Increased tendency for rumination
- Increased tendency toward catastrophising
- Increased tendency toward self-blame
- Less likely to “put things into perspective”
- All associated with mood symptoms

Links between social cognition and emotion regulation are “broken” in BD:

- Suggests that strengthening understanding of social context and emotions may be worthwhile in treatment

Fronto-limbic connectivity in BD may impede efficient regulation:

- One avenue may be to undertake cognitive remediation of brain circuitry required for “effortful control”
Dank je wel!