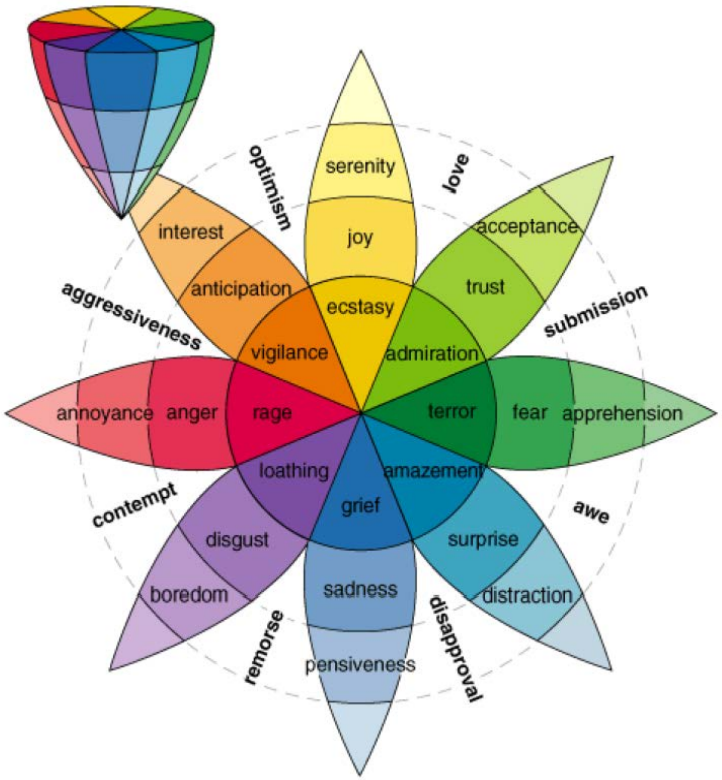
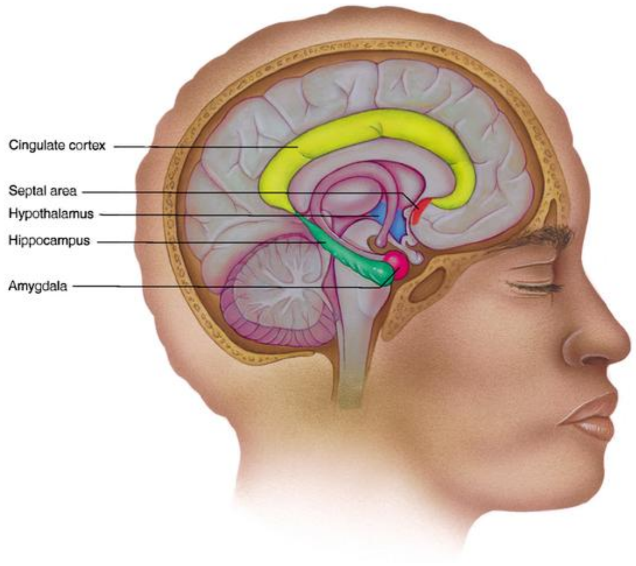
EL CERVELL EMOTIU AL TIMÓ

2na.Part





Cicle: "***Passejant pel nostre Cervell***"

Casa de Cultura de Girona

Universitat de Girona

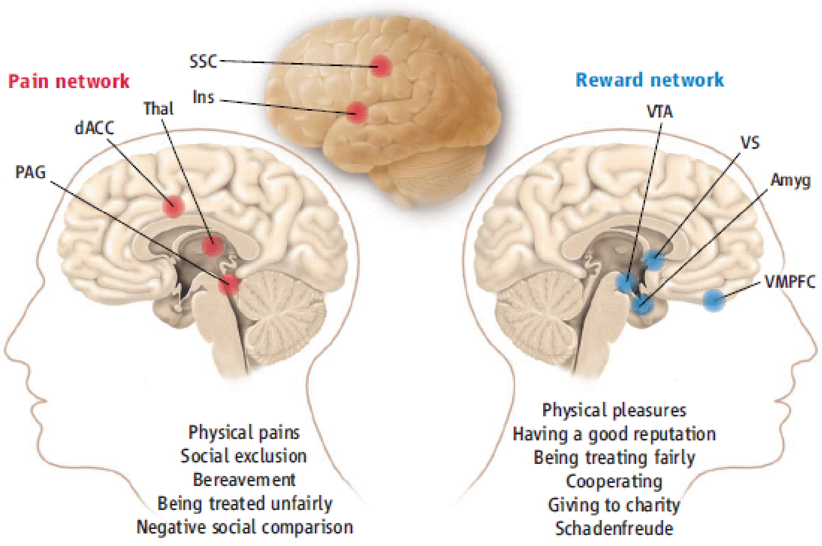
Càtedra Lluís Santaló

Octubre 2013

Adolf Tobeña
Departament de Psiquiatria i Medicina Legal
Facultat de Medicina. Campus de Bellaterra.
Universitat Autònoma de Barcelona

Pains and Pleasures of Social Life

Lieberman MD and Eisenberg NI (2009), ***Science***, 323, 890-891.



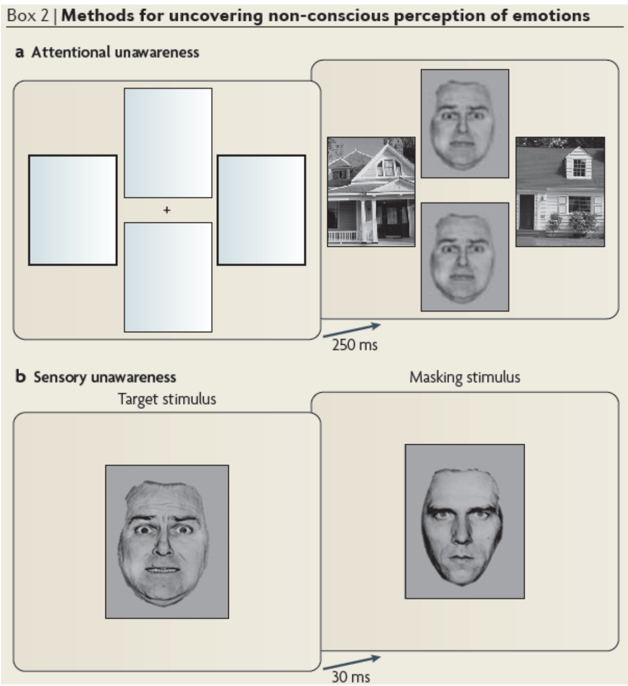
The pain and pleasure systems. The pain network consists of the dorsal anterior cingulate cortex (dACC), insula (Ins), somatosensory cortex (SSC), thalamus (Thal), and periaqueductal gray (PAG). This network is implicated in physical and social pain processes. The reward or pleasure network consists of the ventral tegmental area (VTA), ventral striatum (VS), ventromedial prefrontal cortex (VMPFC), and the amygdala (Amyg). This network is implicated in physical and social rewards.

THE EMOTIONAL BRAIN AT WORK ON:

- Biases on processing racial cues
- Biases on processing threat cues
- Biases towards social obedience+conformity

Neural bases of the non-conscious perception of emotional signals

Tamietto M and De Gelder, B (2010) ***Nature Reviews Neuroscience***, 11, 697-709.



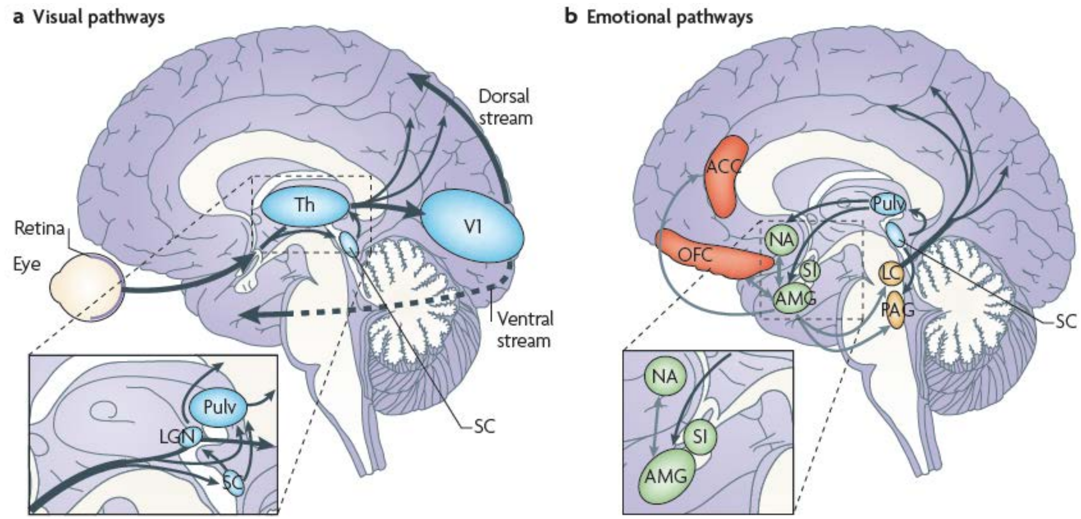


Figure 1 | **Cortical and subcortical pathways for vision and emotion. a** | The primary visual pathway (shown by thick arrows) originates from the retina and projects to the primary visual cortex (V1) in the occipital lobe via an intermediate station in the lateral geniculate nucleus (LGN) of the thalamus (Th). From V1, visual information reaches the extrastriate cortex along the ventral (occipitotemporal) and the dorsal (occipitoparietal) stream. However, a minority of fibres originating from the retina take a secondary route (shown by thin arrows) and reach both the superior colliculus (SC) and the pulvinar (Pulv). These two subcortical sites are connected and also send direct projections to the extrastriate visual cortex, bypassing V1. Another V1-independent visual pathway consists of the direct projections between the superior colliculus and the LGN that, in turn, send efferents to extrastriate cortices in the dorsal stream. **b** | The 'emotion system' includes several cortical and subcortical areas. Among the subcortical structures are the amygdala (AMG) and the substantia innominata (SI; shown in green), which are buried deeply in the temporal lobe and in the basal forebrain, respectively, the nucleus accumbens (NA) in the basal ganglia (shown in green) and brainstem nuclei (shown in yellow), such as the periaqueductal grey (PAG) and the locus coeruleus (LC). Among cortical areas (shown in red) are the orbitofrontal (OFC) and the anterior cingulate cortex (ACC). The visual and emotional systems are extensively interconnected, especially at the subcortical level, where the superior colliculus is connected to the amygdala via the pulvinar. Direct connections also exist between subcortical and cortical emotion regions (for example, between the amygdala and OFC or ACC), between subcortical structures for emotions and cortical visual areas (for example, between the amygdala and temporal cortex) (not shown) and between brainstem nuclei and the cortex via diffuse projections (shown only from the LC). Grey arrows indicate connections within the emotion system.

The role of social groups in the persistance of learned fears

Olsson A et al. (2005) Science, 309, 785-87, 29 July .

Fear Conditioning: 3 steps, SCR measures

Habituation → Acquisition → Extinction

CS's alone

Acquisition:
CS+ (+ shocks)
CS- (no shocks)

6 association trials, 6 sec CS + 200ms shock, ISI: 12-15sec.

Extinction:
CS+ / CS- alone

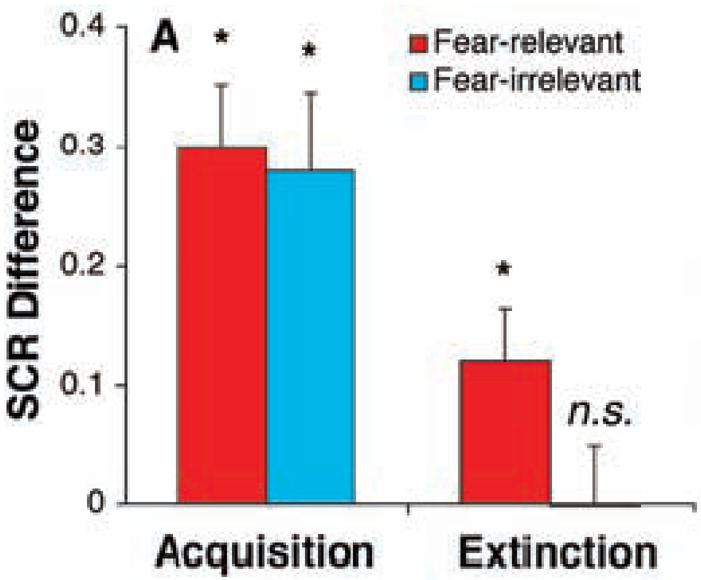
6 extinctions trials, same parameters.

Exp. 1. Butterflies/birds vs. Snakes/spiders

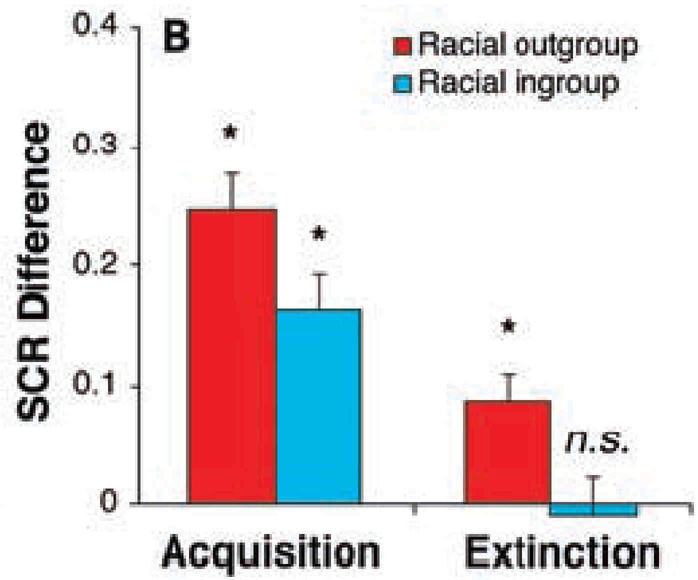
Exp. 2. Blacks vs. white neutral expression faces.

The role of social groups in the persistance of learned fears

Olsson A et al., *Science*, 309, 785-87, 29 July 2005.



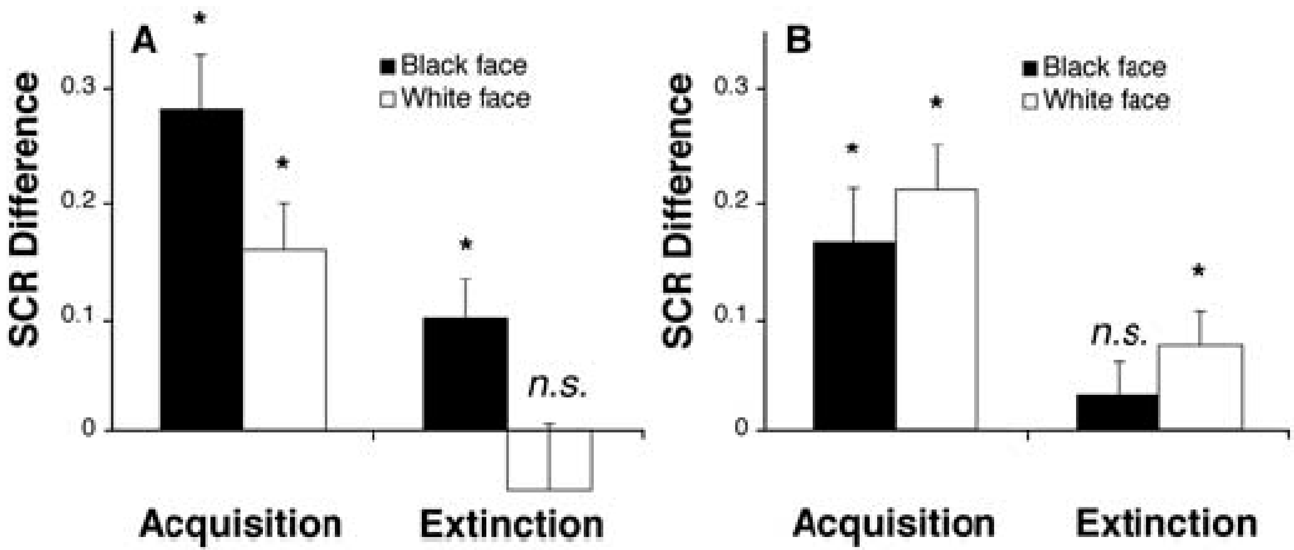
Butterflies/birds vs. Snakes/Spiders



Exp. 2: Black vs white neutral faces

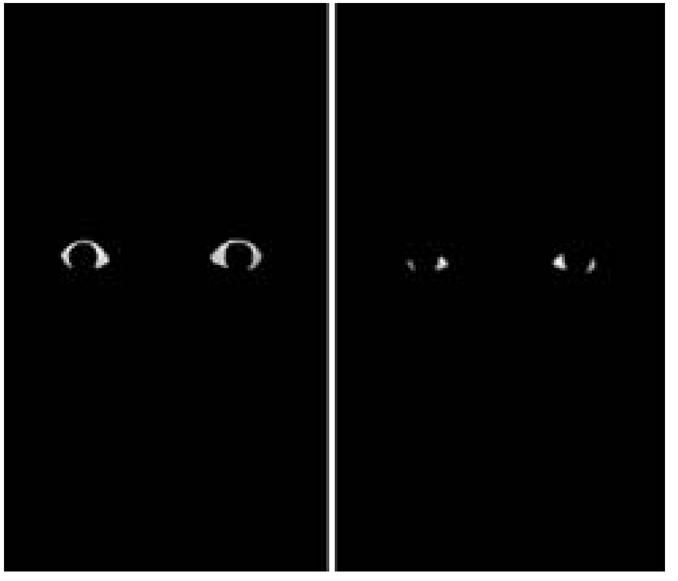
The role of social groups in the persistance of learned fears

Olsson A et al., <u>*Science*</u>, 309, 785-87, 29 July 2005.



White participants N=36
(20 females 16 males)

Black participants N=37
(25 females 12 males)



EYES LOOKING AT YOU

Human Amygdala Responsivity to Masked Fearful Eye Whites

Whalen PJ et al (2004), ***Science***, 306, 2061.

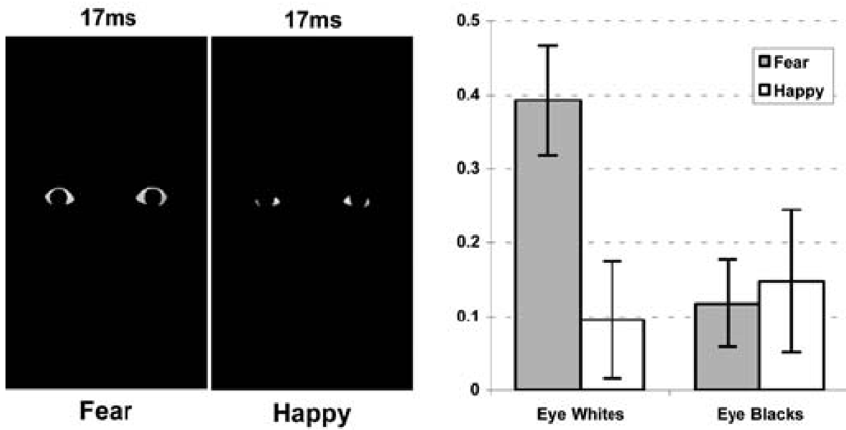


Fig. 1. (**Left**) Examples of the eye-white stimuli. (**Right**) Greater signal increases in the left ventral amygdala occurred to fearful eye whites than to happy eye whites, fearful eye blacks, and happy eye blacks (fig. S1) (*11*). The *y* axis shows the percent signal change from fixation.

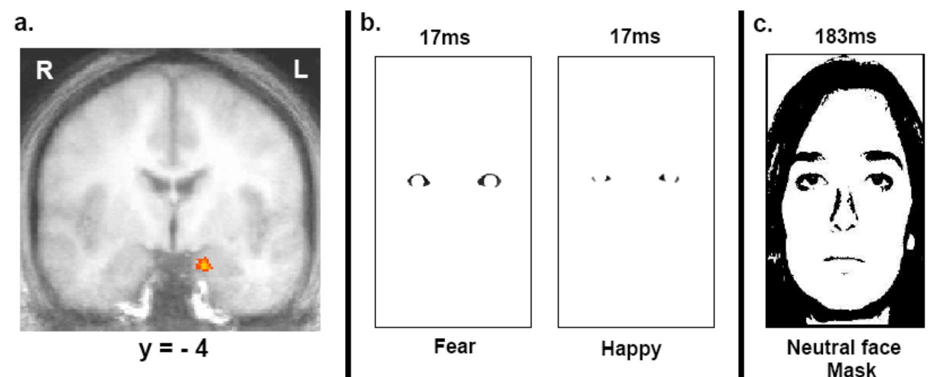


Figure S1. A. Statistical map (coronal plane) depicting the ventral amygdala locus showing responsivity to masked fearful eye-whites. This effect was reliably lateralized to the left (hemisphere x condition interaction, F(1,19) = 27.3, p = 0.00005). R = right, L = left. Image thresholded at p < 0.001, uncorrected. B. Examples of the eye-black stimuli. C. A neutral face mask.

Individual Differences in Trait Anxiety Predict the Response of the Basolateral Amygdala to Unconsciously Processed Fearful Faces

Etkin A, Klemenhaguen KC, Dudman JC, Rogan MT, Hen R, Kandel ER and Hirsch J

Neuron, 44, 1043-1055, 2004.

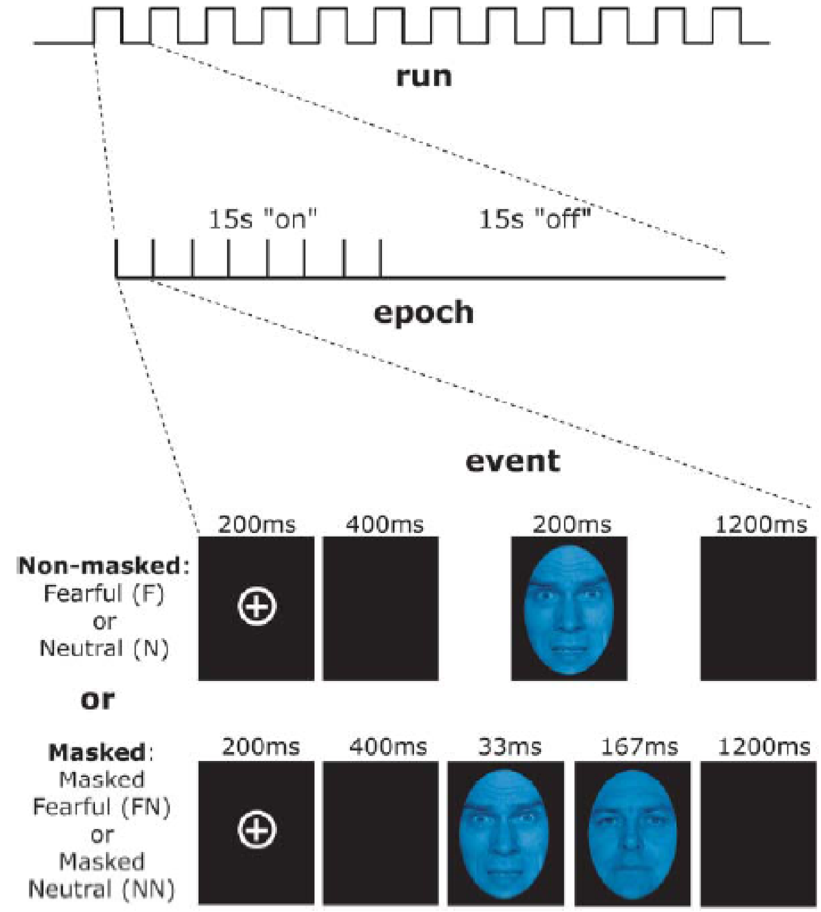


Figure 1. Experimental Paradigm for the Interaction of Attention and Affect

Stimuli were either fearful (F) or neutral (N) expression faces, pseudocolored in red, yellow, or blue. Faces were presented either non-masked (200 ms for each face; F or N) or masked (33 ms for a fearful or neutral face, followed by 167 ms of a neutral face mask of the same gender and color, but different individual; FN or NN, respectively).

Individual Differences in Trait Anxiety Predict the Response of the Basolateral Amygdala to Unconsciously Processed Fearful Faces

Etkin A, Klemenhaguen KC, Dudman JC, Rogan MT, Hen R, Kandel ER and Hirsch J

Neuron, 44, 1043-1055, 2004.

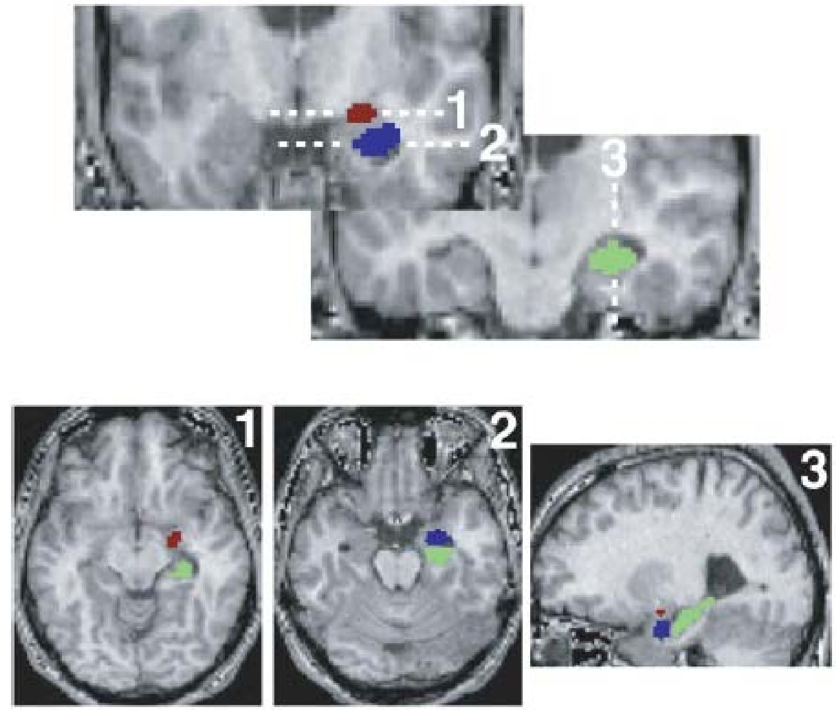


Figure 2. Regions of Interest Used in the Analysis

Regions of interest were drawn for the dorsal amygdala (red), basolateral amygdala (blue), and hippocampus (green) for each subject based on their anatomical scans, illustrated here for one representative subject. Data were extracted from nonsmoothed functional scans to ensure that signal originated from the identified ROIs.

Individual Differences in Trait Anxiety Predict the Response of the Basolateral Amygdala to Unconsciously Processed Fearful Faces

Etkin a et al (2004), Neuron, 44, 1043-1055

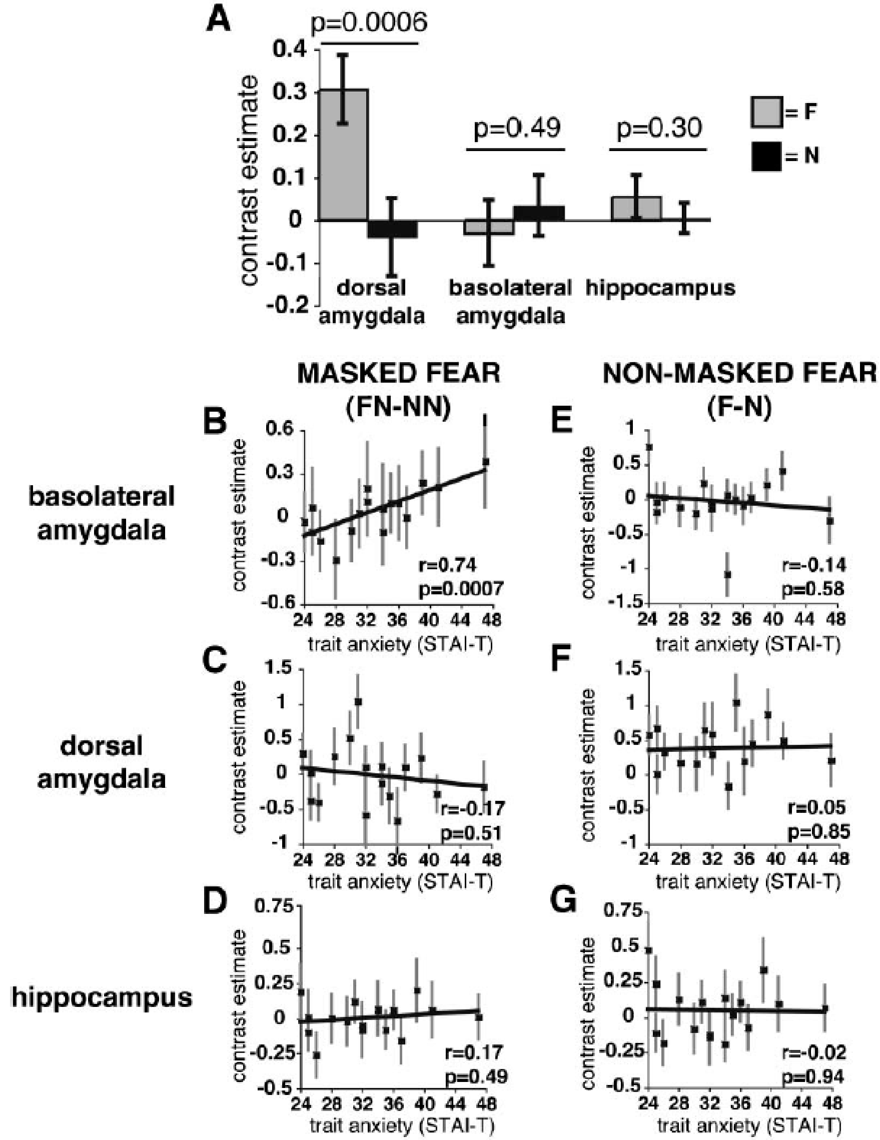


Figure 3. The Basolateral and Dorsal Amygdalar Subregions, as well as the Hippocampus, Are Functionally Dissociable in Emotional Processing

(A) Fearful and neutral epoch main effects during nonmasked presentations from dorsal amygdalar, basolateral amygdalar, and hippocampal ROIs. Activation of the dorsal amygdala by *nonmasked fear* was significantly greater than activation in the other two ROIs.

(B–G) Signal change from dorsal amygdalar, basolateral amygdalar, and hippocampal ROIs for the *masked fear* (FN-NN) and *nonmasked fear* (F-N) comparisons plotted against subjects' trait anxiety (STAI-T) scores and fit to a regression line. The correlation of trait anxiety with basolateral *masked fear*-induced activity was significantly stronger than all other correlations.

Individual Differences in Trait Anxiety Predict the Response of the Basolateral Amygdala to Unconsciously Processed Fearful Faces

Etkin a et al (2004), Neuron, 44, 1043-1055

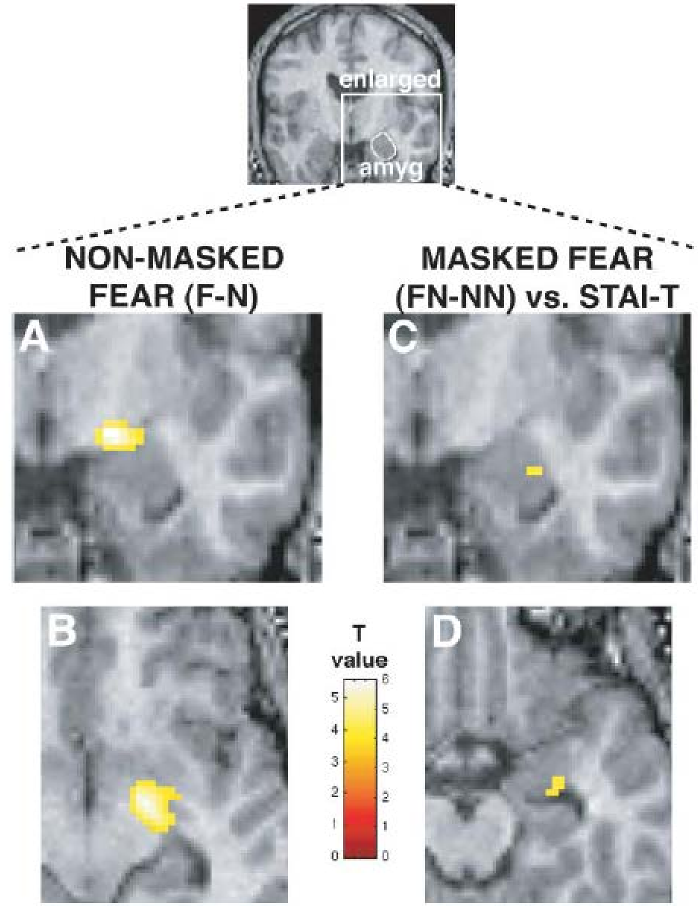
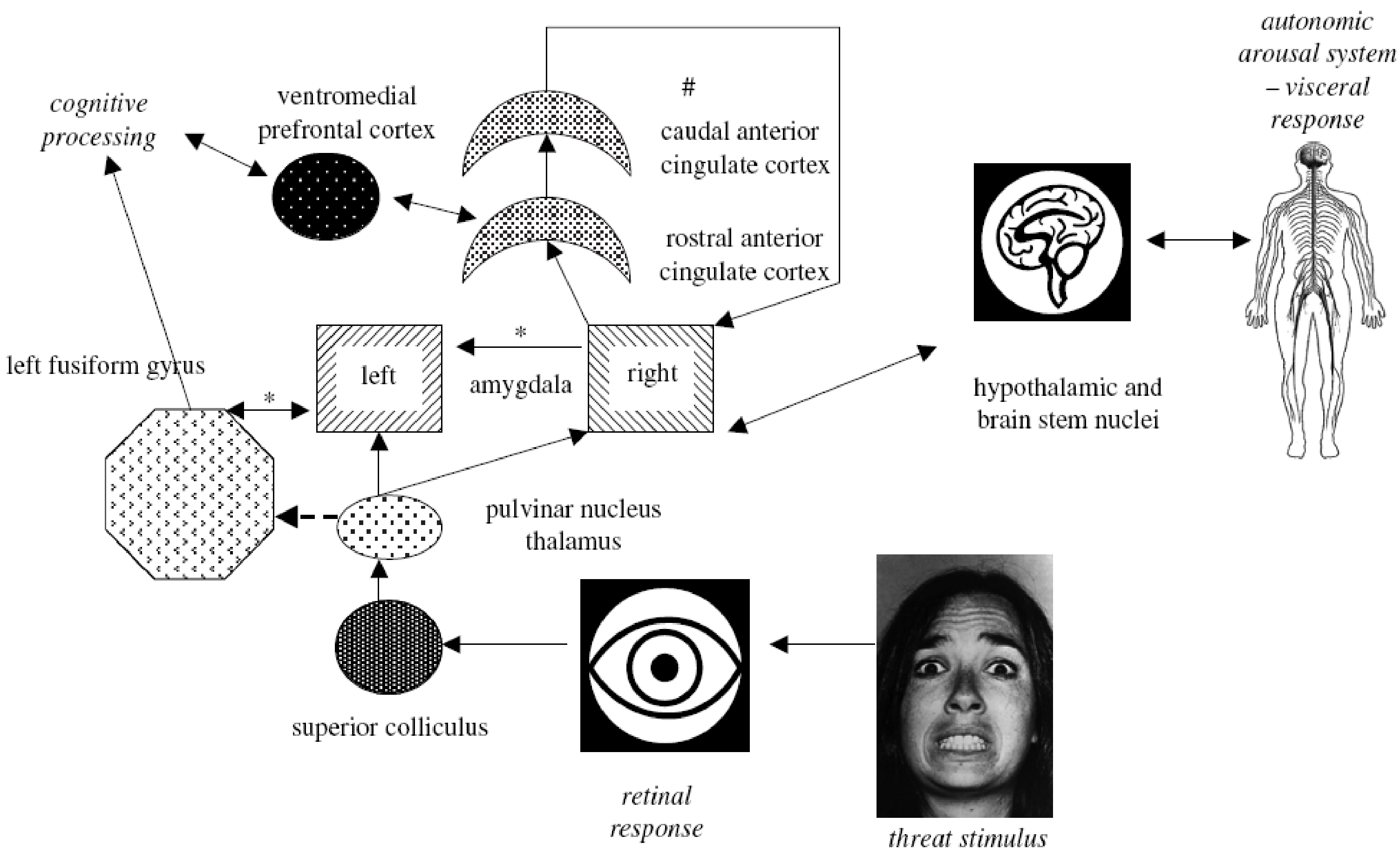


Figure 4. Unconscious Amygdala Activity Reflects Subjects' Trait Anxiety Levels While Conscious Amygdala Activation Is Consistent across Subjects but Independent of Trait Anxiety

Enlarged views of the right amygdala illustrating (1) the dorsal amygdalar cluster from the *nonmasked fear* (F-N) comparison (coronal view at y = −8 [A] and axial view at z = −16 [B]) and (2) the basolateral amygdalar cluster from the correlation of *masked fear*-induced activity (FN-NN) with trait anxiety (coronal view at y = −8 [C] and axial view at z = −28 [D]). The color bar indicates the significance (t value).



Neural systems responding to social threatening stimuli (fearful faces):

X-linked genes influence the integrity of pathways marked with an asteriscus (*), pathways under the influence of allelic variatios at serotonin tranporter indicated by the hash symbol (#) Skuse D (2006), Phil. Trans. R. Soc. B, 361, 2129-2141.

A Single Exposure to the American Flag Shifts Support Toward Republicanism up to 8 Months Later

Carter TJ, Ferguson MJ and Hassin RR (2011)
Psychological Science, 22, 8, 1011-1018.

There is scant evidence that incidental cues in the environment significantly alter people's political judgments and behavior in a durable way. We report that a brief exposure to the American flag led to a shift toward Republican beliefs, attitudes, and voting behavior among both Republican and Democratic participants, despite their overwhelming belief that exposure to the flag would not influence their behavior. In Experiment 1, which was conducted online during the 2008 U.S. presidential election, a single exposure to an American flag resulted in a significant increase in participants' Republican voting intentions, voting behavior, political beliefs, and implicit and explicit attitudes, with some effects lasting 8 months after the exposure to the prime. In Experiment 2, we replicated the findings more than a year into the current Democratic presidential term. These results constitute the first evidence that nonconscious priming effects from exposure to a national flag can bias the citizenry toward one political party and can have considerable durability.

A Single Exposure to the American Flag Shifts Support Toward Republicanism up to 8 Months Later

Carter TJ, Ferguson MJ and Hassin RR (2011)
Psychological Science, 22, 8, 1011-1018.

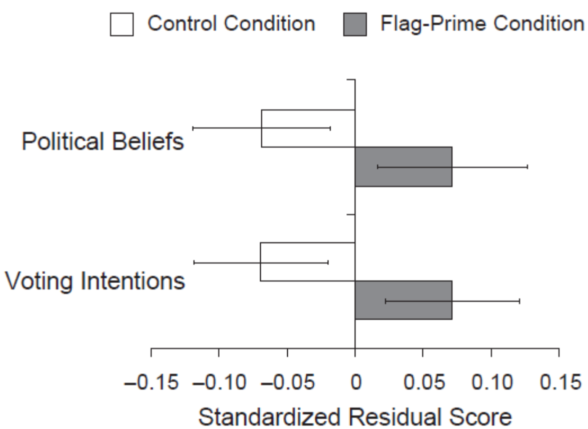


Fig. 1. Voting intentions and political attitudes at Session 2 in Experiment 1 as a function of condition (flag prime or control). The graph presents standardized residual scores that control for responses to the same measures administered at Session 1. Higher numbers indicate a greater intention to vote for the Republican candidates relative to the Democratic candidates and greater support for the politically conservative position relative to the politically liberal position. Error bars indicate ±1 *SEM*.

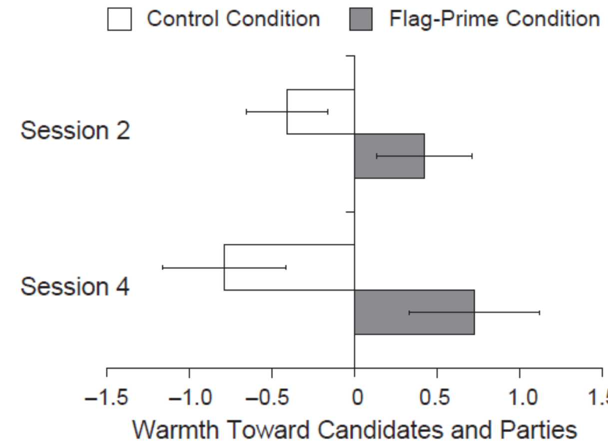


Fig. 2. Relative preference for the Republican and Democratic Parties and presidential and vice presidential candidates as a function of condition (flag prime or control), at Sessions 2 and 4 in Experiment 1. The graph presents standardized residual scores that control for responses to the same measures administered at Session 1. Higher numbers indicate greater preference for the Republican Party and candidates relative to the Democratic Party and candidates. Error bars indicate ±1 *SEM*.

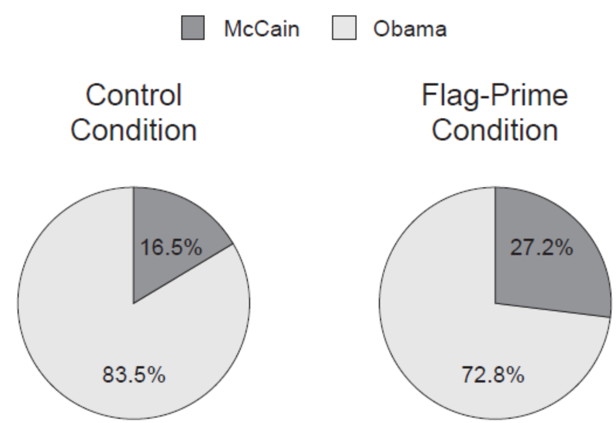


Fig. 3. Percentage of participants in the control and flag-prime conditions who reported voting for McCain and for Obama in Session 3 of Experiment 1 (n = 166).

Herding psychology:

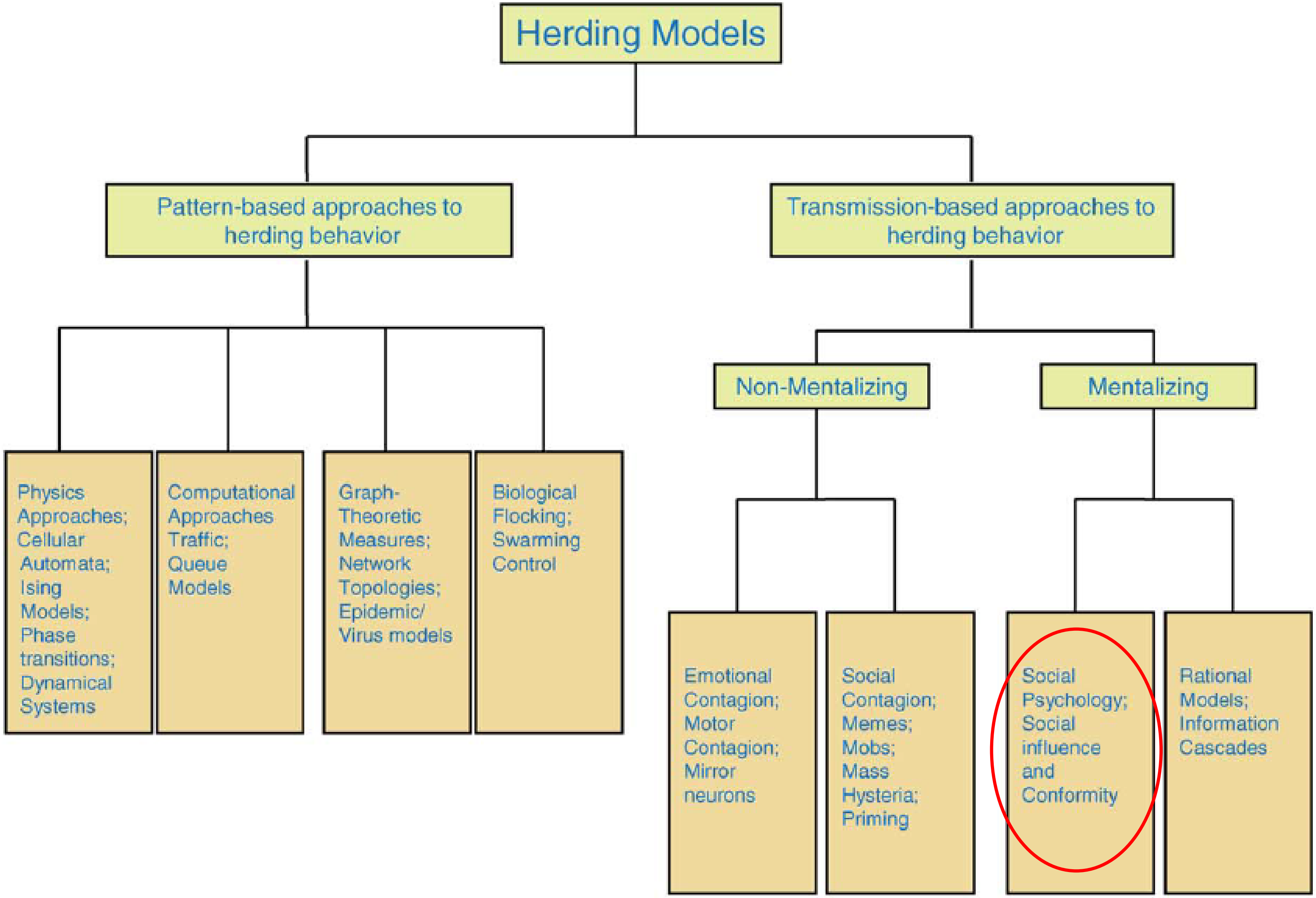
- Congregació
- Gregarisme
- Obediència
- Conformitat
- Persuassió
- Imitació….

'docility' : ***receptivity to social influence***, is an evolved instinct that has survived and permeated human populations to serve important evolutionary purposes. Docile people have the intelligence and motivation to learn quickly from social information and do not screen social information for its contribution to personal fitness. Docility allows people to believe large numbers of propositions without any direct proof. Docile individuals are also more adept at social learning, making them more able to acquire knowledge, skills and 'proper behaviors' i.e. values, goals and attitudes that are useful in overcoming obstacles, thus contributing to the evolutionary fitness of human populations.

So, according to *Herbert Simon (1990)*, ***a genetic predisposition to imitate others has evolved which serves a social purpose in encouraging socially constructive empathy and altruism, helpful in overcoming dissent and conflict***, though Simon's analysis is problematic because it does not allow that ***such conformism might also precipitate tyranny and oppression…***

Herding in humans

Raafat M, Chater N and Frith Ch (2009) *Trends in Cognitive Sciences*,13, 10, 420-428.

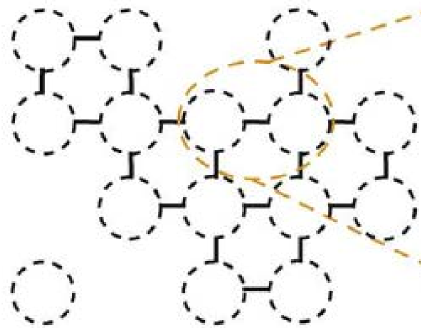


Herding in humans

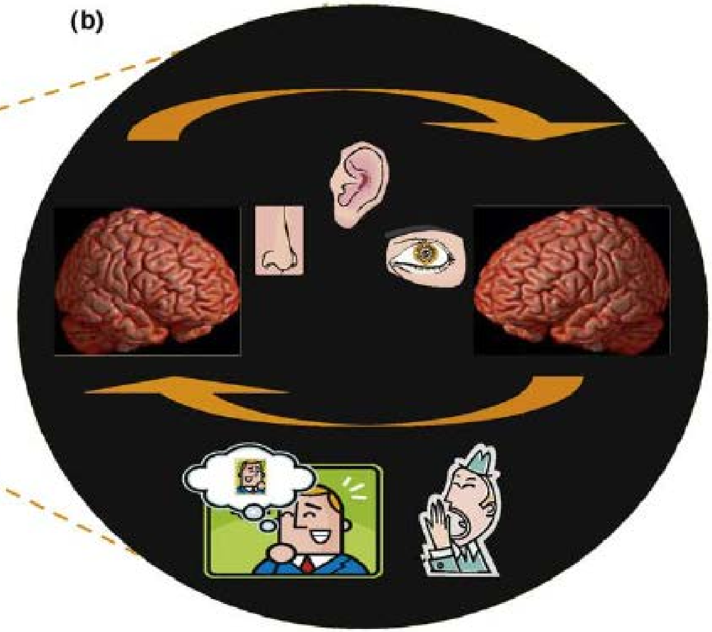
Raafat M, Chater N and Frith Ch (2009) *Trends in Cognitive Sciences*,13, 10, 420-428.

(a)

a focus on the pattern connecting individuals (Figure 1a),



(b)

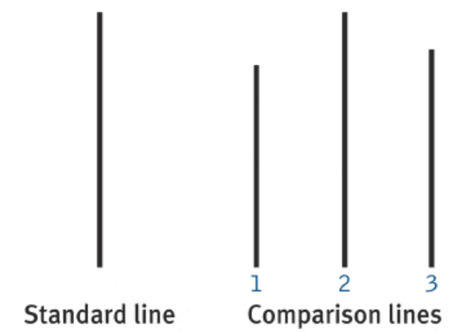


the transmission of information that comprises it (Figure 1b).

Herding is a form of convergent social behaviour that can be broadly defined as the alignment of the thoughts or behaviours of individuals in a group (herd) through local interaction and without centralized coordination. We suggest that herding has a broad application, from intellectual fashion to mob violence; and that understanding herding is particularly pertinent in an increasingly interconnected world. An integrated approach to herding is proposed, describing two key issues: *mechanisms of transmission* of thoughts or behaviour between agents, and *patterns of connections* between agents. We show how bringing together the diverse, often disconnected, theoretical and methodological approaches illuminates the applicability of herding to many domains of cognition and suggest that cognitive neuroscience offers a novel approach to its study.

Herding in humans

Raafat M, Chater N and Frith Ch (2009)
Trends in Cognitive Sciences,13, 10, 420-428.



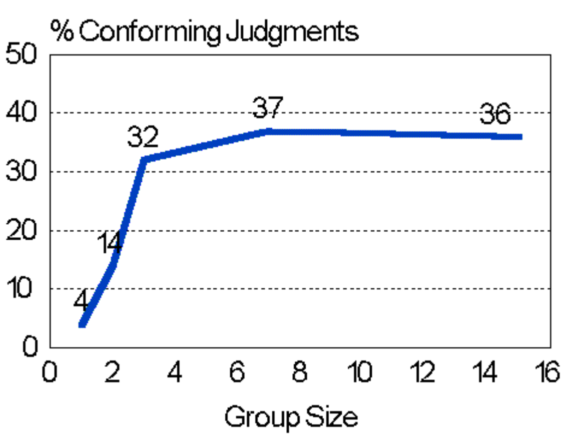
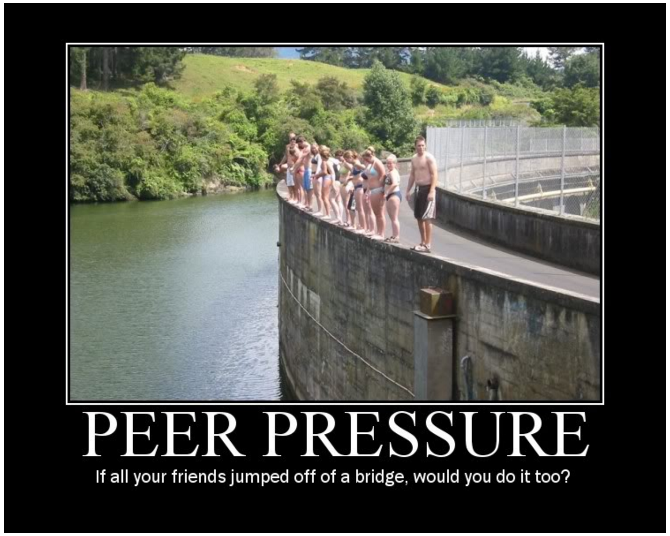


Table 1. A brief sampling of herding history

	When	Discipline	Description	Mechanism
Adam Smith	1759	Economics	"As people imagine themselves in another's situation," they display "motor mimicry" [87]	Motor mimicry
Gustave Le Bon	1895	Psychology	the "ancestral savagery…[of] the collective mind" and the "loss of self" [88]	The idea of collective hypnosis, a form of irrational and unconscious social contagion
Thorstein Veblen	1899	Economics/ Sociology	Make comparisons with similar people who are slightly better [89]	An instinct for emulation
Gabriel Tarde	1903	Psychology	Collective hypnosis called "social somnambulism". People get involved in crowd actions "in mental unity" [90]	The "group mind" as an explanatory principle of crowd psychology and herd behaviour
Georg Simmel	1910	Sociology	First researcher to consider social networks.	"Impulse to sociability" and ramification in loosely-knit networks [91]
Sigmund Freud	1922	Psychiatry/ Medicine	"A group is an obedient herd, which could never live without a master"	Also refers to "herd instinct". "The individual loses his power of criticism, and lets himself slip into the Affect… The cruder and simpler emotional impulses are the more apt to spread through a group in this way" [92]
Floyd Henry Allport	1924	Psychology	Sought to explain collective behaviour in terms of individual psychology [93]	Property of belief, not irrational suggestibility. Hence, the individual in the crowd behaves because he believes that others share his feelings and convictions
John Maynard Keynes	1935	Economics	Contagious "animal spirits" moving the market [94]	Individuals do not process new information efficiently as they don't know which information is relevant. Conventional behaviour easily turns into herd behaviour
Muzafer Sherif	1936	Psychology	Used autokinetic effect, an optical illusion to illustrate that individuals use others' judgments to converge with the social norms of the group [39]	Social norms serve as a shared frame of reference, with a rational attempt to make sense of social reality
Solomon Asch	1951	Psychology	Convergence in the famous line experiments revealing pressure to conform to an erroneous view [40]	Rational attempts of individuals to make sense of social reality to share group perceptions
Lionel Penrose	1951	Genetics	Compared the unfolding of behaviour in mass hysteria to the epidemiology of a disease [95]	Highlighted that both physical and psychological epidemics depend on virulence, transmission and receptivity
Everett Roger	1962	Sociology	Two research streams, one related to diffusion of innovations and the other related to social network analysis, became particularly influential in economics [96]	Defined diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system"
Serge Moscovici	1969	Social psychology	Separated social influence from power relations. Social influence theory assumes that cognitive uncertainty about social reality causes conformity in given situations [97]	Social conflict leads to uncertainty and a willingness to agree with conflicting viewpoints
Mark Granovetter	1973	Sociology	The Strength of Weak Ties interpersonal ties are defined as information-carrying connections between people [98]	Social networks in diffusion processes, stressed the importance of weak ties which permit diffusion
Sushil Bikhchandani, David Hirshleifer, and Ivo Welch	1992	Economics	By modelling showed that people could follow others even if private information and motivations suggested doing otherwise [38]	Assumed incomplete information and rationality. The number of others performing the action taken as evidence that the others possessed better information, yielding conformity and "informational cascades" based on imperfect information
James Fowler and Nicholas A. Christakis	2009	Political Science	Recent example of Social network methodology [27]	Social networks (see Figure I in Box 1)

Herding in humans



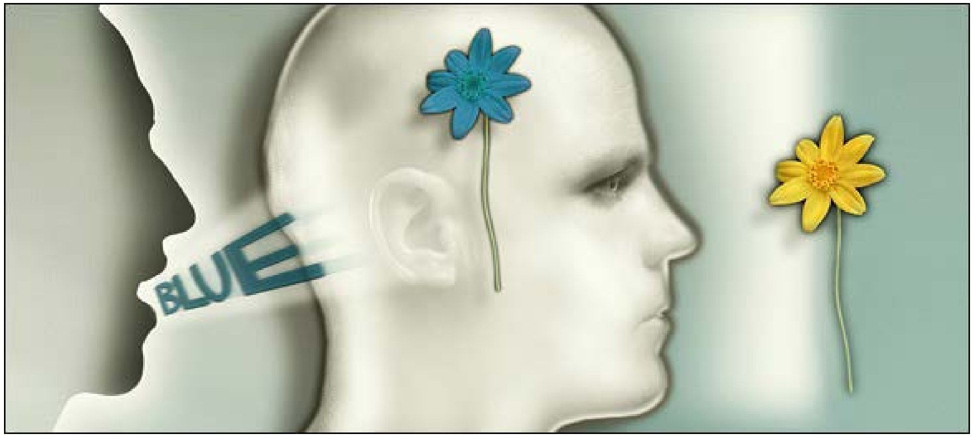
FROM OBEDIENCE TO INDOCTRINATION

Levels:

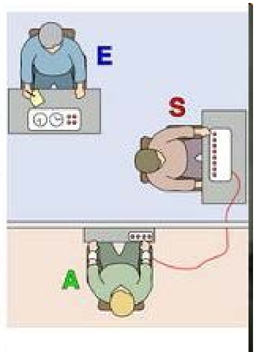
- *Duets*
- *Small groups*
- *Bands, Clans*
- *Tribes, Nations*
- *Sects, Religions, Secular Ideologies*
- *Brands…*

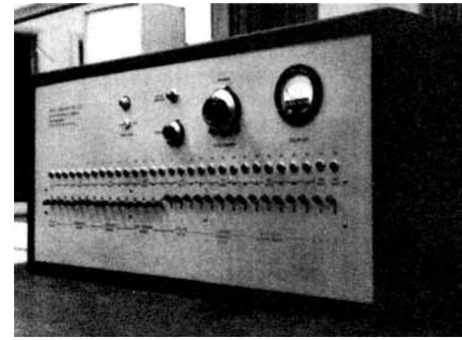
→ Thoughts, values, behaviors…

(from trivial to meaningful)



MILGRAM EXPERIMENTS 60's





Yale University Lab: "Effects of punishment on human learning/memory"

- Paired-words lists rehearsing, till high % correct.
- Lapse.
- Test: errors followed by shocks of increasing intensity.
- E: experimenter; S: subject; A: Learner (actor).
- Subjects recruited from the community (paid or nonpaid, man/women…).

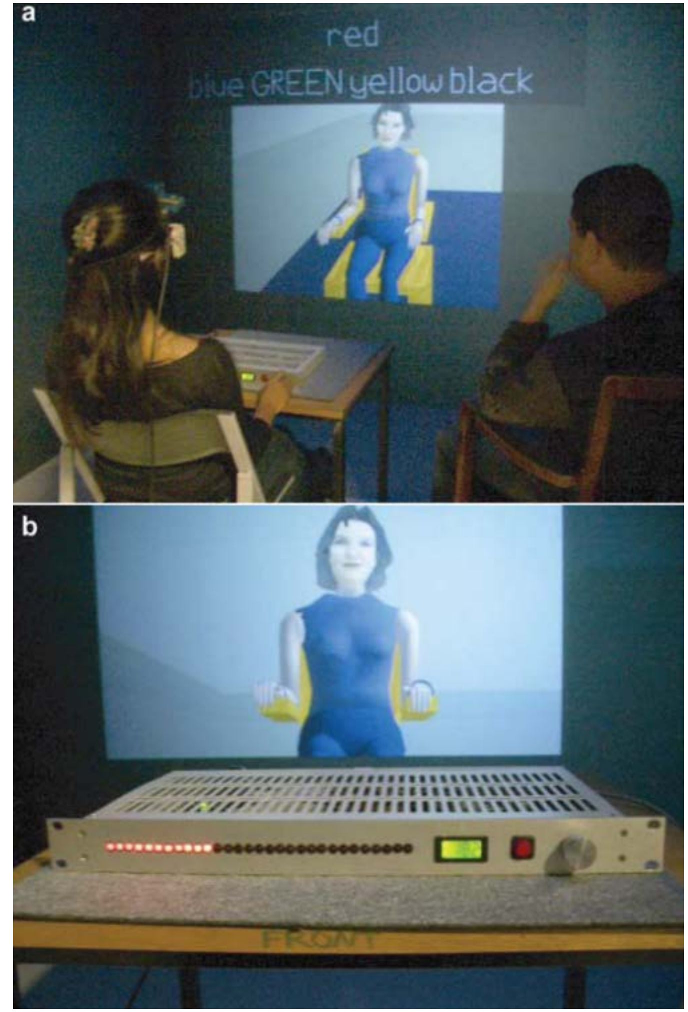
60/65% Subjects apply maximum intensity shocks (Warning: "Life Danger!!")

15-20% stop at high intensity

15% refuse to continue, at moderate intensities, and drop, infuriated.

A Virtual Reprise of the Stanley Milgram Obedience Experiments

Slater et al (2006), *PLoS One*, 1, 1, e39.



Six from the twenty three (26%) participants on the visual condition, stopped delivering shocks before the end of 20 shocks series: 3 gave 19 shocks, and 18, 16 and 9 shocks were given by one person each

Following the style of the original experiments, the participants were invited to administer a series of word association memory tests to the (female) virtual human representing the stranger. When she gave an incorrect answer, the participants were instructed to administer an 'electric shock' to her, increasing the voltage each time. She responded with increasing discomfort and protests, eventually demanding termination of the experiment. Of the 34 participants, 23 saw and heard the virtual human, and 11 communicated with her only through a text interface. *Conclusions*. Our results show that in spite of the fact that all participants knew for sure that neither the stranger nor the shocks were real, the participants who saw and heard her tended to respond to the situation at the subjective, behavioural and physiological levels as if it were real. This result reopens the door to direct empirical studies of obedience and related extreme social situations, an area of research that is otherwise not open to experimental study for ethical reasons, through the employment of virtual environments.

Neurobiological Correlates of Social Conformity and Independence During Mental Rotation

Berns G et al (2005), *Biological Psychiatry*, 58, 245-253.

Results: *Conformity was associated with functional changes in an occipital–parietal network, especially when the wrong information originated from other people. Independence was associated with increased amygdala and caudate activity, findings consistent with the assumptions of social norm theory about the behavioral saliency of standing alone.*

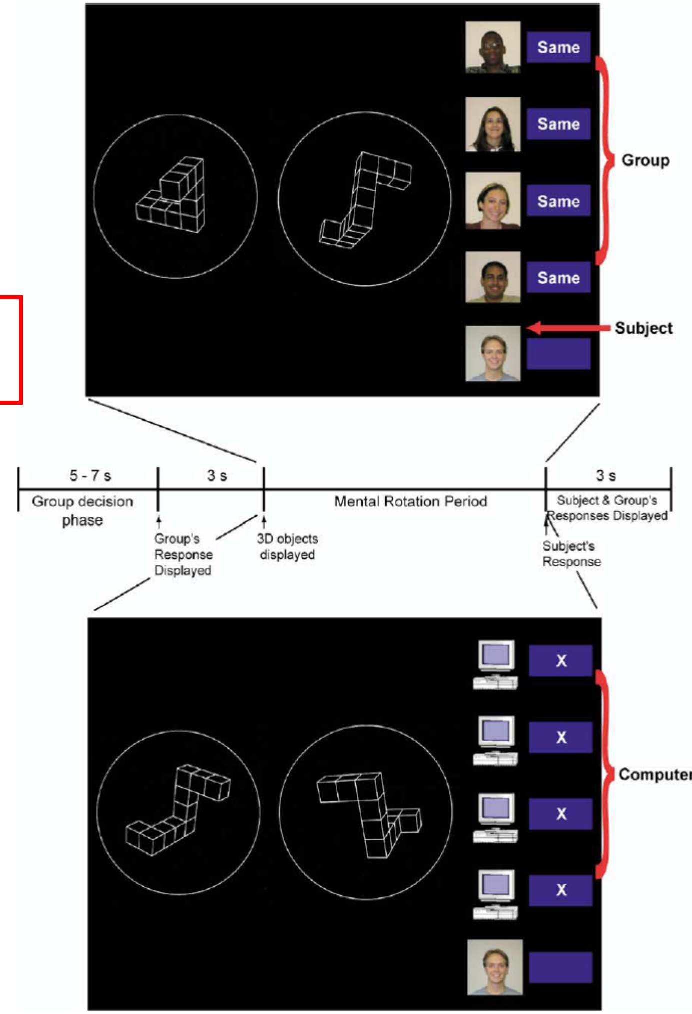
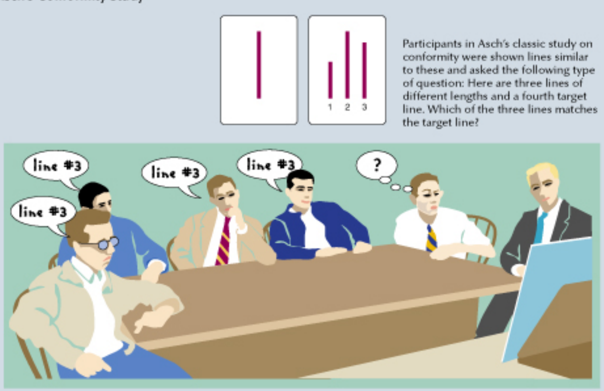


Figure 1. Participants were presented with pairs of three-dimensional objects on a computer screen during a mental rotation period, and they had to decide whether the objects were the "same" (can be rotated to match) or "different" (no rotation can make them match). To induce social conformity, each trial began with the objects being shown first to a group of peers (Group; top panel). In actuality, the group was composed of actors, and their responses were predetermined. After a variable-duration decision phase, the collective response of the group was displayed to the participant. This ensured that the participant would see the group's response. After 3 sec, the same pair of objects was displayed to the participant. In the example shown, the objects are different, but the group has unanimously said they are the same (the participant has not responded yet). The participant responded with a button press, indicating whether the objects were the same or different. Trial types were randomized across three conditions: group correct, group incorrect (as shown), and baseline (responses blinded to participant with an "X"; bottom panel). One run of 48 trials was performed with the group, and another run of the same 48 trials was performed with the group replaced by computers (bottom panel), in which the faces of the group were substituted with computer icons. The order of group and computer runs was counterbalanced across participants and gender.

FIGURE 15.5
Asch's Conformity Study



Participants in Asch's classic study on conformity were shown lines similar to these and asked the following type of question: Here are three lines of different lengths and a fourth target line. Which of the three lines matches the target line?

Only two people have yet to give their opinions, but everyone else appears to have given the same incorrect answer. Which would you say was the correct line if you were next in line? Asch (1951, 1955) created this situation with the use of accomplices, and the true participant was the next-to-last person. Although 75% of participants conformed to the incorrect group response at least once, over the entire experiment, two thirds of responses were independent of the majority.

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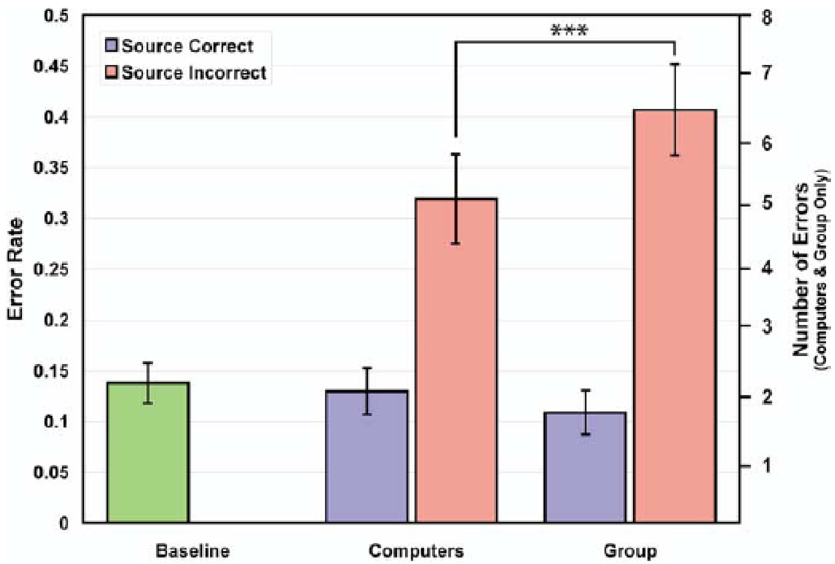

Figure 2. Mean error rates as a function of the source (Computers or Group) and type (Correct or Incorrect) of information. The actual number of errors in the Computers and Group conditions are shown on the right-hand scale (the number of errors in the baseline condition must be multiplied by two, because there were twice as many trials in this condition). Repeated-measures analysis of variance revealed a large main effect of the type of information (Correct, Incorrect, or None) on error rates [$F(2,31) = 31.29$, $p <$

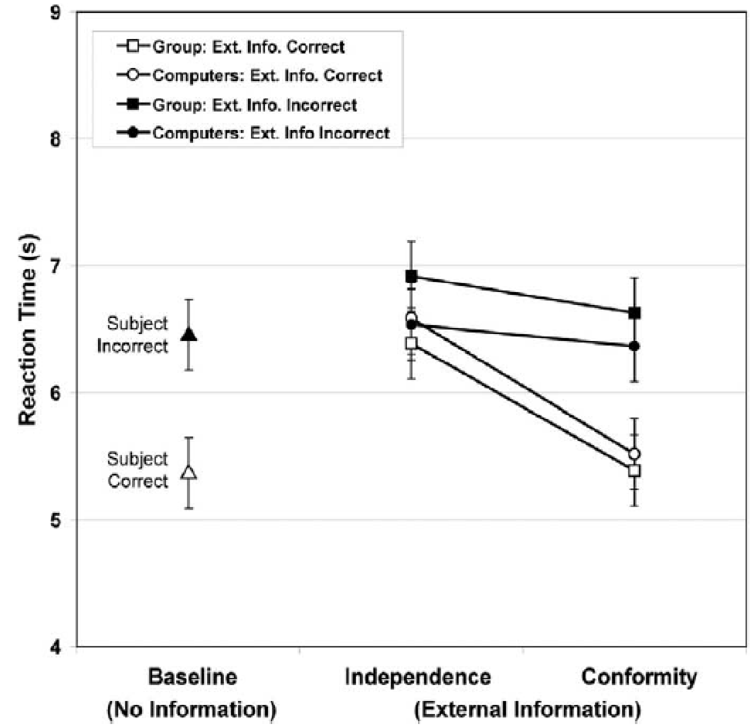

Figure 3. There were significant differences in reaction times (RTs), and these differences depended on several factors. A mixed-model analysis with repeated effects showed that the stimulus pair (Same or Different) had a significant effect on RT [$F(1,579) = 66.38$, $p < .0001$], and a post hoc comparison indicated that Different stimuli took .815 sec (SEM .100 sec) longer than Same stimuli. After adjusting for the effect of Same/Different stimuli in this model, there was a significant lengthening of RT when external information was present [$F(2,579) = 20.27$, $p < .0001$]. Moreover, participants took, on average, 1.11 sec (SEM .18 sec) longer to give an incorrect response than a correct response [$t(32) = 6.2$, $p < .0001$], but this was modulated by an interaction with the nature of the external information presented

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Table 1. Differential Activations During Mental Rotation, Where Group > Computers, and the External Information Was Incorrect

Brain Region[a]	MNI Coordinates (x, y, z)	Cluster Size	t Statistic
Social Conformity (Participant Incorrect)			
L superior occipital gyrus	−18, −90, 9	21	4.99
R superior occipital gyrus	24, −87, 9	34	4.87
R intraparietal sulcus	24, −69, 36	21	4.83
R intraparietal sulcus	18, −57, 48	20	4.09
Social Independence (Participant Correct)			
R amygdala	15, −3, −18	3[b]	4.30
R caudate head	6, 12, 3	7[b]	3.85

Voxels were selected for $p < .001$ (uncorrected) and extent ≥ 10 voxels (except as noted).
MNI, Montreal Neurological Institute; L, left; R, right.
[a]Brain regions determined from the Duvernoy atlas (Duvernoy 1999).
[b]Because of the small size of these structures, the extent threshold was relaxed.

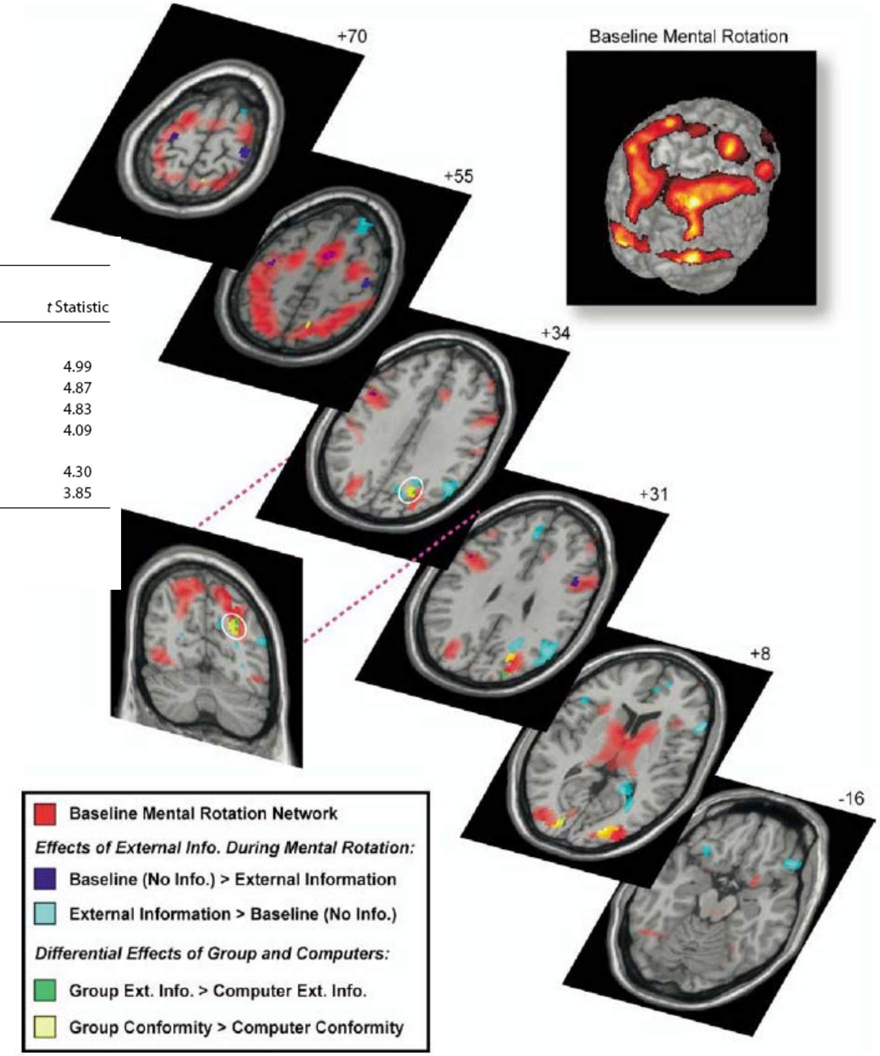

Figure 4. Effects of different forms of external information on brain activation during mental rotation. At baseline (mental rotation with no external information), a wide network of both cortical and subcortical regions was activated (inset and red regions) (all overlays thresholded at $p < .001$, uncorrected for multiple comparisons, and cluster size > 5 voxels). Montreal Neurological Institute coordinates of selected axial slices are indicated adjacent to each slice. External information, regardless of the source, was associated with decreased activation in a small subset of this mental rotation network (dark blue), primarily in frontal regions and the supplementary motor area (slices at +55 and +70 mm). In contrast, external information was associated with increased activation (light blue) in regions largely outside of the mental rotation network, particularly in the right supramarginal gyrus (slices at +31 and 34 mm). When the effects of external information were compared according to the source (Group > Computers), only two small clusters adjacent to the mental rotation network in the right intraparietal sulcus were identified (green). Moreover, the activity in these clusters was largely accounted for by the subset of trials in which the participants conformed to incorrect information from the Group (yellow). An additional two clusters in the occipital cortex were identified as differentiating between conforming to the Group versus the Computers (slice at +8 mm). Thus, the main effect of social conformity (i.e., conforming to the Group relative to conforming to the Computers) was exhibited within the most posterior aspects of the baseline mental rotation network. Because of the anatomic confluence of these different effects within the right intraparietal sulcus, a region-of-interest analysis was performed on this area (circle).

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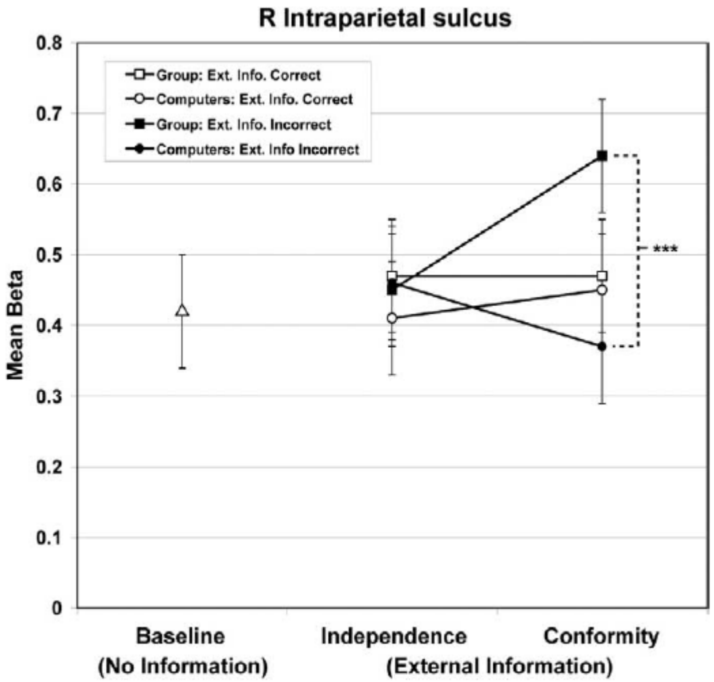


Figure 5. Region-of-interest (ROI) analysis of the right intraparietal sulcus. A 12-mm diameter sphere was centered on the anatomic confluence of effects shown in Figure 4 (Montreal Neurological Institute coordinates: 25, −66, 32). The best-fitting model by Akaike's Information Criterion (Akaike 1974) showed that there was a main effect of source (Group vs. Computers) [$F(1,631) = 6.56$, $p = .01$] and that there was a significant interaction between the source of information and whether the participant gave a correct or incorrect response (i.e., Social Conformity) [$F(1,631) = 5.80$, $p = .016$]. Post hoc comparisons indicated that conforming to incorrect information from the Group was associated with significantly greater activity than conforming to incorrect information from the Computers [***mean difference .271 (SEM .078), $F(1,71) = 11.98$, $p < .001$].

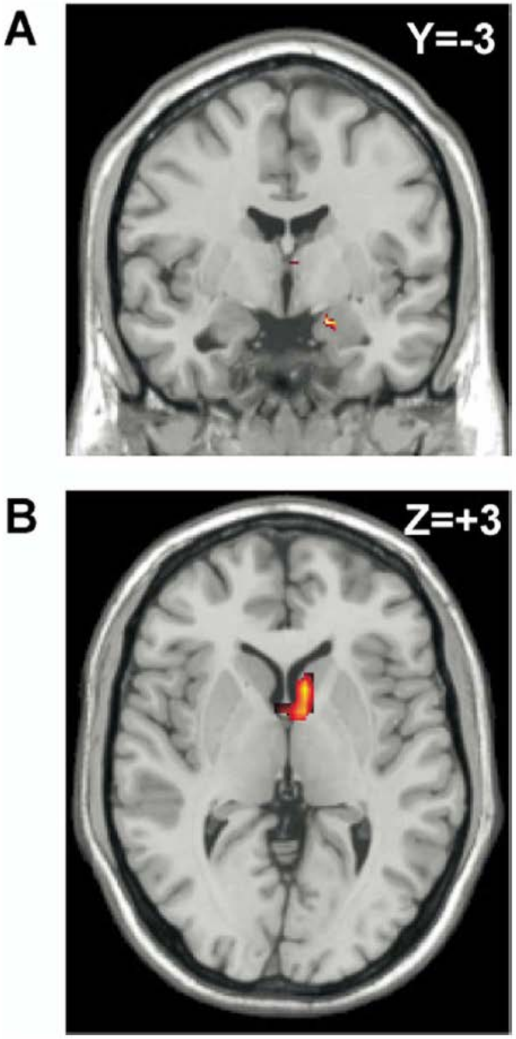
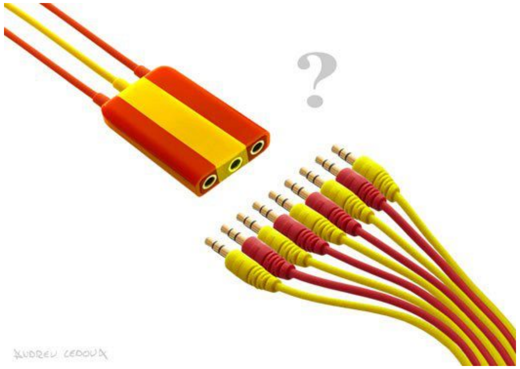


Figure 6. Brain regions associated with greater activity during mental rotation when participants went against the Group, relative to going against the Computers. In the subset of trials in which the external information was incorrect, only the right amygdala (A) and the right caudate (B) showed greater activity when Group Independence was compared with Computers Independence. Peak activations in these two regions were significant at $p < .001$, uncorrected, but the extent of activation is shown thresholded at $p < .01$. See Table 1.



Keep alert against Emotional/Feeling automatisms and conformity manipulations!!