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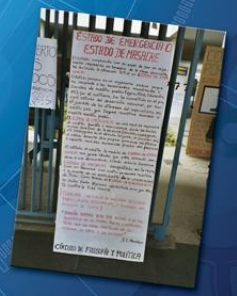
STORIES, NEUROSCIENCE AND EXPERIMENTAL TECHNOLOGIES: ANALYSIS AND DECOMPOSITION OF NARRATIVES IN SECURITY CONTEXTS



Stories, Neurobiology and Political Violence:

Exploring the Neural Mechanisms of Narrative Psychology to Develop War Fighting Tools

LtCol William D. Casebeer, PhD
Program Manager, DSO

Stories: A Critical Dept of Defense (DoD) Resource

Stories and narratives--a powerful influence on human psychology

- Memory
- Reasoning…emotion and cognition
- Identity

A wide array of behaviors salient to the war fighter are influenced by stories

- Radicalization
- Political violence
- Support for counter-insurgency by fence-sitting populations
- Stakeholder mindset in multiple security situations (negotiations, etc.)

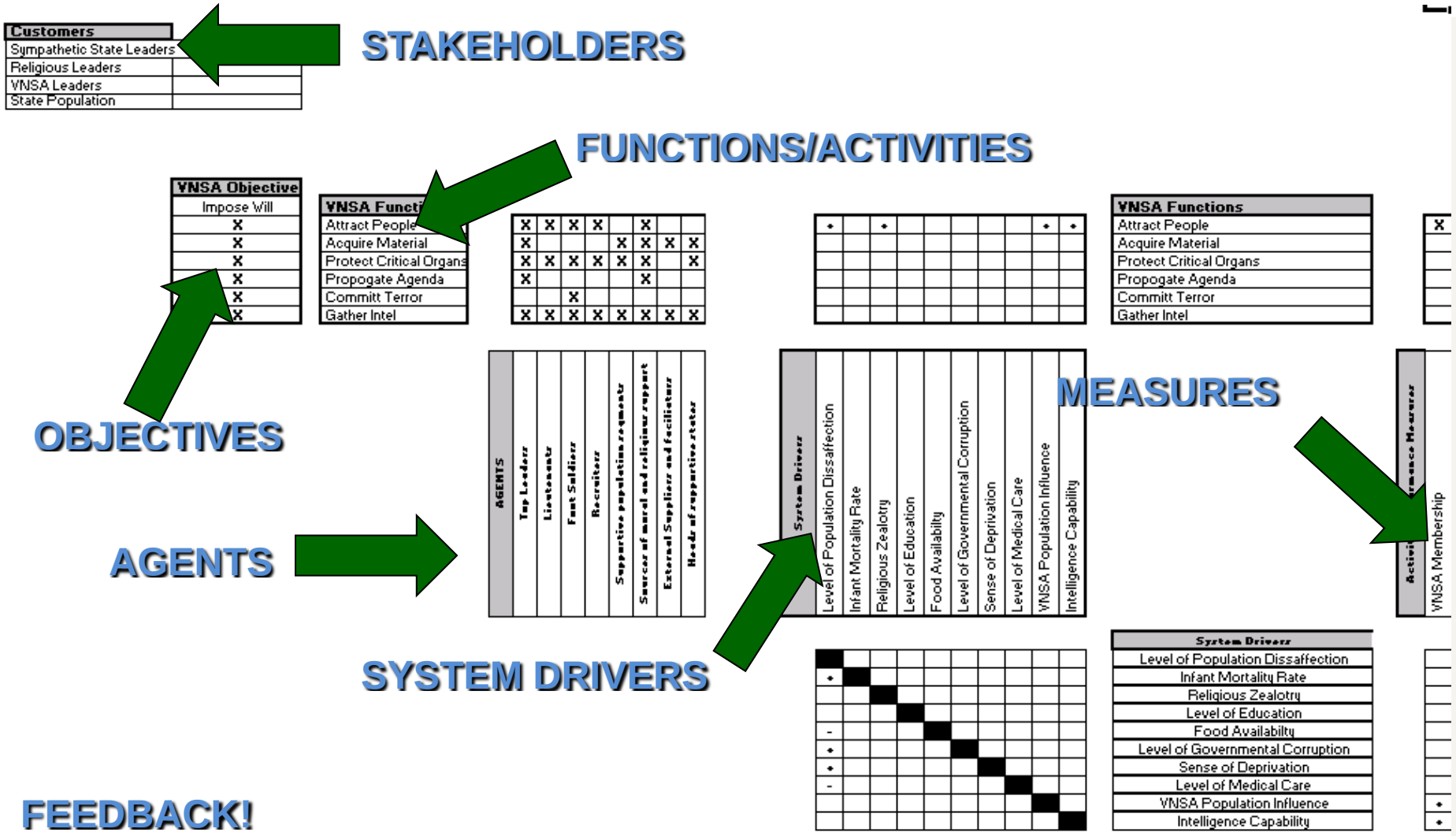
Reaching a tipping point in the basic science of stories

- Co-evolving psychology and neural mechanisms…methods beginning to mature, but in need of support and integration
- Terrorism a clarion call…depth in understanding of story ecology necessary to move forward and put hard science behind intuitions

Story Structure

A story is a schematic stimulus often taking the form of a spoken or written text embodying a Freytag triangle structure

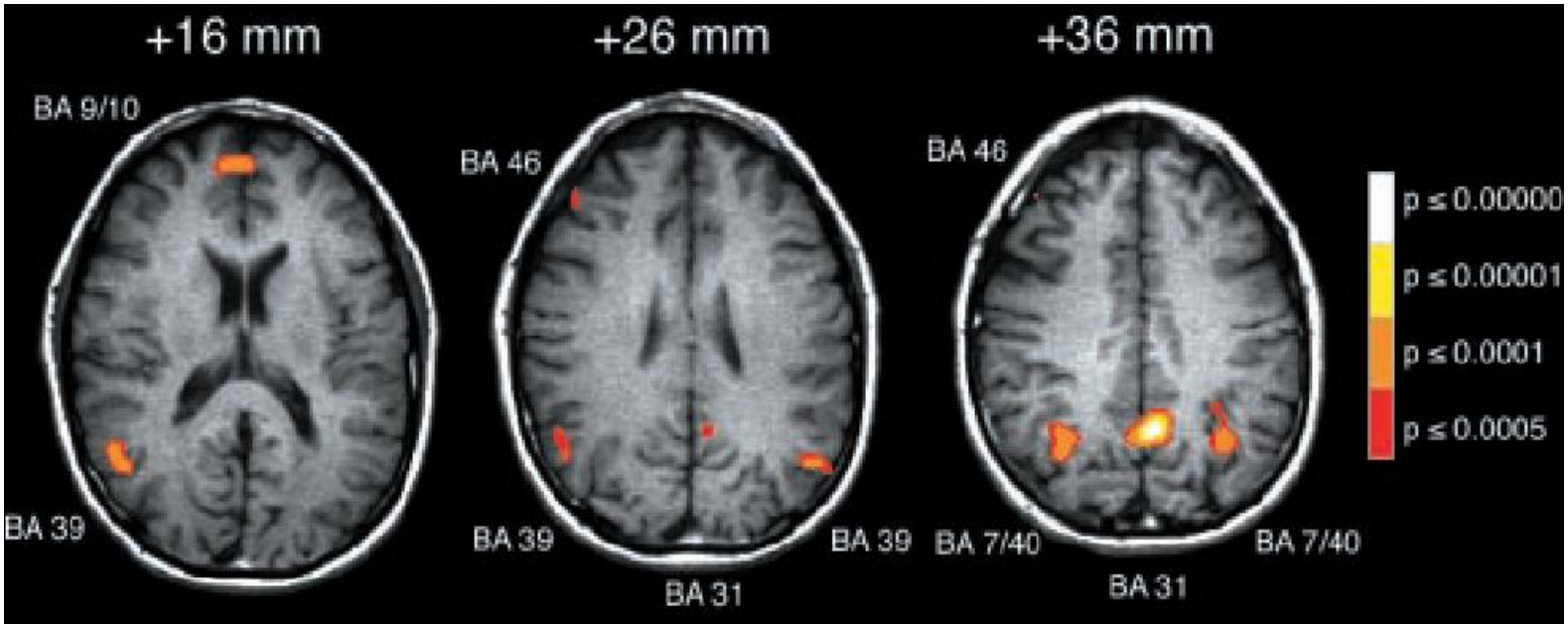
ANALYSIS: Decomposing Story Ecology-- Quantitative Tools



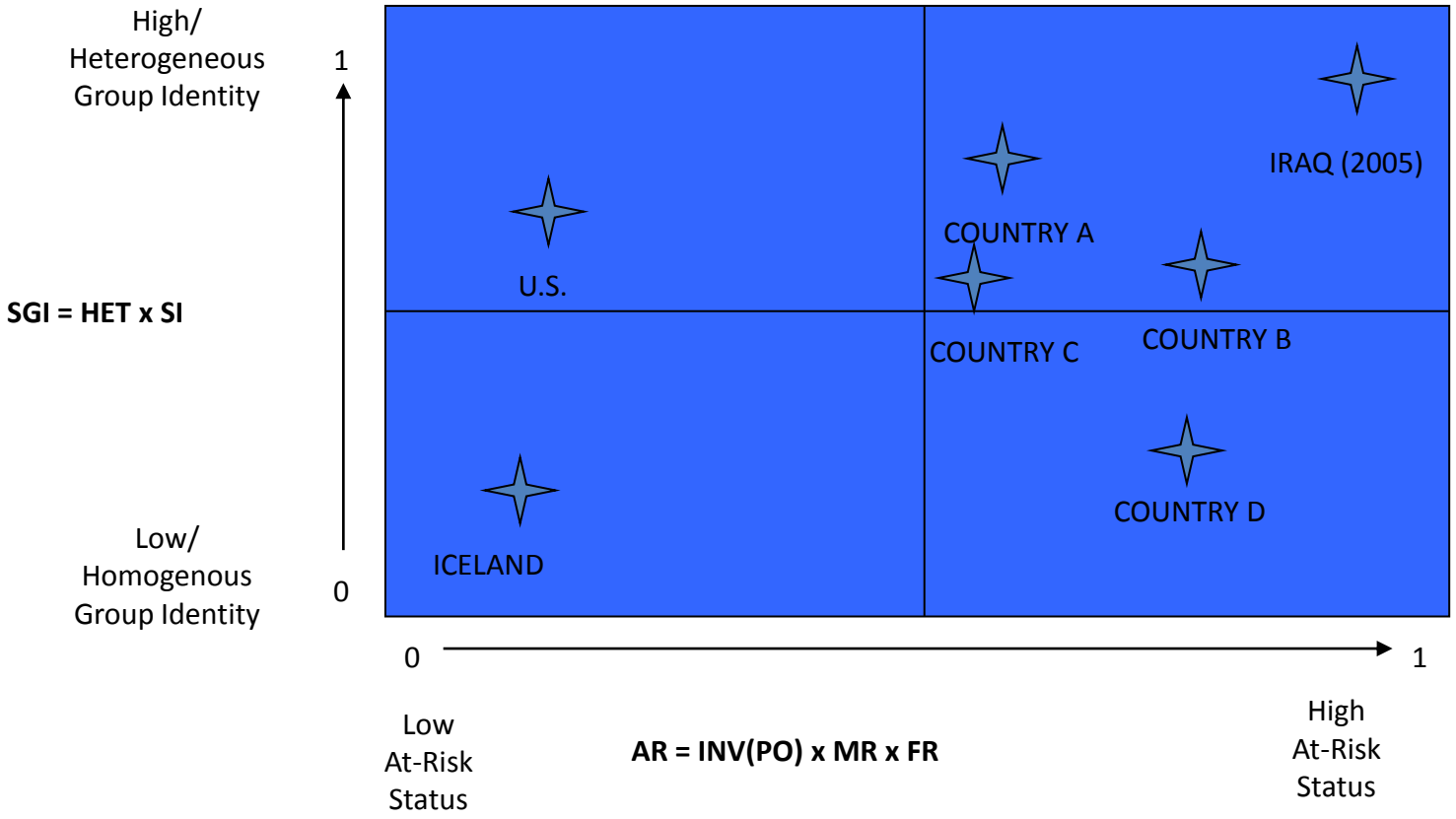
NEUROBIOLOGY Use Case: Stories & Moral Judgment

Findings (Greene et al '01): personal vs. impersonal setups activate different brain structures (Medial Frontal Cortex/Pre-Central Gyrus/Anterior Gyrus)…trolley versus footbridge problem

Significant principled difference is *story structure*…bridge from psychology to neuroscience



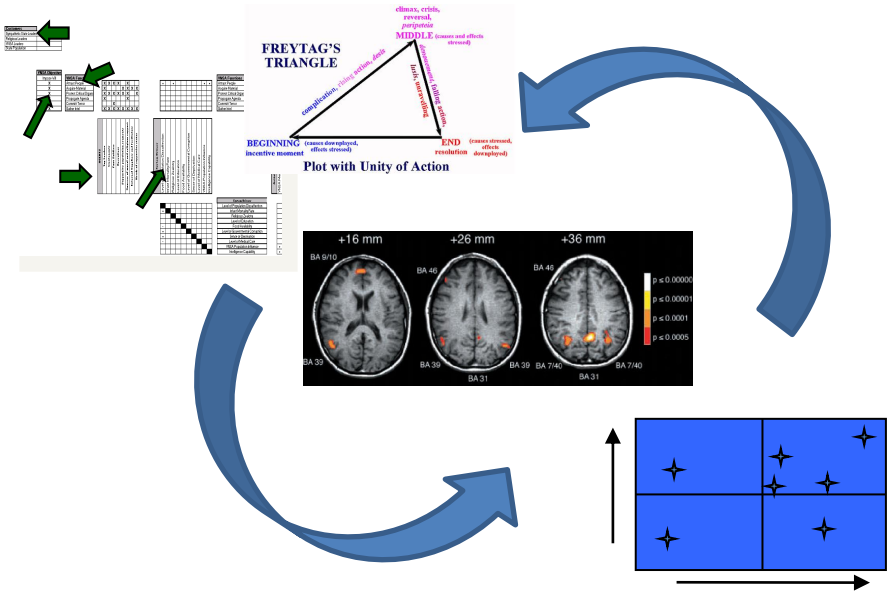
TOOLS: Stories & Political Violence



KEY: SGI = Salient Group Identity, HET = Heterogeneity, SI = Salient Identity, AR = At Risk, INV = Inverse, PO = Political Opportunity Measure, MR = Mobilizing Resources, FR = Frame Resonance

…*stories cut across several variables*

A Research Agenda



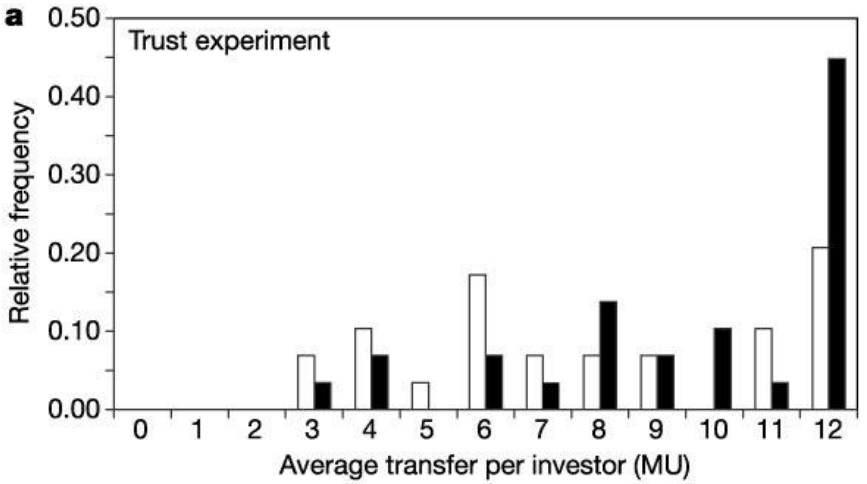
Goal – spur and co-evolve basic science of stories to produce neuropsychologically-informed tools for warfighter

Outcomes – **(1) Analysis:** advance methods to quantitatively decompose stories systematically, **(2) Neurobiology:** quantify influence of stories on human psychology in neuroscientific terms in (a) trust, (b) reward and (c) belief fixation domains, and **(3) Tools:** exploit that understanding to develop DoD tools useful at tactical-to-strategic levels…hardware (sensors), software (simulations), suggested doctrinal modifications

Level of Analysis: Neurotransmitter

Oxytocin an important trust modulator

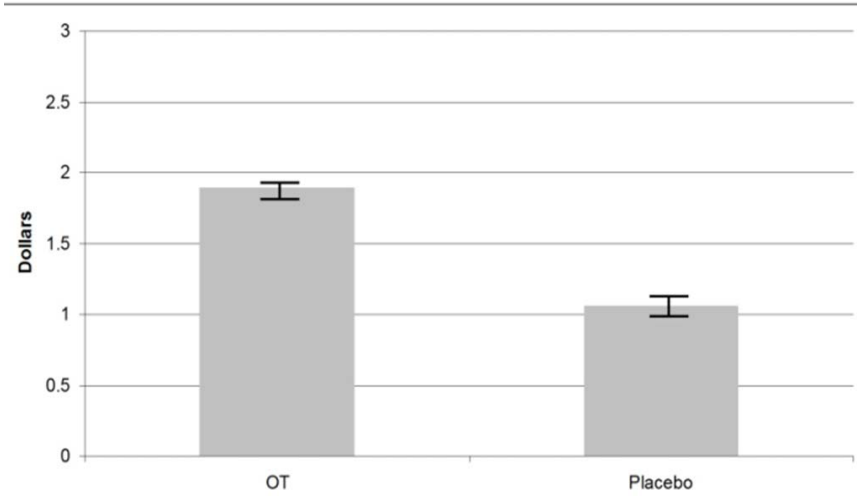
- Mammalian hormone
- Influences pair bonding, maternal behavior…linked to *trust* in economics games
- Possibly autism treatment…theory of mind implications
- Emerging work: influence of text narrative on endogenous oxytocin release…tweets!



MU = Monetary Unit

Narrative and oxytocin

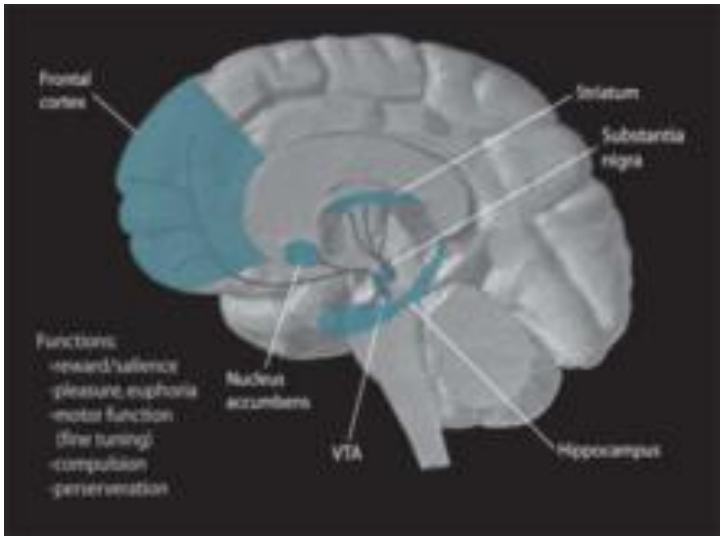
- Confirm/extend text-driven oxytocin (OT) release
- Explore relationship between moral judgments and OT…exogenous interventions and altruism
- Explore and extend environmental influences on OT release and uptake (social radar)
- Eventuate in ambient OT precursor assay linked to trust-based "story reception forecast"
- **Hypothesis:** stories differentially modulate endogynous oxytocin production



Level of Analysis: Learning System

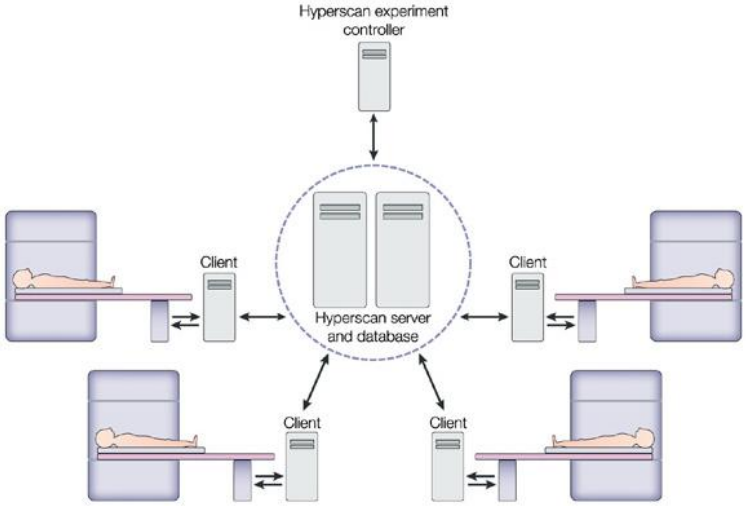
Dopaminergic system important part of human learning

- May transmit "reward prediction error"…teaching signal for brain responsible for learning
- Dysfunction linked to addiction and perseveration…bipolar disorder
- Enervates several important parts of brain responsible for memory, drive, judgment



Pilot work links narrative to dopamine release

- Pilot study links Freytag triangle-driven narratives to dopamine release…initial attempt to correlate liking reactions to stories with mid-brain endogenous mid-brain dopamine uptake
- Confirm and extend work, linking it via hyperscanning (networked Functional Magnetic Resonance Imaging) to cross-cultural influences…
- **Hypothesis:** stories differentially modulate dopamine production and this is linked to liking/disliking reactions



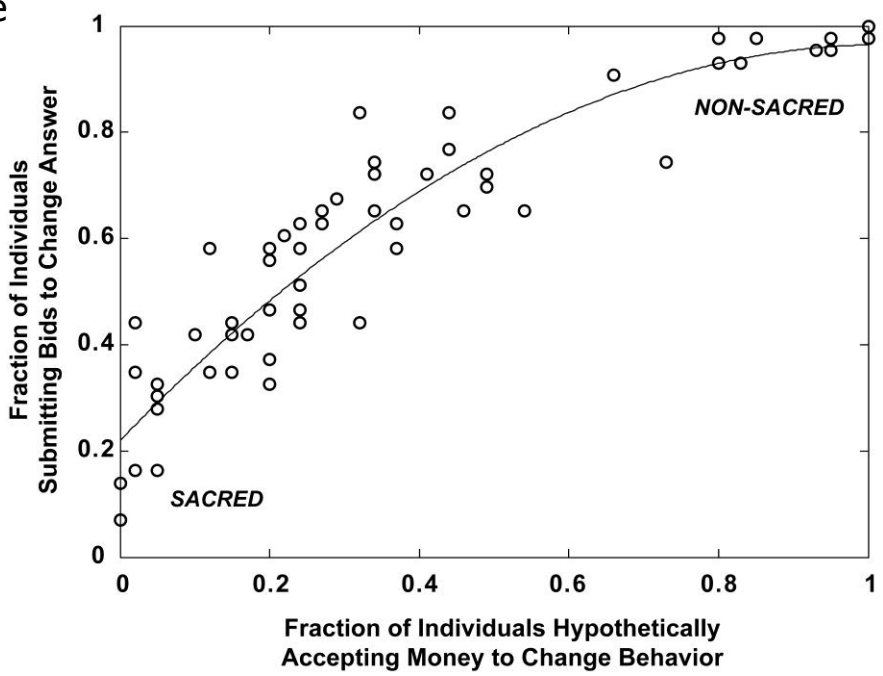
Level of Analysis: System of Systems

Belief fixation difficult to understand

- Likely influenced by multiple brain systems in emotion-cognition interaction
- Auction systems can be used to titrate indifference curves…some values are easily sold
- "Sacred" values linked to multiple phenomena of national security interest: radicalization process, limits on use of force
- Brain systems differentially activated may also be influenced by narrative and story

Narrative links to belief fixation

- Independent behavioral evidence that storytelling modulates "sacred values" (Kohlberg on moral development)…neural correlates identified
- Cognitive neuroscience approach difficult, but paradigm offers entry: systematic way to explore Freytag triangle influence on movement of beliefs along indifference curve
- **Hypothesis:** stories can differentially move beliefs along the sacred/non-sacred indifference curve



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