Supplementary Note

No analyses in this investigation yielded left amygdala activity. Subsequent references to the amygdala imply right amygdala activity only, although corrections for multiple comparisons in ROI analyses were always based on searches of right and left amygdala.

Consistent with previous assertions that the amygdala is associated with automatic processes and lateral prefrontal cortex with controlled effortful processes, a follow-up behavioral study determined that the task used to examine perceptual encoding of AA targets showed no interference from a dual-task manipulation (t_{38}=0.71, P>.5), whereas the verbal encoding task did show interference effects (t_{38}=1.73, P<.05, one-tailed).

The observed pattern of findings, however, does not preclude the interpretation that the amygdala activity might reflect different psychological processes in AA and CA participants. Given that the amygdala also responds to highly arousing positive stimuli, it is also possible that for CA participants the increased amygdala response to AA targets indicates a negative high arousal response to a outgroup whereas in AA participants it reflects a positive high arousal response to an ingroup. However, a number of facts diminish the plausibility of this intepretation of the findings. First, behavioral studies have observed that AA individuals have relatively negative implicit attitudes towards other African-Americans[1,2]. Given that the amygdala has been associated with negative implicit attitudes previously, this suggests that the amygdala activity in AA participants reflects negative, rather than positive, responses. Additionally, in a subsequent pilot study that we conducted, in which a new sample of AA and CA participants rated the AA target faces with respect to their intensity ("How intense is your response to this picture?") and valence ("How positive is your response to this picture?"), AA participants rated the AA target faces as provoking low to moderate responses in terms of intensity suggesting that these images may not to qualify as highly arousing images[3]. Finally, AA participants did not rate the AA faces as more positive than did CA participants (t_{28}=1.42, P>.15), and participant race did not interact with target race on positivity ratings (t_{28}=.11, P>.5), indicating that AA and CA participants did not rate the target faces differently in terms of their positivity. These findings support the notion that the amygdala's response to target race may be a result of negative, rather than positive, culturally-learned associations to African-Americans. Nevertheless, arousal is not a unitary construct and self-reports may not fully capture the brain's response to arousal and positivity. Thus additional research with physiological measures is needed to further examine possible differences in the amygdala responses of AA and CA individuals to race-related stimuli.

A potential concern regarding this result derives from the number of AA faces presented during verbal and perceptual trials with AA targets. It could be argued that amygdala activity was diminished during the verbal trials, relative to the perceptual trials, because there were fewer AA faces during the verbal trials and therefore fewer emotionally evocative stimuli. Additionally, during the verbal trials, attention was split between an AA target face and words rather than between multiple AA faces, as in the perceptual trials. This line of argument could provide a trivial explanation for the negative correlation observed between the amygdala and RVLPFC during verbal trials, namely that time spent attending to words relative to pictures could increase RVLPFC activity and decrease amygdala activity without RVLPFC having any causal impact on amygdala activity.

At least two points argue against this account of the data. First, if the magnitude of RVLPFC activity resulted from the amount of time spent attending to words, then there should have been similar increases in RVLPFC activity during verbal encoding of both AA

and CA targets. Instead, verbal, relative to perceptual, encoding of AA targets produced an increase in RVLPFC activity, whereas verbal, relative to perceptual, encoding of CA targets produced no change in RVLPFC activity. Additionally, multiple studies have found that perceptual processing of a single emotionally evocative image produces amygdala activity, whereas verbal processing of the same image, with no words added to the screen, produces right prefrontal, but no amygdala, activity[4,5]. Thus, the RVLPFC activity in our study cannot be easily attributed to the amount of time spent attending to words rather than pictures. Second, previous research has shown that the presentation of two emotionally evocative images does not produce more amygdala activity than a single threatening image[6]. Moreover, Cunningham et al. has shown that subliminal presentation of AA faces produces more reliable amygdala activity than supraliminal presentation[7]. Finally, in the additional stimulus ratings study that we conducted, the word 'African-American' was rated as being of the same intensity as images of AA faces (t_{28}=.52, P>.5) suggesting that the images may be no more emotionally evocative than the race labels[3]. Consequently, the amygdala activity differences found in the current research are not likely to be the result of the number of AA faces presented or the amount of attention given to pictures in the verbal and perceptual encoding conditions.

The participants were twenty right-handed individuals (11 Caucasian-American and 9 African-American; 10 female; mean age, 23.7 (CA) and 24.9 (AA)) participated in this study. Each participant provided written consent in accordance with UCLA's Institutional Review Board's approved procedures.

Representative samples of the three tasks used in this study are shown in Figure 1. For each task, there was a target stimuli at the top of the screen and a pair of stimuli below. In the *perceptual* encoding task (**Fig. 1a**), participants were instructed to select the face from the bottom pair that matched the target face in terms of race. In the *verbal* encoding task, participants were instructed to select the race label from the bottom pair that described the race of the target face. In the shape match *control* task (**Fig. 1c**), participants were instructed to select the shape from the bottom pair that matched the target shape. The control task was designed to control for the primary sensorimotor aspects of the two race-related tasks and maximize our ability to identify amygdala and PFC responses during those tasks. The perceptual encoding task had two faces presented as the choice pair to control for the presentation of verbal labels in these same screen locations in the verbal encoding task.

Task blocks began with a 2.5s cue indicating the task type followed by six randomized trials that were each 5s in length, resulting in task blocks that were 32.5s in length. Participants used a button box to respond and were told to respond as soon as they were sure of the correct answer. The stimuli remained on the screen for the entire 5s trial. Two versions of the verbal and perceptual categorization tasks were created such that in one version, 83% of the trials contained CA targets and in a second version, 83% of the trials contained AA targets. All faces displayed a neutral expression.

Two fMRI scans were run with a minute break in between. One of the two functional scans consisted of blocks of CA-verbal, CA-perceptual, and control trials and the other consisted of blocks of AA-verbal, AA-perceptual, and control trials. The order of task blocks within a functional scan was either (a) control-verbal-control-verbal-control-perceptual-control-perceptual-control or (b) control-perceptual-control-perceptual-control-verbal-control-verbal-control. The predominant target race shown in the task and order of tasks within each functional scan was counterbalanced across participants.

Images were acquired using a GE 3.0T MRI scanner with an upgrade for echo-planar imaging (EPI; Advanced NMR Systems, Inc.). For each subject, a high resolution structural T2-weighted echo-planar imaging volume (spin-echo; TR =4000 ms; TE 54 ms;

matrix size 128 by 128; FOV=20cm; 26 slices; 4-mm thick, 1-mm gap) was acquired coplanar with the functional scans. Two functional asymmetric spin echo scans (gradient-echo; TR =2500 ms; TE =70 ms; 180 degree offset =25ms; matrix size 64 by 64; FOV=20cm; 16 slices; 4-mm thick, 1-mm spacing) were acquired, each for a duration of 4 minutes and 53 seconds. Each functional scan was composed of 117 brain volumes corresponding to 13 acquired volumes for each of 9 trials blocks. The 13 volumes consisted of one collected during the instruction cue and then two collected for each of the six trials.

The imaging data were analyzed using statistical parametric mapping (SPM'99; Wellcome Department of Cognitive Neurology, Institute of Neurology, London, UK). Images for each subject were first realigned to each other to correct for head motion, then normalized into a standard stereotactic space as defined by the Montreal Neurological Institute and smoothed with a 8mm Gaussian kernel, full width at half maximum, to increase signal to noise ratio.

Our analysis strategy involved region of interest (ROI) analyses of the left and right amygdala and whole-brain analyses to examine the effect of our different conditions. ROIs were defined as spheres centered in the amygdala at ±20, -6, -14 in talaraich space each with a 8mm radius and analyzed using an SPM toolbox (MarsBaR)[8]. ROI analyses were performed at a threshold of $P < .05$ corrected for multiple comparisons. Whole-brain analyses were performed at a threshold of $P < .005$ combined with a cluster size threshold of 5 voxels – corresponding to a corrected threshold of $P < .05$[9].

Between-subject analyses of correlational patterns across neural regions were also performed (see also[10]) by obtaining parameter estimates of signal intensity differences (i.e., beta values) across participants in perceptual encoding relative to verbal encoding. These values were extracted for the maximally active voxel in the amygdala and then entered into a whole-brain regression analysis to identify whether RVLPFC produced a correlated pattern of activity. The results of these analyses refer to the correlational pattern across participants, rather than within participants.

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