Emotional and evolutionary aspects of contagious violence

Jeff Victoroff, M.D.
Associate Professor of Clinical Neurology and Psychiatry
University of Southern California
Keck School of Medicine
Institute of Medicine

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The Haddon Matrix


- Since then the Haddon Matrix has been applied to diverse forms of injury including:
  - Burns (Peck et al., Burns. 34(3):312-9, 2008).
  - Youth gun violence (e.g., Laraque et al. J Natl Med Assoc. 1999 October; 91(10): 557–571.)
Haddon Matrix

Pre-event

Event

Post-event

Personal Factors

Vector or Agent Factors

Physical Environ. Factors

Social Environ. Factors

Pre-event

Event

Post-event
### Haddon Matrix for Terrorist Attacks

<table>
<thead>
<tr>
<th>Pre-event</th>
<th>Event</th>
<th>Post-event</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal Factors</strong></td>
<td><strong>Vector or Agent Factors</strong></td>
<td><strong>Physical Environ. Factors</strong></td>
</tr>
<tr>
<td>Loss</td>
<td>Multi-channel communications</td>
<td>Weapons</td>
</tr>
<tr>
<td>Rage</td>
<td>Crowd communications</td>
<td>Access to target</td>
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<tr>
<td>Satisfaction</td>
<td>Multi-channel communications</td>
<td>Escape options</td>
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<td></td>
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<td>Glory</td>
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**Advantage:** Acknowledges that terrorism is multidetermined.

**Drawback:** Fails to explore the underlying human biology.
Hints of a contagious process

1. Fluctuations in rates of violence that cannot be accounted for by exogenous factors, e.g.:
   - Distribution of crack cocaine
   - Race-specific economic deficits
   - Employment rate
   - Demographic changes
   - Police strategies

2. A quasi-sigmoidal Pattern (e.g., Dodd, 1953; Huff & Lutz, 1974)


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Example: Support for Terrorism among Palestinians and Actual Attacks in Israel

Plot of Combined Support for Attacks (Y1) and Number of Attacks (Y2) Over Time

Time Period: 1996-2011

Y1 = Percent Of Palestinians Who Support Attacks Against Israelis

Y2 = Number of Attacks Carried out Against Israelis

Legend

combined support (multiple polls)  # Attacks


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But why would this tendency for the diffusion of collective aggression be part of human nature?

And how would it work?
Aggression is Normal, Universal
Animal Behavior

Invertebrate and vertebrate aggression

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Most human physical aggression is expected and/or sanctioned

- Toddler behavior
- Sports
- Hunting
- Police behavior
- Warrior behavior
Coordinated collective aggression is essential for group survival
Coordinated collective aggression is essential for group survival.

Neolithic battle, Levant
C. 10,000 BCE

Dani tribal battle
Papua, New Guinea
C. 1947
Indeed, collective aggression may explain cooperative civilization.

**Did Warfare Among Ancestral Hunter-Gatherers Affect the Evolution of Human Social Behaviors?**

Samuel Bowles

*Science, 2009, 324, 1293.*

- **Data:** All archeological and ethnographic sources re. hunter-gatherer warfare in Late Pleistocene/ Early Holocene

- **Results:** Warfare creates conditions favorable to genetic success of altruists and their groups

\[ \delta = \text{warranty mortality} \]
\[ \lambda A = \text{effect of altruism on success in conflicts sufficient for the proliferation of altruistic traits} \]
The success of collective aggression requires that brain systems evolved to support:

1. Detecting signals from people you may imitate
2. Distinguishing in- vs. out-group
3. Shared emotional/cognitive state
4. Capacity to actualize violence
5. Reward response: it has to make you feel good
6. Must contribute to inclusive fitness

Therefore, on theoretical grounds alone, one would predict the discovery of circuits or cell populations that evolved to support:

1. **Imitation**
2. **Reward**
3. **Perceived fitness advantage**
The neurocircuitry of human aggression

Interlocking cortical/subcortical, liminal/subliminal systems mediate:
- Learning of aggression,
- Distress at loss,
- Anger at a provocation,
- Assessment of social propriety of violence,
- Risk-benefit analysis, and
- Reward

VTA

Reward involves widespread interconnections between limbic structures, esp. dopaminergic transmission in the ventral tegmental area and nucleus accumbens

NA mediates two functions:
1. Subjective reward
2. Reversal learning


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Individuals vary in susceptibility to imitate collective aggression in two ways

1. Variation in tendency to imitate

2. Variation in type of violence imitated
   - Pro-social
   - Anti-social
     - Factors plausibly impacting susceptibility:
       - Social factors
         - History of exposures to stress, conflict, deprivation, or loss
         - Social learning of violence
         - Depressed mood
       - Biological factors
         - Gender
         - COMT codon 158 polymorphisms
         - Dopamine DrD2 receptor polymorphisms
         - Variation in amygdalar receptor density for nonapeptides
         - Limbic morphology (Buckholtz, 2010; Boccardi, in press)
         - Testosterone level

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Example: Support for Terrorism May be Associated with Basal Testosterone Level

Testosterone levels:
Sympathetic to terrorism: = 105.8

Not sympathetic to Terrorism = 83.0
P = 0.150

All 8 subjects with testosterone > 1 std. dev. above the mean were sympathetic to terrorism

Victoroff et al., Aggressive Bhv. 2011, 37, 121
The paradox of human evolutionary success

- Collective, imitative aggression was probably required for human survival and flourishing.
- Selective pressures favored emergence of brain mechanisms to support collective aggression.
- Variations in the biopsychosocial mechanisms of contagious violence may account for the diffusion of pro-social vs. anti-social aggression.

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