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Amygdala structure and the tendency to perceive the social system as legitimate and desirable

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Individual variation in preferences to maintain vs. change the societal status quo can play out in the political realm by choosing leaders and policies that reinforce or undermine existing inequalities¹. We sought to understand which individuals are likely to defend or challenge inequality in society by exploring the neuroanatomical substrates of system justification tendencies. In two independent neuroimaging studies, we observed that larger bilateral amygdala volume was positively correlated with the tendency to believe that the existing social order was legitimate and desirable. These results held for members of advantaged and disadvantaged groups (men and women). Furthermore, individuals with larger amygdala volume were less likely to participate in subsequent protest movements. We ruled out alternative explanations in terms of attitudinal extremity and political orientation per se. Exploratory whole brain analyses suggested that system justification effects may extend to structures adjacent to the amygdala, including parts of the insula and orbitofrontal cortex. These findings suggest that the amygdala may provide a neural substrate for maintaining the status quo, and opens avenues for further investigation linking system justification and other neuroanatomical regions.

Humans commonly live in hierarchical social systems, with members maintaining established inequalities by tolerating and justifying disparities among individuals and groups^{1,2}. Although people sometimes object to perceived injustices through collective protest and resistance, social systems with entrenched disparities (such as those based on patriarchy, segregation, and caste or class) typically endure very long periods of stability and perceived legitimacy before organized efforts to uproot them are successful³. In the current research program we examine neuroanatomical substrates of preferences to maintain existing social arrangements.

Identifying brain regions that are related to the defense of hierarchical social systems is a

critical step toward a complete understanding of the neurobiological processes that underlie the stability of prevailing social systems and the perpetuation of social inequality. Research on humans and non-human primates has suggested that the amygdala—a small brain region located bilaterally in the medial temporal lobe—is an important brain structure for assessing and navigating hierarchical social systems. For instance, rhesus macaques with amygdala lesions (vs. intact amygdalae) became less socially dominant over time and fell in the social hierarchy^{4,5}. Macaques with bilateral amygdala lesions also exhibit less fear in response to threatening stimuli⁶. Thus, loss of social status may stem from a diminished capacity to assess the social and physical environment.

Humans with amygdala damage exhibit similar behavioural changes. For instance, they are more likely to judge strangers' faces to be approachable and trustworthy^{7,8}, are less likely to respond punitively to violations of social norms⁹, and may exhibit a complete lack of fear when confronted with threatening stimuli such as snakes¹⁰. Amygdala damage thus impairs typical social functioning in human and non-human primates.

Amygdala size and structure in healthy individuals predicts variability in social functioning¹¹. Grey matter volume in the amygdala is positively associated with social status in macaques¹², as well as social network size in macaques¹³ and humans^{14,15}. Studies of amygdala lesions and grey matter volume therefore suggest that this brain region is vital for navigating social systems. This fits with functional neuroimaging work linking the amygdala to the processing of motivationally salient information, whether that information conveys threat¹⁶⁻¹⁸, uncertainty^{19,20}, or features of social groups²¹⁻²⁴.

Previous work suggests that orientations concerning hierarchy and belief systems regarding society are also rooted in the neuroanatomical structure of the amygdala. For instance,

larger bilateral grey matter volume in the amygdala was associated with learning the status of members of a novel hierarchical social system, but it was not associated with learning a non-social hierarchy²¹. Other studies reveal a positive correlation between political conservatism and right amygdala volume²⁵. Thus, amygdala volume may be related to ideology and the formation of knowledge and opinions regarding the legitimacy and desirability of social hierarchy. However, it is not entirely clear why this relationship would exist.

Here we consider the possibility that associations among amygdala volume, responses to social hierarchy, and political conservatism may be due in part to individual variability in the motivation to defend and bolster the existing social system—termed *system justification*^{1,26}. A system-justifying psychological orientation favors the social, economic, and political status quo and may promote vigilance to social hierarchy and a preference for ideologies that characterize extant inequality as legitimate and necessary^{1,27}. Many behavioural studies have shown that system justification accounts for attitudes and behaviours that attribute legitimacy to existing hierarchical social systems, such as stereotyping²⁸, conservative and meritocratic ideologies^{27,29,30}, and a reluctance to help those who are disadvantaged³¹. Moreover, system justification is theorized to arise from basic psychological needs to manage threat, uncertainty, and social relations³²—three functions that are linked to the amygdala.

Given the role of system justification in supporting the existing social order and the amygdala's role in promoting vigilance in social hierarchies, we investigated the possibility that individual differences in system justification motivation would vary with amygdala structure. We explored the hypothesis that greater system justification would be associated with larger grey matter volume in the amygdala in Study 1 and conducted a confirmatory replication in Study 2. We focused on brain structure as an indicator of slow-to-change individual differences in

regional computational capacity¹¹.

We assessed T1-weighted structural magnetic resonance imaging (MRI) scans from 48 healthy young Caucasian adults (58% female; Study 1) and directly replicated the effects in 45 healthy adults (67% female; Study 2) of diverse ethnic backgrounds to test the reliability and generalizability of the effect. In addition to the neuroanatomical scan, participants completed the general system justification scale³³, which includes items such as “In general, you find society to be fair,” and “Everyone has a fair shot at wealth and happiness.” They also indicated their political orientation from 1 = *extremely liberal* to 11 = *extremely conservative*³⁴. We then used voxel-based morphometry^{11,35} analyses to examine the relationship between system justification and grey matter volume (see Methods for further details).

Given previous work suggesting that there could be a relationship between amygdala size and system justification^{21,25}, we conducted small volume corrected region of interest (ROI) analyses within anatomically-defined masks of the left and right amygdala. We constrained our analyses to the left and right amygdala by applying ROI masks based on the Harvard-Oxford subcortical structural atlas implemented in the Oxford University Centre for Functional MRI of the Brain Software Library (www.fmrib.ox.ac.uk). These masks of the left and right amygdala included voxels that had a 20% or greater chance of being classified as the amygdala. Following previous studies²⁵, we entered potential confounding variables of age, sex, and global brain volume as regressors of no interest, so any observed effects would not be attributable to these factors. In Study 1, system justification was positively associated with grey matter volume (Fig. 1a) in the left amygdala ($t(43) = 3.82$, $p_{FWE-corr.} = .013$, peak MNI coordinates: $x = -36$, $y = -9$, $z = -17$) and right amygdala ($t(43) = 4.58$, $p_{FWE-corr.} = .002$, peak MNI coordinates: $x = 27$, $y = 12$, $z = -21$). We then conducted a confirmatory replication in Study 2 with a strong *a priori*

hypothesis of a positive relationship between system justification and amygdala volume (Fig. 2a), which was observed bilaterally (left amygdala, $t(40) = 3.84$, $p_{FWE-corr.} = .014$, peak MNI coordinates: $x = -11$, $y = -1$, $z = -26$; right amygdala, $t(40) = 4.68$, $p_{FWE-corr.} = .002$, peak MNI coordinates: $x = 20$, $y = 8$, $z = -14$). All significant clusters within the amygdala ROIs are reported in Supplementary Tables 1 and 2.

We then extracted mean grey matter volume values of *all* voxels within these amygdala masks to assess the bivariate correlation with system justification and alternative explanatory models (see Methods). We confirmed with the mean ROI-volume analysis that larger grey matter volume in the bilateral amygdalae was strongly associated with greater system justification in Study 1, $r(46) = .29$, $p = .04$ (Fig. 1c), and Study 2, $r(43) = .49$, $p = .001$ (Fig. 2c), adjusting for age, sex, and global brain volume²⁵.

To assess alternative explanations that variability in amygdala volume may be accounted for by more specific ideological beliefs or by ideological extremity, we tested a range of linear regression models that included political ideology, economic system justification, and attitudinal extremity (see Supplementary Methods and Supplementary Table 3 for discussion of each model). Across the various models in Study 1, the data were most parsimoniously explained by a model that included system justification as the primary predictor of interest, $\beta = .14$, $SE = .17$, $t = 2.06$, $p = .045$. A model that included ideology in addition to system justification did not explain a significantly greater proportion of the variance in amygdala volume than the model that only included system justification ($\Delta R^2 < .001$, $p = .88$), and ideology was not a significant predictor of amygdala volume ($\beta = -.01$, $t = -.16$, $p = .88$), whereas system justification remained a marginally significant predictor ($\beta = .14$, $SE = .19$, $t = 1.94$, $\Delta R^2 = .02$, $p = .059$; see also Supplementary Methods). Additional models examining differences in amygdala volume as a

function of economic system justification (the tendency to legitimize economic inequality under capitalism³⁶) and attitudinal extremity (across ideology, general system justification, and economic system justification) did not yield consistently significant effects. Tests of the same models for Study 2 supported the observation that system justification (more than other factors) was a significant and robust predictor of amygdala volume (all β s > .29, p s < .01).

We also conducted an exploratory whole brain analysis (following Kanai et al.²⁵) such that voxels positively related to system justification were thresholded at $p < .001$ with a minimum cluster of 20 voxels (see Fig. 1b and Fig. 2b). All peak clusters for both studies are reported in Supplementary Tables 1 and 2. In addition to confirming the bilateral amygdala effect, the whole brain analysis of both studies revealed clusters in additional regions such as the orbitofrontal cortex (OFC), which has rich connections with the amygdala and has also been identified as a critical neural component in socio-emotional behaviour. It has been suggested that the OFC uses the motivational information detected by the amygdala to guide and adjust goal-directed behaviours in social environments such as hierarchical contexts³⁷. We also observed system justification effects in the insula in both studies, which is consistent with previous (incidental) findings linking insula structure with conservatism²⁵. As the insular cortex is a region linked to a diverse array of functions, such as disgust³⁸, interoceptive awareness³⁹, pain detection⁴⁰, and empathy⁴¹, we did not have strong predictions regarding its relationship with system justification. Thus, although we did not predict structural variation in the OFC and the insula (among other regions; see Supplementary Tables 1 and 2) as a function of system justification, future work more directly examining such a relationship could illuminate the regulatory processes necessary for functioning in and perhaps justifying a hierarchical social system.

An important implication of system justification is that even those who are disadvantaged by the existing social arrangements can be motivated to maintain such arrangements, thereby internalizing aspects of their own state of disadvantage¹. For instance, women often exhibit attitudes and behaviours that support existing gender inequalities, such as believing they deserve less money for their work than men⁴²⁻⁴⁴ and viewing themselves in sexually objectifying ways⁴⁵. We explored the possibility that disadvantaged groups may be as likely as advantaged groups to exhibit a strong connection between amygdala structure and system-justifying tendencies by comparing women and men in our data. Combining both samples, we observed that the relationship between system justification and amygdala volume (adjusting for the effects of age, global brain volume, and sample) was not significantly different in women ($r(56) = .38, p = .004$), as compared to men ($r(33) = .19, p = .28$), $z = .92, p = .36$ (two-tailed; see Methods and Supplementary Figure 1). The positive relationship between amygdala volume and system justification was non-significantly stronger for women than men. This result suggests that the correlation is *not* driven simply by the members of an advantaged social group (men); rather, the same basic neurobiological processes appear to underlie system-justifying preferences in relatively advantaged and disadvantaged groups.

Finally, we investigated whether amygdala volume predicted subsequent political activity aimed at challenging the status quo. We followed up with 20 participants from Study 1 who indicated whether they had participated in any protest movements over the (approximately) three-year period following their initial brain scan (see Methods for details). We observed that larger amygdala volume (at Time 1) was associated with a decreased likelihood of participating in protest, $b = -4.03, SE = 1.81, \text{Wald } X^2(1) = 4.93, p = .03, 95\% \text{ CI } (e^b): \{.001, .624\}$ (see Fig. 3). Although the sample size was small, this link between amygdala volume and protest

behaviour provides initial evidence that the amygdala may not only be related to beliefs about society, but also willingness to take action to change certain aspects of the social system.

Together these findings provide evidence linking larger amygdala volume to (a) the tendency to justify the existing social system as legitimate and desirable, and (b) a reluctance to participate in social protest aimed at changing the status quo. These results were quite robust, having emerged in exploratory and confirmatory studies using relatively conservative amygdala ROI definitions and persisting after adjusting for other social and psychological variables.

Justifying existing hierarchical social structures most often benefits those who are in socially dominant positions, and for high-status individuals basic motivations to positively regard oneself, one's group, and the larger social system are in alignment^{1,2,46}. For those in low-status positions, this motivational intersection is fraught with difficulty, insofar as basic preferences to positively regard oneself and one's group often conflict with the individuals' location at (or near) the bottom of the hierarchical system¹. Nevertheless, examples abound of low-status individuals favoring the dominant out-group over their subordinate in-group in a wide range of intergroup contexts, including those based on race, gender, and socioeconomic status^{45,47,48}. The question remains, however, whether it is occupying a dominant social position itself—or justification of the social structure that maintains power disparities—that is related to amygdala structure in humans. Although our comparison of men and women in the present studies suggests the possibility that members of relatively advantaged and disadvantaged groups share the same neural signature that underlies system justification, our sample was collected from a relatively high-status population (students at a highly ranked university). Nevertheless, our findings are consistent with the speculation that “the amygdala seems to be involved in the formation and maintenance of a social hierarchy as well as the perception and learning of social dominance”⁴⁹.

This analysis opens the door to further examinations of the pattern of relations involving the amygdala, social dominance, and system justification in advantaged and disadvantaged groups (see also Supplementary Discussion).

The healthy functioning of a democratic society is aided by a sophisticated understanding of the basic processes that motivate consequential political behaviours such as taking collective action to subvert existing inequalities or supporting policies to maintain them. Our results suggest that a common neuroanatomical structure may support system-justifying preferences to maintain inequality, possibly among members of disadvantaged as well as advantaged social groups. This work contributes to a growing literature demonstrating that individual differences in social and political beliefs are not simply the product of deliberate considerations but are also deeply rooted in biological processes⁵⁰. Continued investigations into the neurobiological and psychological processes underlying social and political preferences are critical for understanding when humans are expected to criticize or defend inequality in their social environments.

Methods

Participants

Study 1. We scanned 49 healthy right-handed participants (mean age = 19; 58% female) who were recruited from the student participant pool at New York University (NYU), based on their participation in a mass questionnaire at the start of the term. The study was approved by University Committee on Activities Involving Human Subjects (UCAIHS), the NYU Institutional Review Board, and all participants provided written informed consent. The data for Study 1 were collected from 2011-2012. We intentionally recruited an ethnically homogeneous, Caucasian sample from the NYU student participant pool to minimize potential racial/ethnic differences, and sampled evenly across the ideological spectrum. Due to a clerical error, one

participant was scanned who did not meet the pre-selection criteria; we therefore excluded this participant from the analyses, leaving 48 participants for the reported analyses.

Study 2. We scanned 45 healthy right-handed participants (mean age = 20; 67% female) who were more ethnically diverse than in Study 1 and who identified as 27% White, 9% Black, 16% Latino/Hispanic, 44% Asian, and 4% other. The greater ethnic diversity of participants in Study 2 expanded upon the generalizability of Study 1. The data for Study 2 were collected from 2013-2014. The study was approved by University Committee on Activities Involving Human Subjects (UCAIHS), the NYU Institutional Review Board, and all participants provided written informed consent.

Procedure

Participants arrived to the scan center for a study titled “Scanning Social Judgments and Decisions” in Study 1 and “Social Cognition” in Study 2. They underwent a resting state structural MRI scan, and responded to a questionnaire (which included measures of system justification and political ideology) outside the scanner. The experimenter was unaware of the participants’ ideology, and the ideological preselection process was independent of the scanning session.

In Study 1, we randomly counterbalanced the order of the scan and the questionnaire in order to determine whether the experience of being inside the MRI scanner affected how participants reported their system-justifying and ideological beliefs, such that 25 participants were scanned before taking the questionnaire, and 23 were scanned after taking the questionnaire. There were no order effects for system justification, whether it was measured before ($M = 4.78$, $SD = 1.46$) or after the scan ($M = 4.94$, $SD = 1.42$), $t(46) = .39$, $p = .70$. Participants who reported their ideology before the scan were significantly more conservative (M

= 6.13, $SD = 2.67$) than those who reported after the scan ($M = 4.28$, $SD = 2.25$), $t(46) = -2.61$, $p = .01$. However, it may be that there were pre-existing ideological differences between the two groups despite random assignment, as we found participants' ideology scores from a larger battery of questionnaires used for participant recruitment (measured before the experimental session and therefore unaffected by the study) were significantly more conservative among those who took the questionnaire first ($M = 6.52$, $SD = 2.64$) than those who underwent the scan first ($M = 4.56$, $SD = 2.53$), $t(46) = -2.62$, $p = .01$, suggesting that group differences were not due to the experience of being inside the scanner. (System justification scores from the battery were not different as a function of scanner-questionnaire order, $t(46) = -1.04$, $p = .30$.)

Given that the scanner experience did not appear to significantly affect participants' responding in Study 1, in Study 2, we measured system justification and political ideology for all participants after the scan session.

System justification. Participants were given the 8-item general system justification scale³³, which measures the extent to which people are motivated to justify, defend, and bolster the extant social, economic, and political systems. The scale assesses agreement with items such as "Society is set up so that people usually get what they deserve" and "American society needs to be radically restructured" (reverse-scored) on a 9-point scale ranging from 1 = *strongly disagree* to 9 = *strongly agree*. In Study 1, the mean system justification score was 4.86 ($SD = 1.43$; $\alpha = .88$). In Study 2, the mean system justification score was 4.12 ($SD = 1.18$; $\alpha = .73$).

Political ideology. Participants were also asked to indicate their political ideology³⁴ on an 11-point scale ranging from 1 = *extremely liberal* to 6 = *neither* to 11 = *extremely conservative*. In Study 1, the mean ideology score was 5.17 ($SD = 2.60$). In Study 2, the mean ideology score was 4.09 ($SD = 2.00$).

Consistent with previous work²⁷, greater system justification was correlated with greater conservatism in both studies (as administered in the scan session questionnaires): $r(46) = .37, p = .01$ (Study 1); $r(43) = .45, p = .002$ (Study 2).

MRI data acquisition

For both studies, we acquired MRI images with a 3T Siemens Allegra head-only scanner. T1-weighted high-resolution anatomical images (MPRAGE, repetition time = 2500 ms; echo time = 4.35 ms; field of view = 256×256 mm; voxel size = $1 \times 1 \times 1$ mm) were acquired for each subject, with slices collected manually aligned to be parallel to the anterior commissure-posterior commissure line.

MRI data analysis

VBM preprocessing and analysis. We used voxel-based morphometry (VBM) to analyze the structural images³⁵. We first segmented T1-weighted MR images into grey matter (GM) and white matter (WM) using the segmentation tools in Statistical Parametric Mapping 8 (SPM8; Wellcome Department of Imaging Neuroscience, London UK, <http://www.fil.ion.ucl.ac.uk/spm>). Then we performed diffeomorphic anatomical registration through exponentiated lie algebra (DARTEL) in SPM8 for intersubject registration of the grey matter images. We smoothed the registered images with a Gaussian kernel of 12 mm full-width half-maximum and then transformed them to Montreal Neurological Institute (MNI) stereotactic space using affine and nonlinear spatial normalization implemented in SPM8. We ensured that the total amount of grey matter was retained before and after spatial transformation by modulating the transformed images by the Jacobian determinants of the deformation field. Therefore, the value of GM volume represented the volume of tissue per unit of spatially normalized image in arbitrary units. Total GM volumes across the whole brain were computed from the segmented images for each

participant.

Small volume analyses. We first conducted small volume corrected region of interest (ROI) analyses on the smoothed, normalized images within anatomical masks of the left and right amygdala. For these ROI-constrained analyses, we applied masks based on the Harvard-Oxford subcortical structural atlas implemented in the Oxford University Centre for Functional MRI of the Brain Software Library (www.fmrib.ox.ac.uk). These masks of the left and right amygdala included voxels that had a 20% or greater chance of being classified as the amygdala. (A parallel analysis using more inclusive amygdala masks—that is, masks that included voxels with a 0.5% or greater chance of being classified as the amygdala—yielded nearly identical results.) We entered system justification scores as the primary contrast of interest in the model, as well as potential confounding variables of age, sex, and global brain volume as regressors of no interest in the SPM8 model, following previous literature²⁵.

Mean ROI value analyses. In order to assess a range of regression models, we applied the anatomical masks (classifying >20% chance amygdala) that were used for the small volume analyses and extracted the mean grey matter volume separately from all the voxels of the left and right amygdalae within these masks. We averaged the mean extracted volume of the left amygdala and the right amygdala to compute a single bilateral amygdala volume score for each subject. We then assessed the relationship between bilateral amygdala volume (using the extracted ROI values) and system justification, as well as political ideology, economic system justification³⁶, and ideological extremity across a variety of regression models, again adjusting for effects of age, sex, and global brain volume (see Supplementary Methods and Supplementary Table 3 for reports of all models tested assessing effects on amygdala volume).

We also explored other ROIs, following a previous finding linking grey matter volume in

the anterior cingulate cortex (ACC) and the left insula to political ideology²⁵. For these regions, we extracted GM volume using procedures in SPM8. These ROIs were defined as spheres with a radius of 20 mm centered at $x = -3$, $y = 33$, $z = 22$ for the ACC, and $x = -38$, $y = -16$, $z = -2$ for the left insula²⁵. We did not find significant associations between these brain regions and system justification or ideology that replicated across both studies (see Supplementary Tables 4-5 for reports of all effects).

Whole brain analyses. Additionally, we explored whether there were other regions that varied with system justification across the whole brain. We entered the smoothed, normalized images into a multiple regression analysis across the participants. Following previous work^{25,51,52}, we included the regressors of sex, age, and overall brain volume as covariates of no interest and therefore regressed out any effects of these factors. We entered system justification as a regressor of interest. Voxels positively related to system justification were thresholded at $p < .001$ with a minimum cluster of 20 voxels. See Supplementary Tables 1 and 2 for all peak clusters in Study 1 and 2, respectively.

Gender comparison

To explore the possibility that lower-status groups may be as likely as higher-status groups to exhibit a positive relationship between amygdala structure and system justification, we compared women and men in our data. We combined the samples of Studies 1 and 2 to increase our statistical power for this analysis, and we used the extracted mean ROI values from the amygdala volume masks, adjusted for the effects of age, global brain volume, and sample. We found that the relationship between system justification and amygdala volume was not significantly different among women ($r(56) = .38$, $p = .004$) compared to men ($r(33) = .19$, $p = .28$), $z = .92$, $p = .36$ (two-tailed; see Supplementary Figure 1).

Follow-up survey of protest participation

We recruited 20 participants (12 female) from Study 1 whose data were initially collected when they were first year college students (Time 1). These participants had previously indicated in Study 1 that they would be interested in participating in follow-up studies, and we attempted to recruit the full sample of Study 1, offering \$60 for follow-up participation. The follow-up survey (Time 2) was conducted shortly before or after participants' college graduation (mean age = 21.95 years). The average time difference between Study 1 and the follow-up survey was 3.04 years ($SD = .28$).

Because not all participants from Study 1 (at Time 1) came back at Time 2, we compared those who had only participated at Time 1 with those who participated at Time 2 to assess whether the two subsamples differed substantially. We found that the two subsamples did not differ in age ($t(46) = .95, p = .35$), gender ($t(46) = .39, p = .70$), or political orientation ($t(46) = -.52, p = .61$). It should be noted that at Time 1, participants were preselected to represent the full spectrum of ideology (and minimize the typically observed liberal skew in college participants). Despite the fact that we obtained a smaller sample size at Time 2 than at Time 1, the lack of ideological difference between the two groups indicates that the ideological balance was maintained at Time 2.

As an index of political behaviour in the form of collective action, we asked participants about their participation in protests since entering college ("Have you engaged in protest activities while in college?") to which their response was binary (i.e., *Yes* or *No*). If participants indicated that they had engaged in protest activities, we also asked them to specify the type of protest. Six participants indicated they had participated in a protest during college and 14 indicated they had not. Of those who reported participating in a protest, they indicated that they

had participated in protests on Occupy Wall Street ($N = 4$), Black Lives Matter ($N = 3$), the Climate Change March ($N = 2$), and against rape and sexual violence ($N = 1$). Notably, no participants indicated engaging in collective action for explicitly conservative causes, such as the Tea Party movement.

To assess whether amygdala volume at the start of college could predict subsequent political activity, we entered amygdala volume (at Time 1, adjusted for age, gender, and global volume) into a binary logistic regression predicting the likelihood that students participated in protests. Strikingly, students who had larger amygdala volumes as freshmen were less likely to participate in protests in later years, $b = -4.03$, $SE = 1.81$, Wald $X^2(1) = 4.93$, $p = .03$, 95% CI (e^b): $\{.001, .624\}$ (see Fig. 3).

Data availability

All data and materials for these studies are available at <https://osf.io/p7vmw/>.

Code availability

All syntax code used for the analyses are available at <https://osf.io/p7vmw/>.

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Figure 1. The relation between grey matter volume in the bilateral amygdalae and system justification in Study 1 ($N = 48$). **(a)** Multi-slice coronal heat maps (at MNI $y = 6, 7, 8, 9, 10, 11, 12$) show grey matter volume differences in the bilateral amygdalae correlated with system justification ($t > 3.0$, $p_{FWE-corr.} < .05$). Amygdala effect is observed in the overlapping region between bilateral amygdala masks (in blue) and system justification statistical map (in orange). **(b)** Glass brain images of whole brain analysis (coronal, sagittal, and axial cross-sections from top to bottom) suggest specificity of system justification effect in regions including the bilateral amygdalae ($p < .001$, minimum cluster of 20 voxels). **(c)** Higher tendencies to assess the existing social system as fair and legitimate (i.e., system justification) were positively associated with larger grey matter volume in the bilateral amygdalae, $r(46) = .29$, $p = .04$. Here amygdala volume is computed as the average of left and right amygdala volumes, adjusted for age, gender, and overall brain volume, and standardized such that 0 indicates average volume with changes in 1 SD increments.

Figure 2. Study 2 ($N = 45$) replication of positive correlation between bilateral amygdala volume and system justification. All computations and statistical adjustments are the same as in Study 1. **(a)** Multi-slice coronal heat maps (at MNI $y = 1, 2, 3, 4, 5, 6, 7$) show grey matter volume differences in the bilateral amygdalae correlated with system justification ($t > 3.0$, $p_{FWE-corr.} < .05$). Amygdala effect is observed in the overlapping region between bilateral amygdala masks (in blue) and system justification statistical map (in orange). **(b)** Glass brain images of whole brain analysis (coronal, sagittal, and axial cross-sections from top to bottom) suggest specificity of system justification effect in regions including the bilateral amygdalae ($p < .001$, minimum cluster of 20 voxels). **(c)** Higher tendencies to assess the existing social system as fair and legitimate (i.e., system justification) were positively associated with larger grey matter volume in the bilateral amygdalae, $r(43) = .49$, $p = .001$.

Figure 3. Participants' likelihood of (in blue) and reported (in black) participation in a protest during college (assessed at Time 2; $N = 20$) as predicted by bilateral amygdala grey matter volume (standardized and adjusted for age, sex, and global brain volume) at the start of college (Time 1), $b = -4.03$, $SE = 1.81$, Wald $X^2(1) = 4.93$, $p = .03$, 95% $CI(e^b)$: $\{.001, .624\}$.

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