

How to build a strong belief

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Talk Outline

- Ways of thinking about what beliefs are
- Where beliefs come from
- How beliefs get strengthened
- Some predictions and future directions

'Everyday' view: the OED on belief

- “The mental action, condition, or habit, of trusting to or confiding in a person or thing; trust, dependence, reliance, confidence, faith.”
- “Mental acceptance of the proposition, statement, or fact, as true, on the ground of authority or evidence; assent of the mind to a statement, or to the truth of a fact beyond observation, on the testimony of another, or to a fact or truth on the evidence of consciousness; the mental condition involved in this assent.”
- “The thing believed; the proposition or set of propositions held true; [...] often simply = opinion, persuasion.”
- “A formal statement of doctrines believed, a creed.”
- “Confident anticipation, expectation. *Obs.*”

Beliefs are relational constructs involving three kinds of entities

BELIEVER ← ATTITUDE → BELIEF ← TRUTH → REALITY

ATTITUDE – trust, commitment, agreement, assent (or doubt, rejection)

– incorporates positive (or negative) valence

BELIEF – true/false, tested/untested/untestable, in/comprehensible

– incorporates proposition

- beliefs' content relates to reality
- the believer's attitude to the belief is valenced
- beliefs vary in strength

Psychology: beliefs are ...

- 1) logically structurally **coherent** (in themselves and as part of a belief system)
- 2) clear and **distinct** (e.g. relative to noise)
- 3) important, relevant or **significant** to the believer (personally, socially)
- 4) **accessible** to consciousness
- 5) given **commitment** by the believer (e.g. how he/she would defend the belief)
- 6) held with **confidence** which the believer has in the belief's truth

These contribute to the concept of BELIEF STRENGTH, which draws on:

- **cognition** (coherence, distinctiveness, accessibility, etc)
- **emotion** (significance, emotional commitment, confidence)
- **behaviour** (belief defence, effects of belief on behaviour)

Belief strength usually measured by self-report or by proxy, e.g. reaction time.

Neuroscience (I): mental events are ...

- instantiated by changing patterns of neural activity which mark coincidences
- patterns change as neurons adjust their synapses' strengths to increase the correlation between neuron activity and signal occurrence, making patterns more **distinct** from noise and each other
- making patterns more distinct contributes to **confidence** in the event
- stronger patterns require less effort and generate faster responses
- some patterns overlap and some of these cannot be co-activated without conflict (**incoherence**)
- patterns will be similar, not identical, in apparently identical circumstances
- pattern activation is necessary for events to be consciously **accessible**

Neuroscience (II): beliefs are expectations

- Expectations are **future**-oriented – they predict states of affairs – and derive from **past** experience, i.e. memories
- Expectations incorporate an positive, negative or neutral **valenced attitude** which relates the expected event to the expectation-holder
- Expectations come with a measure of ‘**confidence**’, and may be more or less coherent, distinct and accessible to consciousness
- Brain inputs are continuously **compared** against expectations generated from the current situation. Strong expectations can ‘filter out’ conflicting information, e.g. in visual illusions
- Expectations are strengthened by confirmation, or lack of disconfirmation (inherently **rewarding**); weakened by disconfirmation (inherently **punishing**).

If beliefs are expectations, then ...

- beliefs should be **translatable** into expectations, and vice versa
- beliefs, like expectations, may be subject to **biases** e.g. temporal discounting, mood, attention etc.
- developmentally, beliefs may originate in predictions of the effects of **actions** and be extended to more abstract concepts later
- beliefs and expectations should share methods of **modification**
- confirming a belief should be **rewarding**, and disconfirming it should feel like **punishment**, especially if the belief is strongly held
- beliefs and expectations should share neural circuitry
- not all beliefs may require **language**

Sources of beliefs (I)

Beliefs about the (physical or imagined) world/self/others arise from various sources:

- direct sensorimotor experience of the object or event ('perception')
- extended/indirect experience via technology ('enhanced perception')
- information supplied via media or personal report ('testimony')
- information from the body ('feelings')
- imagination, reflection and memory

- Thus beliefs have four main sources:

world ... people ... body ... mind

Sources of beliefs (II)

Sources:

Objects / events

People

Body

Imagination / memory

Methods:

Direct experience

Via technology

Via report

Brain Processes:

Sensory perception / feedback / interoception / memory

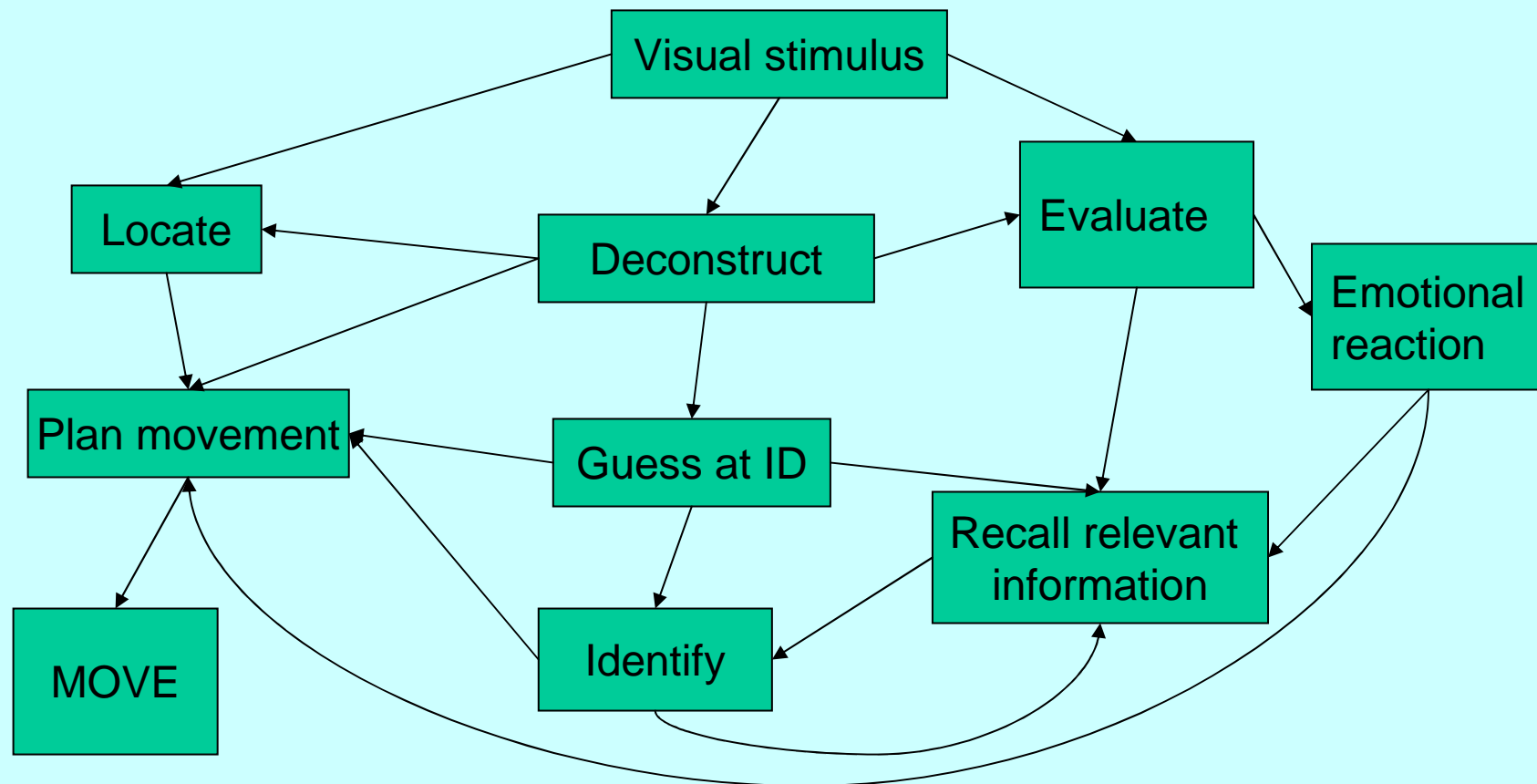
Result:

Information
re objects

Information
re people

Information
re self

Stimulus Processing



Sources of strength (I)

A belief's strength at a given time depends on how strongly its neural pattern is activated. This in turn depends on:

- the pattern's activation history (reflected in its synaptic strength)
- the level of current neural activity (will alter synaptic strength)
- what else is going on in the brain

Sources of strength (II)

The strength of a network of synapses can be changed by:

- making synaptic neurotransmission more efficient (e.g. by increasing input signals, causing **repeated activation** of the synapse)
- restructuring brain networks to e.g. create new synapses (**rewarding** stimuli, e.g. drugs, and **emotions** do this)
- amplifying and focusing neural activity (**emotions** and **reward expectation** do this)

Evidence suggests that the effects of emotions and rewards (especially some drugs) are more intense than those of repetition.

How to strengthen patterns of neural activity

Slowly, using **repetition**, reflection etc (e.g. habit formation)

- patterns less conscious, more 'taken for granted' over time
- many implicit beliefs, skills etc are formed in this way
- cognition (e.g. reflecting on new information) can alter patterns
- beliefs tend not to be considered significant for personal identity

Quickly, using **emotions**, rewards and punishments

- patterns much stronger and harder to change
- beliefs often explicit, prompting extensive rumination
- cognition may have little or no effect on the pattern
- beliefs can become core aspect of personal identity

How to strengthen a belief (fast)

Take a stressed and miserable target (or generate negative emotions to make them so).

Present the belief B:

- provide reasons why adopting B will relieve the target's misery
- associate B with strong positive emotions (this 'proves' it)
- associate any doubt or challenge with negative emotions
- repeatedly confirm B
- encourage the target to confirm B with rewards for doing so
- if possible, make the target dependent on such rewards

Emotions and Threats

By intensifying and focusing neural activity, emotions enhance memory and make responses more efficient.

Negative emotions are especially potent, as **threats** take priority.

Types of threats in our evolutionary past include:

- inanimate hazards (e.g. lightning, earthquakes)
- animate hazards (both powerful predators, e.g. bears, and weaker but dangerous animals, e.g. snakes)
- other humans
- poisons and diseases

Evolved threat responses

Threats from more powerful sources

- e.g. natural catastrophes, powerful predators, higher-status humans
- evoke **fear**, helplessness, anxiety and submission/escape behaviour
- associated objects, events and behaviours can become aversive

Immediate threats from less powerful sources

- e.g. physical obstacles, scavengers, same-or lower-status humans
- evoke **anger** and retaliatory threat behaviour
- behaviour may be reinforced rather than inhibited

Delayed threats

- e.g. poisons, microorganisms, parasites, sick/diseased individuals
- evoke **disgust**, avoidance, nausea and vomiting, self-cleaning
- objects associated with the threat become aversive ('contaminated')

Hypothesis: belief challenge is interpreted as threatening

- Body systems generating physical threat responses have been co-opted for responses to abstract threats,
 - e.g. demons (**fear**), lying (**anger**), immorality (**disgust**)
- Beliefs are expectations. True beliefs indicate accurate prediction; belief confirmation is rewarding
- An idea challenging an established belief is threatening / aversive
- Ideas presented by a person resemble immediate threats and may trigger **fear** or **anger**, especially if they challenge strong beliefs
- Challenging ideas *per se* resemble delayed threats, triggering **disgust**

Predictions

- affirmation and challenge of strong beliefs should produce distinct physiological, including hormonal, responses
- similarity of beliefs should correlate with trustworthiness more than, say, ethnicity
- openness to experience may correlate (inversely) with disgust sensitivity, *ceteris paribus*; hence men should score more highly, on average, on openness to experience
- language and reactions used to describe outgroup beliefs should rely heavily on disgust
- arguments should be more likely to be rejected if associated (subconsciously) with disgust

Future directions

- Explore the neuroanatomy and physiology
- Investigate the neural mechanisms underlying belief challenge, modification and acceptance
- Consider developmental and evolutionary aspects
- Explore the implications for belief in other species
- Investigate gender differences
- Explore relationships between disgust and perceptions of control
- Explore relevance of belief similarity to kinship judgements

Further information

- All material is copyright Kathleen Taylor 2009
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- This presentation was given to a James Martin Institute philosophy workshop on neuroethics on 6 March 2006