The Social Regulation of Emotion

James Coan
Virginia Affective Neuroscience Laboratory
Department of Psychology
University of Virginia
http://www.affectiveneuroscience.org

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Part 1:
The Cheetahs of Emotion Regulation
It’s only a movie!
Coan, Allen & Harmon-Jones, 2001; Coan & Allen, 2003; Coan & Allen, 2004; Coan, Allen & McKnight, 2006; Coan & Allen, 2008
...only a movie...
...only a movie...
I want a drink!
House, Landis & Umberson, 1988

- Evans County blacks ($RR = 1.08$)
- Evans County whites ($RR = 1.83$)
- Tecumseh ($RR = 3.87$)
- Gothenburg ($RR = 4.00$)
- Alameda County ($RR = 2.44$)
- Eastern Finland ($RR = 2.63$)

Age adjusted mortality rate

Level of social integration
**Figure 2. Probability that Humor by Wife Significantly Decreased Husband’s Heart Rate**

Gottman, Coan, Carrere & Swanson, 1998
Part 2:
We Return to Baseline
Social contact during threat

Study 1: fMRI study of 16 couples; selected for high relationship satisfaction

*Psychological Science, 2006*

Coan, Schaefer & Davidson, 2006
Functional region of interest (ROI) approach
All ROIs p < .005, corrected

Threat minus safety contrasts during the no handholding condition were considered normative or baseline. This allowed identification of threat responsive brain regions

Coan, Schaefer & Davidson, 2006
Bodily Arousal

Coan, Schaefer & Davidson, 2006

No-hand  Spouse  Stranger
Any handholding causes some attenuation of neural threat response, spouse handholding causes more.

Coan, Schaefer & Davidson, 2006
"Automatic" emotion regulation
Ventromedial PFC

Attention to task demands
Superior frontal gyrus

Effortful Emotion Regulation
Dorsolateral PFC

Arousal
Ventral ACC

HPA-Axis
Hypothalamus

Hypervigilance
Superior Colliculus (visual)

Motivated Escape?
Caudate / Nucleus Accumbens

Pain Anticipation
Right Anterior Insula (conscious experience?)

Sensory motor preparation
Posterior cingulate cortex
Supramarginal gyrus

Somatic attention
Postcentral gyrus (shock)

Alone
“Automatic” emotion regulation
Ventromedial PFC

Effortful Emotion Regulation
Dorsolateral PFC

Attention to task demands
Superior frontal gyrus

Hypervigilance
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Right Anterior Insula (conscious experience?)

Sensory motor preparation
Posterior cingulate cortex
Supramarginal gyrus

Somatic attention
Postcentral gyrus (shock)

Stranger and partner handholding

Arousal
Ventral ACC

HPA-Axis
Hypothalamus

Hypothalamus

Postcentral gyrus (shock)
"Automatic" emotion regulation  
Ventromedial PFC

Effortful Emotion Regulation  
Dorsolateral PFC

Attention to task demands  
Superior frontal gyrus

Arousal  
Ventral ACC

Hypervigilance  
Superior Colliculus (visual)

HPA-Axis  
Hypothalamus

Motivated Escape?  
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Posterior cingulate cortex  
Supramarginal gyrus

partner handholding
Down Regulation Model:

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**Down Regulation Model**: Brain would be most active when regulated by the high quality relational partner!

One likely candidate mediating structure for the down-regulation model is the prefrontal cortex...
Eisenberger, et al. (2007) *Neuroimage*

No structures correlated *positively* with the provision of social support. Not even the prefrontal cortex
Perhaps our brains **assume** proximity to social networks and relational partners – Regulatory effect is a *return to baseline*.

Perhaps our brains **assume** proximity to social networks and relational partners

– Distance from relational partners increases threat sensitivity.

Social Baseline Theory

Threat + Partner + High Quality → A

Social Baseline Theory

Social Baseline Theory

Social Baseline Theory

Part 3:
Relationships Matter
Right Anterior Insula

- Handholding condition by dyadic adjustment (DAS) interaction (mixed model), $F(2,23) = 4.33$, $p = .03$
- Anticipation of pain
- Re-representation of bodily afferents - modulates subjective pain experience? (Craig, 2003).

Coan, Schaefer & Davidson, 2006
Hypothalamus
- Handholding condition by dyadic adjustment (DAS) interaction (mixed model), $F(2,27) = 4.31, p = .02$
- “HPA-Axis”; starting point hormonal stress cascade to regulate bodily threat response.
- Implicated in immune system and memory functioning

Coan, Schaefer & Davidson, 2006
Part 4:
These Findings Generalize Well
Social contact during threat
Study 2: fMRI study of 27 same sex couples; also selected for high relationship satisfaction
Coan, Thrasher & Tatum, in prep
Right Amygdala
- Partner effect
- Threat detection
- $F(2,50) = 5.52, p < .01$

$\% \text{Signal Change}$

- $p = .004$
- $p = .07, \text{ns}$
- $p = .19, \text{ns}$

Coan, Thrasher & Tatum, in prep
Left Cerebellum
- Partner effect
- Modulation of arousal
- $F(2,50) = 4.01$, $p < .03$

Coan, Schaefer & Thrasher, in prep
Left Cerebellum
- Dyadic adjustment (DAS) Main Effect (mixed model), $F(1,66) = 6.33$, $p = .01$
- Modulation of arousal

$\text{Coan, Schaefer & Thrasher, in prep}$
Right Fusiform Gyrus
  • Dyadic adjustment (DAS) by Group Interaction Effect (mixed model), $F(1,69) = 9.45, p = .003$
  • Perceived intentionality/Avoidance
  • Modulation of amygdala

Lesbian

$r = .15, p = .60, \text{ns}$

Coan, Schaefer & Thrasher, in prep
Right Fusiform Gyrus

- Dyadic adjustment (DAS) by Group Interaction Effect (mixed model), $F(1,69) = 9.45$, $p = .003$
- Perceived intentionality/Avoidance
- Modulation of amygdala

Lesbian

$r = .15$, $p = .60$, ns

Gay

$r = -.67$, $p = .01$

Coan, Schaefer & Thrasher, in prep
Social regulation among low SES

Study 3: fMRI study of 22 platonic friends; low socioeconomic status background.

Coan, Beckes & Hasselmo, in preparation
Anterior Cingulate Cortex

- *Friend* effect
- Conflict Monitoring
- $F(2,20) = 4.03, p < .03$

$p = .008$

$p = .63$

$p = .30$

Coan, Beckes & Hasselmo, in prep
Inclusion of Other in Self (IOS) scale

Right Anterior Insula – Closeness by Handholding

Coan, Beckes & Hasselmo, in prep

Friend

r = .12
Right Anterior Insula – Closeness by Handholding

Stranger

$r = .11$

Coan, Beckes & Hasselmo, in prep
Right Anterior Insula – Closeness by Handholding

Alone

$r = .46$

Coan, Beckes & Hasselmo, in prep
Inferior Frontal Gyrus – Closeness by Handholding

Friend

$r = -0.04$
Inferior Frontal Gyrus – Closeness by Handholding

Stranger

$r = -0.06$
Inferior Frontal Gyrus – Closeness by Handholding

Alone

\[ r = 0.34 \]
Part 5:
The Key is Bioenergetics
Economy of Action and Perception/Action Links
Social Baseline Theory

Beckes & Coan, in press; Coan, 2008; Coan, 2010; Hughes, Crowell, Uyegi, & Coan, under review
Schnall, et al 2008

n = 34

Friend

Alone

Degrees

Verbal

Visual
Schnall, et al. 2008

$n = 34$
$r = -0.74, p < 0.004$

Relationship Duration

Degrees

Verbal  |  Visual

Friend  |  Alone

Schnall, et al. 2008
Part 6:
I Am You and You Are Me
Threat to Self and Threat to Other
fMRI study of 22 friends

Beckes, Hasselmo, & Coan, under review
Right Orbital Frontal Cortex

% Signal Change, Threat to Other

Friend
$r = .68$

Stranger
$r = .46$

% Signal Change, Threat to Self

Beckes, Hasselmo, & Coan, under review
Right Dorsolateral Prefrontal Cortex

Beckes, Hasselmo, & Coan, under review
% Signal Change, Threat to Other

Friend
\( r = .90 \)

Stranger
\( r = .29 \)

% Signal Change, Threat to Self

Beckes, Hasselmo, & Coan, under review
Part 7:
He Reaches For Me All the Time
Humans can regulate themselves in a lot of different ways, and better than any other animal.

It’s only a movie!
But self-regulation is costly, exhausting, and probably a poor long-term strategy under even the best circumstances.
I am totally conserving vigilance processing right now.

Social proximity and contact decreases the burden associated with challenging environments.
We achieve this by extending and distributing our sense of self across our social networks, taking on as our own the states of those closest to us.
The “baseline” human emotion regulation strategy is probably social in nature.
How does all this manifest in the “real world?”

- Email excerpt from a woman coping with her husband’s cancer…
- "He never holds my hand, it is not like him. But, after this surgery and all the time in the hospital, he constantly wants me to hold his hand. He reaches for me all the time."
Thanks!

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John Gottman     Cat Thrasher
Richie Davidson  Karen Hasselmo
Sue Johnson      Alex Tatum

Lane Beckes

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