Neuroscience 575 (2025) 95–103

Contents lists available at ScienceDirect

Neuroscience

journal homepage: www.elsevier.com/locate/nsc

Authoritarianism and the brain: Structural MR correlates associated with polarized left- and right-wing ideology traits

Jesús Adrián-Ventura [a,*], Diego Avendaño [b], Anna Miró-Padilla [c], Anastasia Cherednichenko [c], César Ávila [c], Angelo Fasce [d]

[a] University of Zaragoza, Spain
[b] KU Leuven, Belgium
[c] Jaume I University, Spain
[d] University of Erfurt, Germany

ARTICLE INFO

Keywords:
Right-wing authoritarianism
Left-wing authoritarianism
structural MRI
Insula
Prefrontal cortex

ABSTRACT

Authoritarian attitudes across the political spectrum foster radical behaviors, which adversely affect the social fabric. Both left-wing (LWA) and right-wing (RWA) forms of authoritarianism have been described in relation to their psychological correlates, yet little is known about their neurobiological basis. In this study, we explored brain structural correlates (e.g., in cortical thickness (CT) and gray matter (GM) volume) of authoritarianism. For this purpose, we assessed authoritarian dispositions in a sample of 100 young adults and collected 3 T MR images. Images were computed using the CAT12 toolbox. Behaviorally, both the LWA and RWA were positively associated with negative urgency; the LWA also showed a robust positive association with trait anxiety. At the neural level, results showed a negative correlation (r = -0.48) between RWA and a GM volume cluster located in the dorsomedial prefrontal cortex (dmPFC). In addition, we also observed a negative correlation (r = -0.41) between the LWA anti-hierarchical aggression subscale and a CT cluster located in the right anterior insula. Additionally, the resulting clusters converged with further left-wing and right-wing ideology scales related to LWA and RWA, thus providing a robustness check. These results are supported by previous studies showing the relevance of the dmPFC and the anterior insula on social cognition and empathy/inhibitory control, respectively.

Introduction

Authoritarian attitudes across the political spectrum are manifested in a plethora of radical behaviors that often result in repression, violence, and restrictions of civil liberties such as liberty of expression, freedom to choose one's lifestyle, and equality rights. According to Levitsky and Ziblatt (2018), democracies in the current Western context are being progressively eroded by authoritarian tendencies, with political positions becoming increasingly closed-minded and people describing their political systems in terms of "us versus them" (Arbatli & Rosenberg, 2020; McCoy et al., 2018; Twenge et al., 2016). This partisan socio-political landscape produces strong affective polarization and an illiberal conception of the principles of liberal democracies. For instance, Moore-Berg et al. (2020) found that Democrats and Republicans in the US are equally likely to dehumanize each other, while Kingzette et al. (2021) offer political data on how the relativization of democratic norms led individuals to oppose or reject civil liberties depending on whether they perceive themselves to be in power or not, with a similar state of affair in other cultural contexts, such as the Spanish-speaking world (Fasce & Avendaño, 2022).

Notwithstanding previous research on this topic and its indubitable value, the cognitive-behavioral results obtained so far have been barely integrated with neurobiological data. In fact, this idea has been resonating in the last years, as illustrated by new debates in the academia (e.g., Zmigrod & Tsakiris, 2021) and by novel research framework proposals such as *the neurocognitive model of ideological thinking* (Zmigrod, 2021). The intention of the present article is to provide unprecedented evidence on this line of research, analyzing the neural underpinnings of authoritarian attitudes in terms of brain structure.

General characterization of authoritarianism

Historically, authoritarianism had been regarded as a phenomenon associated with the right wing. Nearly all conceptual frameworks and

* Corresponding author at: Department of Psychology and Sociology, University of Zaragoza, Atarazanas 4, 44003 Teruel, Spain.
E-mail address: jadrian@unizar.es (J. Adrián-Ventura).

https://doi.org/10.1016/j.neuroscience.2025.04.027
Received 16 December 2024; Accepted 13 April 2025
Available online 16 April 2025

psychometric tools have focused on *Right-Wing Authoritarianism* (RWA), and the construct has been vastly studied in relation to rightist forms of prejudice and antidemocratic attitudes (Duckitt, 2022; Fasce & Avendaño, 2020). The most widely used model of RWA posits that it consists of three distinct dimensions. The first, *authoritarian aggression*, is characterized by the disposition to inflict harm on others—whether psychologically, physically, or socially—"accompanied by the belief that proper authority approves it or that it will help preserve such authority" (Altemeyer, 1996, p. 10). The second dimension, *authoritarian submission*, involves a readiness to accept the declarations and actions of authorities without question, driven by the belief that "proper authorities should be trusted to a great extent and deserve obedience and respect" (Altemeyer, 1996, p. 9). Finally, the third dimension, *conventionalism,* is defined as a "strong acceptance of and commitment to the traditional social norms in one's society" (Altemeyer, 1996, p. 10). In line with this perspective, people with high levels of RWA would be prone to displaying conservative ideologies, traditional values and lifestyles, religious orthodoxy, and favorable attitudes toward punitive measures for social control (Duckitt, 2010).

On the other hand, and less studied, *Left-Wing Authoritarianism* (LWA) has gained increasing relevance within the social and behavioral sciences. Recent advances have been made in understanding authoritarian attitudes among left-leaning individuals and groups across diverse sociopolitical contexts and languages (see Conway et al., 2018; Conway & McFarland, 2019; De Regt et al., 2011; Fasce & Avendaño, 2023; Manson, 2020; Van Hiel et al., 2006). In fact, Costello et al. (2022) have recently made an important contribution on the conceptual elucidation and psychometric measurement of LWA. According to their model, there are three dimensions of LWA: *Anti-Hierarchical Aggression*, which is the disposition to violently overthrow and penalize the current structures of authority and power in society; *Anti-Conventionalism*, characterized by a sense of moral superiority and a desire for ideological uniformity within the group; and *Top-Down Censorship*, the drive to use group authority to coercively and punitively control ideologies and behaviors that do not conform or are not consistent with left-wing standpoints. In the work of Costello et al. (2022), this construct displayed a nomological network reflecting cognitive rigidity, coercive group behavior, and moral absolutism. The same LWA construct has also been linked to support for authoritarian policies and rejection of fundamental civil liberties and rights (Fasce & Avendaño, 2022; Manson, 2020).

Authoritarianism and psychological disposition

Authoritarianism has been associated with a wide range of psychological traits, with radicals at both extremes of the political spectrum sharing common traits, such as psychological distress, cognitive simplicity, overconfidence in their judgments, and intolerance (Van Prooijen & Krouwel, 2019). This cognitive style sets the foundation for observable authoritarian tenets such as dogmatism, punitive attitudes toward the out-group, and desire for rigid authority figures (Manson, 2020). However, extremisms within the ideological spectrum also present notable differences. Indeed, both forms of authoritarianism exhibit divergent nomological networks in terms of personality and, to some extent, clinical traits. For instance, a *meta*-analysis revealed that RWA was associated with high consciousness and, especially, low openness to experience (Sibley & Duckitt, 2008)—a robust pattern of associations that may represent "social conformity" (Nicol & De France, 2016; Sibley & Duckitt, 2010). Clinical correlates associated with RWA are more ambiguous: some authors argue that high endorsement of RWA could be related to depressive symptoms (Duriez et al., 2012), whereas others point to its "protective function" as a "behavioral immune system" (Terrizzi et al., 2013). Nevertheless, a *meta*-analysis carried out by Onraet et al. (2013) revealed a weak relationship between RWA attitudes and psychological well-being.

In relation to LWA, the recent development of adequate measures to assess this psychological construct has yielded relevant advances. Krispenz and Bertrams (2024) depicted a robust association of LWA with a narcissistic psychological profile: As a whole, LWA positively correlated with neuroticism, whereas the anti-hierarchical aggression factor showed positive associations with antagonism, Machiavellianism, and psychopathy. Similarly, Conway et al. (2023) conducted 12 studies analyzing a range of socio-contextual dynamics and their relationship to LWA. Across the studies, results revealed that people scoring high on LWA perceived different contexts as more threatening (e.g., ecological threats, COVID-19, MAGA Republicans, etc.). These results align with other investigations highlighting that perceived grievance tends to be particularly high among left-wing authoritarians (Fasce & Avendaño, 2023; Love & Sharman, 2024).

In sum, whereas high-order factors such as dogmatism or cognitive rigidity are recurrent variables when explaining authoritarian behaviors, it is fundamental to extend this analysis to a greater level of granularity. For example, one may be interested in studying not only general scales, but also their subscales, which could provide new insights. Moreover, analyzing different personality and clinical scales would provide further knowledge about the psychological profiles of LWA and RWA. Among these new dimensions are core clinical and personality variables such as neuroticism (e.g., trait anxiety), impulsivity (e.g., urgency), and emotional regulation, which are key transdiagnostic variables (Johnson et al., 2013; Pearlstein et al., 2024; Peris-Baquero et al., 2023). In this regard, recent research showed that variables typically linked to authoritarianism, such as political conservatism and dogmatism, are positively linked to impulsivity (Zmigrod et al., 2021). Altogether, individual differences in these psychological dispositions may foster authoritarian responses. Based on previous research, it is plausible that radicalized behaviors associated with LWA and RWA stem from a deficient behavioral inhibition system. Moreover, higher anxiety levels would boost extremist behaviors linked to LWA. So, it is crucial to further investigate and confirm the relationship between those core clinical traits (e.g., anxiety, urgency/emotion regulation) and different forms of authoritarianism.

Authoritarianism and the brain

Scientific literature relating RWA and LWA with the brain structure is scarce. Indeed, to date, no previous studies have analyzed the neural correlates of LWA, either anatomically or functionally. This is not surprising given the recent advances on the conceptual elucidation and psychometric measurement of LWA (Costello et al., 2022). However, the development of new measurement models and their adaptation to other languages (e.g., Avendaño et al., 2022) makes LWA a potential candidate for further research that may help to disentangle its neuropsychological structure.

Despite the longer psychological tradition in the study of RWA, the first study aimed at analyzing its correlates in terms of brain structure was recently published (Balagtas et al., 2023). In that study, the authors adopted a whole-brain and region-of-interest (ROI) approach to investigate the gray matter (GM) volume correlates of RWA in a sample of 82 Singaporean Chinese adults (mean age = 25.89 ± 5.68 years). No results were found at the whole-brain level, however, some results emerged when analyzing *ad-hoc* spheric ROIs, including a significant positive correlation between RWA and the bilateral amygdala and a negative correlation with ventromedial prefrontal cortex (vmPFC), yet only the latter result survived when utilizing more accurate ROIs (e.g., atlas-based). This RWA-vmPFC link aligns with the seminal findings reported by Asp et al. (2012b), as the authors observed that patients with damage in the vmPFC endorsed more RWA. Moreover, these patients also failed in tasks that covariate with RWA attitudes, such as tests of false beliefs (e.g., they were more credulous to misleading advertisements; Asp et al., 2012a). These results can be interpreted under the tenets of the "false tagging theory" (FTT), which establishes the vmPFC as the core brain region when it comes to assessing—or "tagging"—previous beliefs as false when new information is provided (Warner

et al., 2016). Therefore, impaired functioning of the vmPFC could lead to endorsement of authoritarian behaviors, such as submission or conventionalism. However, it is worth noting that despite the link between RWA and vmPFC being clear, this relationship should be taken cautiously. In fact, when the vmPFC ROI (atlas-based) was tested by means of threshold-free cluster enhancement (TFCE), the results did not survive (see Balagtas et al., 2023).

Overview of the present study

The aim of this study was to provide new evidence on stable neural traits of authoritarianism (both for RWA and LWA). Whereas no previous report exists on the brain correlates of LWA, one recent research that carried out voxel-based morphometry (VBM) sought to investigate the structural correlates in GM volume of RWA (Balagtas et al., 2023). However, this study did not examine other anatomy measures such as cortical thickness (CT) and the RWA assessment was limited to the general score of the scale without considering the subscales (i.e., aggression, submission, and conventionalism). Accordingly, given the limited literature relating authoritarianism with the brain architecture, the primary goal of our research was to analyze: a) the GM volume correlates of RWA, LWA, and their respective subscales, and b) the CT correlates of RWA, LWA, and the subscales.

Given the novelty of this study, and the lack of previous research on ideological authoritarianism and brain structure and function, our analyses were exploratory in nature. For this reason, we conducted whole-brain analyses (both for GM volume and CT), and, following the strategy adopted by Balagtas et al. (2023), we also conducted ROI analyses to provide further information on the relationship between the amygdala and the vmPFC with authoritarianism. For the former we expected a positive association and for the latter we predicted a negative one. Additionally, as a robustness check, we compared the significant results with related ideology scales.

As a secondary goal, we examined the relationship between LWA, RWA, and their corresponding subscales, with relevant transdiagnostic traits (e.g., impulsivity, anxiety and emotion regulation). These analyses were intended to further replicate and extend previous research (e.g., Conway et al., 2023; Krispenz and Bertrams, 2024; Zmigrod et al., 2021) by studying new, related scales. So, together with the brain results, this behavioral output would help to unravel the neurobehavioral structure of LWA and RWA. Considering the aforementioned behavioral and clinical findings, we expected to observe positive associations of RWA and LWA with impulsive traits, as well as a positive relationship between LWA and trait anxiety.

Material and methods

Power analyses

G*Power v.3.1.9.7 software was utilized to compute the *a priori* required sample size. Given that the literature on this research topic is limited, we established a classic threshold: medium effect size with a power of 0.80 at an alpha of $p < 0.05$. Given an effect size of $f^2 = 0.15$ and 3 predictors, the required sample size was 77 for multiple regression analyses. Likewise, the required sample size was 84 for an effect size of $r = 0.30$ (two-tailed) in correlation analyses. Our total sample size met both criteria (see next section), thus indicating an adequate, well-powered study.

Participants

One hundred ($N = 100$) volunteers took part in the study (37 males, 63 females; mean age = 22.29, $SD = 2.63$; range = 18–30 years). The vast majority were undergraduates, given that they were recruited from the student community via local announcements and word of mouth. All participants were right-handed according to the Edinburgh Handedness Inventory (Oldfield, 1971), none of them referred a history of psychiatric, neurological, or severe medical disorders and none had experienced traumatic brain injury with loss of consciousness. As inclusion criterion, all participants had a scaled score > 8 (i.e., within the normality range) on the matrix reasoning test from the WAIS-III. Participants were informed of the nature of the research and all provided written informed consent before inclusion; additionally, they received monetary compensation for their time. The research project was approved by the Ethical Committee of Jaume I University (CD/11/2021).

The data matrix for analyses with all the translated items, scales and brain measures (from the resulting VBM and SBM clusters, as well as the ROIs) are publicly available in OSF (https://osf.io/hsfvy/). Of note, part of this dataset has been previously utilized in two studies from our research group focused on a different research topic (Cherednichenko et al., 2024; Miró-Padilla et al., 2023).

Behavioral assessment

Behavioral data were collected online via Qualtrics XM. All participants completed the questionnaires during the week before the MRI scan. In addition to sociodemographic variables (e.g., age, sex, education level), we assessed the following dimensions:

– *Political orientation*: single-item 10-point Likert scale representing the left-wing/right-wing axis (1 = extremely left-wing, 10 = extremely right-wing). We included this item to ensure that our sample was sufficiently represented across the political spectrum (i.e., skew normal distribution).

– *Right-wing authoritarianism (RWA)*: We used the Spanish adaptation (Fasce et al., 2020) of the 18-item scale developed by Dunwoody & Funke (2016). This scale is composed of 3 subscales: Aggression (RWA Aggression), Submission (RWA Submission) and Conventionalism (RWA Conventionalism).

– *Left-wing authoritarianism (LWA)*: We used the Spanish adaptation (Avendaño et al., 2022) of the 39-item scale recently developed by Costello et al. (2022). The questionnaire consists of 3 subscales: Anti-hierarchical aggression (LWA AHA), Anti-conventionalism (LWA AC), and Top-down censorship (LWA TDC).

– *Impulsivity (UPPS-P)*: The short Spanish version of the UPPS-P impulsive behavior scale (20 items; Cándido et al., 2012) was administered. This questionnaire is composed of 5 different subscales (Cyders et al., 2007; Lynam et al., 2006): (positive/negative) urgency (strong reactions [i.e., acting rashly] to positive/negative affect situations), lack of premeditation (not thinking about the consequences of actions), lack of perseverance (inability to stay focused on long, boring or difficult tasks), and sensation seeking (the tendency to pursue and get engaged in new, exciting experiences, despite their peril).

– *State-trait anxiety inventory (STAI-T)*: Given that our interest was to assess stable traits, we selected the 20-item scale of trait anxiety (Spielberger et al., 1982).

– *Emotion regulation questionnaire (ERQ)*: We utilized a Spanish adaptation (10 items; Cabello et al., 2013) of the original ERQ scale (Gross & John, 2003). This instrument has two different factors: Reappraisal (i.e., the cognitive change process aimed at modifying the emotional impact of certain situations) and Suppression (i.e., a top-down strategy for inhibiting emotion-expressing behaviors).

Moreover, we also included additional measures of political ideology as robustness checks. These scales—radical and cultural feminism, and social dominance orientation—were intended to assess ideology-content dimensions widely associated with LWA and RWA, respectively. The psychometric information of the scales is provided in the supplementary material.

Image acquisition

Brain structural data were all acquired on a 3.0 T GE SIGNA™

Architect MRI scanner (Waukesha, WI, USA). A high-resolution 3D T1-weighted BRAVO sequence was acquired for each participant by using a 24-channel coil. Participants were placed in a supine position inside the MRI scanner with their heads stabilized with pads to prevent involuntary motion. All sequences were taken covering the whole brain, and we set the following parameters: TR = 8.52 ms, TE = 3.28 ms, FOV = 240 mm (100 %), flip angle = 12°, matrix = 256 × 256, voxel size = 0.5 × 0.5 mm, space between slices = 0.5 mm, slice thickness = 1 mm, number of images = 384. The total sequence length was 4 min 17 s. Additionally, to improve comfort, participants wore MRI compatible goggles (VisuaStim, Resonance Technology Inc., Northridge, CA, USA) during the sequence run, through which we presented landscape images.

Image preprocessing

Voxel-based morphometry (VBM) was conducted using the Computational Anatomy Toolbox (CAT12.8.2, r2170; www.neuro.uni-jena.de/cat/) for the Statistical Parametric Mapping software (SPM12, v7771; www.fil.ion.ucl.ac.uk/spm/software/spm12/) under the Matlab R2022b (v9.13) environment. All the T1-weighted images were first reoriented to the anterior–posterior commissure (AC-PC) line and subsequently preprocessed via the CAT12 segment module. This procedure applies an extension of the unified segmentation (Ashburner & Friston, 2005). We followed the standard preprocessing pipeline: 1) segmentation of the original images into GM, white matter, and cerebrospinal fluid by using the SPM12 tissue probability maps; 2) affine registration and regularization based on the space template provided by the International Consortium for Brain Mapping (ICBM); 3) spatial shooting registration (normalization) of the GM segments to the Montreal Neurological Institute (MNI) template via Optimized Shooting; and 4) modulation by the affine + non-linear components derived from the spatial MNI normalization. Once the preprocessing was completed a data quality check was conducted by means of the CAT12 check sample homogeneity data module. To do this, we included the quality measures obtained during the segmentation as well as total intracranial volume (TIV) and age as nuisance variables. The results showed two potential outliers in brain volume, which were excluded from the sample for further volumetric analyses. Finally, the resulting (modulated) normalized GM volume maps were spatially smoothed with a 6-mm full-width at half-maximum (FWHM) Gaussian kernel.

Surface-based morphometry (SBM) was computed as an extension of the VBM procedure. Specifically, under the same VBM segmentation module, we further estimated the surface and cortical thickness (CT). When the preprocessing finished, the surface data were resampled and smoothed with a 15-mm FWHM Gaussian kernel. Prior to the analyses, the CT data were also checked to detect possible outliers. In this case, we only included age as a nuisance. In line with the volumetric data, results showed the same two participants as potential outliers, which were removed for further surface analyses. Thus, both for the volumetric and surface analyses, the sample utilized was composed of the same participants ($n_{final} = 98$).

Statistical analysis

Given the exploratory nature of our study, we adopted a whole-brain approach. Specifically, we conducted a series of multiple regression analyses by taking the RWA and LWA scales, and their corresponding subscales, as independent variables, and the different structural metrics (i.e., the whole-brain GM volume and CT) as dependent variables. Likewise, the GM volume analyses included age and TIV as covariates of no interest. Sex was not included in these analyses to avoid multicollinearity with the TIV variable. Regarding the CT analyses, all the regression models included age and sex as covariates of no interest. TIV was not included in these analyses as the brain size correction is not necessary for CT. Given the exploratory nature of these analyses, the statistical threshold was set bilaterally (two-tailed). Following the recommendations by Chen et al. (2019), we applied an uncorrected cluster-forming threshold of $p < 0.0005$ with a subsequent multiple-comparison FWE correction at $p < 0.025$. In addition, we applied an absolute threshold masking of 0.1 to ensure that we only selected GM voxels, whereas we also corrected our results for non-stationary smoothing. Afterwards, the significant, resulting clusters were taken as binary ROIs and their corresponding values (e.g., GM volume in ml or CT in mm) were extracted for each participant's brain. These values, together with the behavioral data, were further computed using IBM SPSS v.27 (IBM Corp., Armonk, NY, USA) and analyzed by partial correlations to rule out nuisance effects (e.g., age and sex or TIV).

We also conducted ROI analyses on the amygdala and the vmPFC given the hypothesized role of these regions in authoritarian attitudes (see Balagtas et al., 2023). For the ROI GM volume analyses, the amygdala and the vmPFC were extracted from the Neuromorphometrics atlas parcellation. As the vmPFC is not defined as such, we created a bilateral ROI composed of the gyrus rectus plus the medial frontal cortex. As for the ROI CT analyses, the vmPFC was defined as the bilateral medial orbitofrontal cortex from the Desikan-Killiany (DK40) atlas. Both atlases are freely distributed within the CAT12 toolbox.

Finally, regarding the behavioral correlation results, we only underscored medium effect sizes (i.e., $r > 0.30$; Cohen, 1992). Of note, two participants did not complete the UPPS-P, STAI-T, and ERQ, so the analyses involving these scales were carried out on 96 participants.

Results

Behavioral data

Descriptive results for the variables included in the study are presented in Table 1. All scales reached satisfactory internal consistency levels (Cronbach's alpha between 0.68 and 0.93). Given the normal distribution of our behavioral data (i.e., skewness and kurtosis between ± 2), we conducted Pearson's correlations. Tables 2 and 3 display the correlations between the dimensions assessed in the study and RWA and LWA, respectively.

We observed significant relationships between RWA and LWA and some of the assessed variables. The most notable associations were found between the RWA Aggression subscale and the Negative urgency trait ($r = 0.30$, $p = 0.003$, see Table 2). Of note, RWA also showed an inverse correlation with (lack of) Perseverance, particularly the Conventionalism factor ($r = -0.28$, $p = 0.007$). Moreover, we also found a significant relationship between trait anxiety and the Anti-hierarchical aggression ($r = 0.30$, $p = 0.004$) and Anti-conventionalism ($r = 0.31$, $p = 0.002$) subscales of LWA (see Table 3).

VBM and SBM brain analyses

Regarding the whole-brain GM volume analyses, the results showed a significant negative correlation ($r = -0.48$) between the RWA scale and a cluster co-located in the dorsal section of the medial prefrontal cortex ($p < 0.0005$ uncorrected, $p < 0.025$ FWE-corrected; $k = 288$, MNI maxima = -10, 56, 26). Results are displayed in Fig. 1. No other significant positive or negative result was found.

In relation to the whole-brain CT analyses, the results revealed a significant negative correlation ($r = -0.41$) between the LWA AHA subscale and a cluster co-located in the right anterior insula/inferior frontal gyrus ($p < 0.0005$ uncorrected, $p < 0.025$ FWE-corrected; $k = 205$, MNI maxima = 34, 18, −7). Results are displayed in Fig. 2. No other significant positive or negative result was found.

Further post-hoc analyses were conducted with the resulting clusters in order to provide a robustness check of these results. For this purpose, we correlated the resulting GM volume and CT clusters with left- and right-wing ideologies strongly related to LWA and RWA, respectively. These analyses can be consulted in the Supplementary Material. In short, the results provided criterion validity evidence by linking the CT cluster

Table 1
Descriptive statistics (n = 98).

	Min	Max	Mean (*SD*)	Skewness (*SE*)	Kurtosis (*SE*)	Cronbach's alpha
Political Orientation	1	9	3.65 (1.74)	0.61 (0.24)	−0.20 (0.48)	–
RWA	28	59	43.48 (6.68)	0.18 (0.24)	−0.31 (0.48)	0.73
RWA Aggression	6	23	13.94 (3.43)	0.38 (0.24)	0.01 (0.48)	0.71
RWA Submission	6	20	13.08 (3.19)	0.00 (0.24)	−0.53 (0.48)	0.68
RWA Conventionalism	9	25	16.46 (3.38)	0.18 (0.24)	−0.18 (0.48)	0.70
LWA	59	163	115.20 (21.38)	−0.29 (0.24)	−0.22 (0.48)	0.93
LWA Anti-hierarchical aggression	14	54	30.26 (8.83)	0.18 (0.24)	−0.44 (0.48)	0.89
LWA Anti-conventionalism	19	56	40.11 (8.54)	−0.33 (0.24)	−0.55 (0.48)	0.89
LWA Top-down censorship	23	60	44.84 (7.58)	−0.40 (0.24)	−0.07 (0.48)	0.82
Negative urgency	4	16	9.31 (2.60)	−0.05 (0.25)	−0.26 (0.49)	0.77
(Lack of) premeditation	4	16	7.71 (2.17)	0.58 (0.25)	0.98 (0.49)	0.75
(Lack of) perseverance	4	15	7.57 (2.68)	0.64 (0.25)	−0.24 (0.49)	0.83
Sensation seeking	6	16	10.31 (2.39)	0.24 (0.25)	−0.78 (0.49)	0.77
Positive urgency	6	16	10.20 (2.46)	0.14 (0.25)	−0.60 (0.49)	0.79
Trait anxiety	7	55	24.24 (11.26)	0.60 (0.25)	−0.18 (0.49)	0.91
ERQ Reappraisal	6	42	29.93 (6.64)	−0.93 (0.25)	1.33 (0.49)	0.85
ERQ Suppression	4	28	14.57 (6.37)	0.02 (0.25)	−1.08 (0.49)	0.88

Note. Two participants did not complete the UPPS-P, STAI-T, and ERQ, so these scales were computed on 96 participants. RWA = Right-Wing Authoritarianism, LWA = Left-Wing Authoritarianism, ERQ = Emotion Regulation Questionnaire.

Table 2
Partial correlations controlled for age and sex between RWA and the dimensions assessed in the study (n = 96).

	NU	PRE	PER	SS	PU	STAI T	ERQ R	ERQ S
RWA	0.22*	0.01	−0.20	0.10	0.06	−0.09	−0.02	0.13
RWA Aggression	**0.30****	0.07	0.11	0.21*	0.24*	0.19	−0.01	0.17
RWA Submission	0.03	0.00	−0.24*	−0.05	−0.14	−0.18	−0.12	0.01
RWA Conventionalism	0.11	−0.04	−0.28**	0.04	0.02	−0.20	0.10	0.09

Notes. RWA = Right-wing authoritarianism, NU=Negative urgency, PRE=(Lack of) premeditation, PER=(Lack of) perseverance, SS=Sensation seeking, PU=Positive urgency, STAI T = Trait anxiety, ERQ R = Emotion regulation − Reappraisal, ERQ S = Emotion regulation – Suppression.
Two-tailed tests: * $p < 0.05$, ** $p < 0.01$. Values in bold represent medium effect sizes ($r > 0.30$).

Table 3
Partial correlations controlled for age and sex between LWA and the dimensions assessed in the study (n = 96).

	NU	PRE	PER	SS	PU	STAI T	ERQ R	ERQ S
LWA	0.21*	0.00	0.12	0.07	0.06	0.26*	−0.08	0.07
LWA Anti-hierarchical aggression	0.20	−0.02	0.09	0.07	0.03	**0.30****	−0.08	0.20*
LWA Anti-conventionalism	0.10	−0.03	0.12	0.07	0.02	**0.31****	−0.12	0.10
LWA Top-down censorship	0.25*	0.07	0.08	0.05	0.09	0.06	−0.01	−0.14

Notes. LWA = Left-wing authoritarianism, NU=Negative urgency, PRE=(Lack of) premeditation, PER=(Lack of) perseverance, SS=Sensation seeking, PU=Positive urgency, STAI T = Trait anxiety, ERQ R = Emotion regulation − Reappraisal, ERQ S = Emotion regulation – Suppression.
Two-tailed tests: * $p < 0.05$, ** $p < 0.01$. Values in bold represent medium effect sizes ($r > 0.30$).

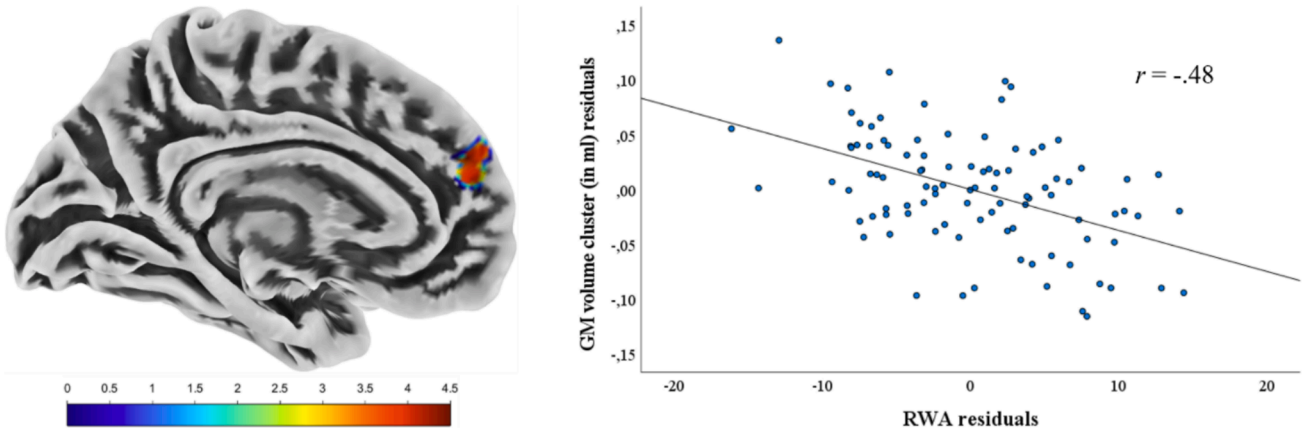

Fig. 1. Multiple linear regression between scores on the RWA scale and whole-brain GM volume (n = 98). A negative correlation was found between RWA and a GM volume cluster co-located in the dorsal section of the medial prefrontal cortex. The scatterplot represents the correlation between the residual scores (controlling for age and TIV). The color bar represents T-values. Of note, the correlation remained virtually identical (r = -0.45, $p < 0.001$) even after controlling for political orientation.

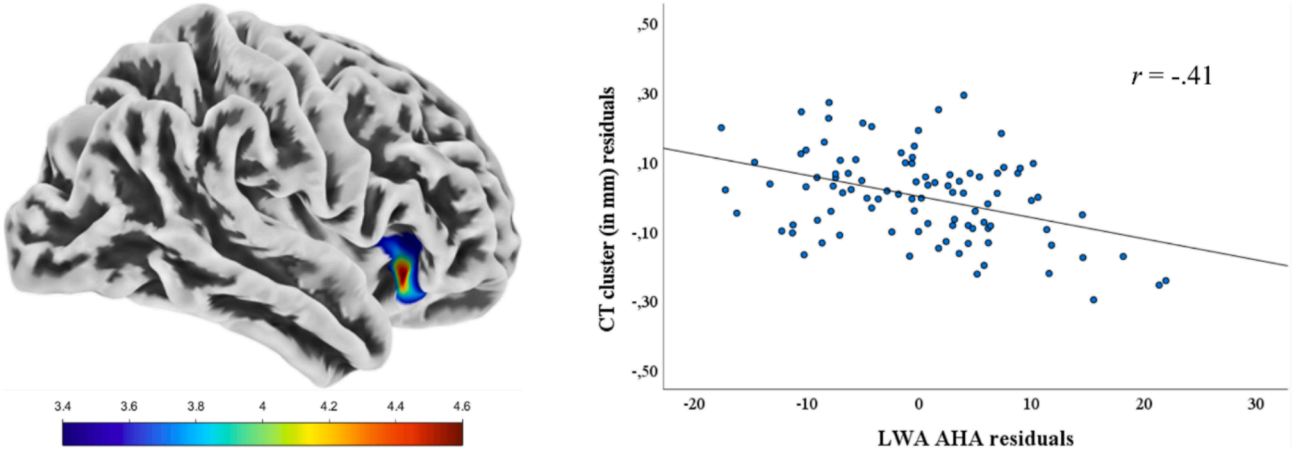

Fig. 2. Multiple linear regression between scores on the LWA AHA subscale and whole-brain CT ($n = 98$). A negative correlation was found between LWA AHA and a CT cluster co-located in the right anterior insula/inferior frontal gyrus. The scatterplot represents the correlation between the residual scores (controlling for age and sex). Of note, one participant was identified as an outlier in the CT cluster variable, so it was removed from the correlation analysis and the scatterplot. The color bar represents T-values. Notably, the correlation remained virtually identical (r = -0.44, $p < 0.001$) even after controlling for political orientation.

to left-wing ideologies (i.e., radical and cultural feminism) and the GM volume cluster to a right-wing one (i.e., social dominance orientation). Results are displayed in Supplementary Table 1.

ROI analyses

Results from the ROI analysis only revealed weak associations (Table 4). In particular, we observed a significant negative association between the vmPFC GM volume and the LWA AC subscale (r = -0.18). Likewise, results revealed a significant negative correlation between the LWA AHA and the vmPFC CT (r = -0.18). Although significant, these results yielded low effect sizes so their interpretation should be taken cautiously.

Discussion

The focus of our study was to provide evidence on the neurobehavioral profiles linked to different forms of authoritarianism. For this, we analyzed the brain structural correlates in GM volume and CT by MRI of both left-wing and right-wing authoritarianism in a well-powered sample of young Spanish adults. To the best of our knowledge, this is the first study reporting this type of analysis. Behaviorally, our results revealed a significant medium-sized association between the RWA Aggression subscale and the Negative urgency trait from the UPPS-P. At the neural level, we observed a range of significant results. On the one hand, VBM analyses revealed a negative correlation between the total RWA scale and a cluster located in the medial prefrontal cortex. On the other hand, SBM analyses showed a negative association between the LWA AHA subscale and a cluster located in the right anterior insula/inferior frontal gyrus. Relevantly, this relationship between brain and authoritarian traits was further complemented by significant associations between the resulting clusters and left and right-wing political ideologies. Additionally, the ROI analysis revealed a small negative association for two LWA dimensions: between the vmPFC GM volume and the AC subscale, and between the AHA subscale and the vmPFC CT.

Table 4
Partial correlations obtained in the ROI analyses ($n = 98$).

	Amygdala R GM volume	Amygdala L GM volume	vmPFC GM volume	vmPFC thickness
RWA	0.02	0.02	0.06	−0.11
RWA Aggression	0.04	0.06	0.15	−0.05
RWA Submission	−0.02	−0.04	−0.10	−0.11
RWA Conventionalism	0.01	0.03	0.06	−0.07
LWA	0.09	0.07	−0.12	−0.07
LWA Anti-hierarchical aggression	0.06	0.00	−0.06	−0.18*
LWA Anti-conventionalism	0.06	0.08	−0.18*	−0.04
LWA Top-down censorship	0.11	0.10	−0.05	0.04

Notes. vmPFC = ventromedial prefrontal cortex.
One-tailed tests: * $p < 0.05$, ** $p < 0.01$.
Correlations were controlled for age and TIV (GM volume) or sex (cortical thickness).

Negative urgency is associated with a plethora of rash behaviors underlying negative emotions. RWA is characterized by dogmatic, intolerant attitudes aimed at protecting one's identity and security. Consequently, this confrontational view would boost aggressions toward the outgroup. Hence, higher NU would sketch a behavioral pattern inclined towards impulsive aggressive behaviors against those who threaten the status quo (Osborne et al., 2023; Van Hiel et al., 2020) as evinced by everyday situations (Depauw et al., 2022). This explanation would also apply to the LWA TDC subscale ($r = 0.25$). Yet, the key trait linked to LWA is anxiety, especially in relation to the AHA and AC subscales (r = 0.30 and 0.31, respectively). This relationship is not surprising, given that LWA has been associated with neuroticism and higher sensitivity toward threatening situations and grievance (Conway et al., 2023; Fasce & Avendaño, 2023; Krispenz & Bertrams, 2024). Thus, this aggrieved worldview would underpin authoritarian reactions based on AHA and AC. Taken together, the results from both RWA and LWA would perform in a similar fashion: When facing potential threats, both right- and left-wing authoritarians would react aggressively, with this behavioral repertoire being modulated by trait anxiety within the left-wing—indeed the combination of anxiety and impulsivity amplify aggressive actions (Zhang et al., 2024).

The relationship between RWA and medial prefrontal regions aligns with previous findings (Asp et al., 2012b). However, the cluster observed in this study was located more dorsally—indeed the vmPFC ROI analyses showed spurious effects. The function of the dorsomedial prefrontal cortex (dmPFC) has been comprehensively studied in fMRI research. A precise neurofunctional description of this region was made by De La Vega et al. (2016), where dmPFC was established as a cortical hub of social cognition based on their strong association with a psychological topic conformed by keywords such as "social", "empathy", "moral", "person", "judgments", "mentalizing", "mental", "theory", "people", and "mind". Concomitantly, this region is involved in theory

of mind, particularly in false belief tasks (Schurz et al., 2014). The dmPFC also shows a central role on political dynamics: The activity of this region has been related to conflict-elicited threats among conservatives in Nash & Leota (2022), polarization on political issues in Leong et al. (2020), and with challenges to political beliefs in Kaplan et al. (2016). Additionally, a VBM study showed that the larger dmPFC GM volume, the more propensity for impartial punitive behaviors toward the in-group and out-group (Baumgartner et al., 2013). Along this line, our study adds new evidence by emphasizing the role of dmPFC in RWA attitudes, probably reflecting cognitive inflexibility and poorer perspective-taking.

The negative association found between the LWA AHA subscale and the right insula/IFG CT can also be explained from a neurocognitive perspective. There is abundant information relating these areas with cognitive control processes (Langner et al., 2018; Liu et al., 2020). Importantly, the right anterior insula is strongly related with affective empathy (Fan et al., 2011; Morawetz et al., 2022). It seems more than plausible that a lack of empathy may promote aggressive actions against the out-group when confronting political views. For instance, Haas et al. (2017) assessed individuals' responses to incongruent party line policy positions held by political candidates. The authors found that the incongruent trials yielded higher activation than the congruent in the bilateral anterior insula, the anterior cingulate cortex, and the amygdala. Interestingly, the effect on the left anterior insula was more prominent in liberals regarding ingroup partisan candidates. In a different study, Kaplan et al. (2016) found that, in addition to the dmPFC, the insula also plays a crucial role in maintaining beliefs, as lower bilateral insula and amygdala activation was observed in those individuals who changed their beliefs more. Hence, research illustrates a potential relationship between affective cognitive control and empathy processes that could subserve as modulators in political contexts. Also, these empathic attitudes are less visible in liberals than in conservatives (Casey et al., 2023). As reported in our study, and supported by this previous literature, the right anterior insula would be pivotal in this relationship.

Taken together our results provide new insights into the political neuroscience field from a neurobehavioral perspective. In brief, we show that authoritarianism from both sides of the political spectrum could be motivated by urgency. Convergently, these rash behaviors would be poorly managed by the identified frontal areas (i.e., the dmPFC or insula/IFG). In support of this idea, previous research found that the negative urgency trait correlated negatively with the dmPFC GM volume (Muhlert & Lawrence, 2015) and positively with the right anterior insula activity in an emotional, inhibitory Go/No-Go task (Chester et al., 2016). Remarkably, different reviews have shown that higher activity and/or lower GM volume in the medial prefrontal and insular regions constitute core brain traits of aggressive tendencies (Blair, 2016; Cupaioli et al., 2021; Lantos & Molenberghs, 2021). Furthermore, the right anterior insula is also recruited when aggressive outbursts are driven by fear or angry states (Puiu et al., 2020; Zhan et al., 2018). So, in belligerent, authoritarian political scenarios, the disruption of the aforementioned regions would be associated with transgressions toward the outgroup. Our supplementary results added further evidence to this idea by linking our brain results to left- and right-wing political ideologies related to LWA and RWA. This idea would also be supported by the strong association of these regions with partisan political ideologies (Panish & Nam, 2024).

The neurobehavioral hallmarks linked to RWA and LWA add valuable information to the so-called neurocognitive model of ideological thinking (Zmigrod, 2021), thus enriching the burgeoning field of political neuroscience. More specifically, our results provide new insights on the *antecedents to ideological thinking*, that is, neurobiological and cognitive dispositions that modulate one's adhesion to ideological worldviews. So, our study posits that left- and right-wing authoritarian endorsement could be early predicted from stable neurobehavioral traits. In this regard, it is worth noting that genetic factors may account for variance on authoritarian endorsement. For instance, twin studies have associated authoritarianism—only for the right-wing—with high heritability and long-term stability (Kleppesto et al., 2024; Ludeke & Krueger, 2013). Likewise, neurobiological studies have linked genetic factors to individual variations in the maturation of cortical thickness (Schmitt et al., 2024; Teeuw et al., 2019). Finally, the neural dissimilarities between RWA and LWA found in our study suggest different biological origins for those. That is, whereas both the RWA and LWA AHA dimensions are rooted within the prefrontal cortex, our results set a more precise distinction by relating the dmPFC with RWA endorsement and the right anterior insular cortex with LWA AHA. In turn, individual differences in the anatomy of these brain regions would mediate cognitive processes such as perspective-taking or affective cognitive control, respectively.

Still, our study has some limitations. For instance, our sample was mainly composed of undergraduate students within a narrow age range (18–30 years), which limits the generalization of our findings. Thus, conducting newer research on the general adult population would be needed to provide more generalizable results. Likewise, our study is mainly applicable to the European, Western political and cultural context of Spain, so further investigations in different countries and cultural settings would be beneficial to uncover potential cross-cultural variation in authoritarian attitudes. Finally, further research may be aimed at analyzing not only anatomical correlates, but also functional dynamics (e.g., task-based fMRI, resting-state, etc.) to obtain a richer profile of left- and right-wing authoritarians. Also, these studies should adopt longitudinal or experimental approaches in order to solve the "chicken-and-egg problem" in political neuroscience (Jost et al., 2014).

CRediT authorship contribution statement

Jesús Adrián-Ventura: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Diego Avendaño:** Writing – original draft, Methodology, Conceptualization. **Anna Miró-Padilla:** Writing – review & editing, Investigation. **Anastasia Cherednichenko:** Writing – review & editing, Investigation. **César Ávila:** Writing – review & editing, Funding acquisition. **Angelo Fasce:** Writing – original draft, Methodology, Conceptualization.

Funding

Angelo Fasce received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 964728 (JITSUVAX) and from the Alexander von Humboldt Foundation (Fellowship for experienced researchers).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.neuroscience.2025.04.027.

Data availability

The data that support the findings of this study are openly available in OSF at https://osf.io/hsfvy/. This study was not preregistered in an independent, institutional registry.

References

B. Altemeyer The authoritarian specter 1996 Harvard University Press.

Ashburner, J., Friston, K.J., 2005. Unified segmentation. *NeuroImage* 26 (3), 839–851. https://doi.org/10.1016/j.neuroimage.2005.02.018.
Arbatli, E., Rosenberg, D., 2020. United we stand, divided we rule: how political polarization erodes democracy. *Democratization* 28 (2), 285–307. https://doi.org/10.1080/13510347.2020.1818068.
Asp, E., Manzel, K., Koestner, B., Cole, C.A., Denburg, N.L., Tranel, D., 2012a. A neuropsychological test of belief and doubt: damage to ventromedial prefrontal cortex increases credulity for misleading advertising. *Frontiers in Neuroscience* 6, 100. https://doi.org/10.3389/FNINS.2012.00100.
Asp, E., Ramchandran, K., Tranel, D., 2012b. Authoritarianism, religious fundamentalism, and the human prefrontal cortex. *Neuropsychology* 26 (4), 414–421. https://doi.org/10.1037/A0028526.
Avendaño, D., Fasce, A., Costello, T., Adrián-Ventura, J., 2022. Spanish Adaptation of the Left-Wing Authoritarianism Index. *Journal of Personality Assessment* 104 (5), 692–699. https://doi.org/10.1080/00223891.2021.1981345.
Balagtas, J.P.M., Tolomeo, S., Ragunath, B.L., Rigo, P., Bornstein, M.H., Esposito, G., 2023. Neuroanatomical correlates of system-justifying ideologies: a pre-registered voxel-based morphometry study on right-wing authoritarianism and social dominance orientation. *Royal Society Open Science* 10 (3), 230196. https://doi.org/10.1098/RSOS.230196.
Baumgartner, T., Schiller, B., Hill, C., Knoch, D., 2013. Impartiality in humans is predicted by brain structure of dorsomedial prefrontal cortex. *NeuroImage* 81, 317–324. https://doi.org/10.1016/J.NEUROIMAGE.2013.05.047.
Blair, R.J.R., 2016. The Neurobiology of Impulsive Aggression. *Journal of Child and Adolescent Psychopharmacology* 26 (1), 4–9. https://doi.org/10.1089/CAP.2015.0088.
Cabello, R., Salguero, J.M., Fernández-Berrocal, P., Gross, J.J., 2013. A Spanish adaptation of the Emotion Regulation Questionnaire. *European Journal of Psychological Assessment* 29 (4), 234–240. https://doi.org/10.1027/1015-5759/A000150.
Cándido, A., Orduña, E., Perales, J.C., Verdejo-García, A., Billieux, J., 2012. Validation of a short Spanish version of the UPPS-P impulsive behaviour scale. *Trastornos Adictivos* 14 (3), 73–78. https://doi.org/10.1016/S1575-0973(12)70048-X.
Casey, J.P., Vanman, E.J., Barlow, F.K., 2023. Empathic Conservatives and Moralizing Liberals: Political Intergroup Empathy Varies by Political Ideology and Is Explained by Moral Judgment. *Personality and Social Psychology Bulletin*. https://doi.org/10.1177/01461672231198001.
Chen, G., Cox, R.W., Glen, D.R., Rajendra, J.K., Reynolds, R.C., Taylor, P.A., 2019. A tail of two sides: Artificially doubled false positive rates in neuroimaging due to the sidedness choice with t -tests. *Human Brain Mapping* 40 (3), 1037–1043. https://doi.org/10.1002/hbm.24399.
Cherednichenko, A., Miró-Padilla, A., Adrián-Ventura, J., Monzonís-Carda, I., Beltran-Valls, M.R., Moliner-Urdiales, D., Ávila, C., 2024. Physical activity and hippocampal volume in young adults. *Brain Imaging and Behavior*. https://doi.org/10.1007/S11682-024-00916-4.
Chester, D.S., Lynam, D.R., Milich, R., Powell, D.K., Andersen, A.H., DeWall, C.N., 2016. How Do Negative Emotions Impair Self-Control? A Neural Model of Negative Urgency. *NeuroImage* 132, 43–50. https://doi.org/10.1016/J.NEUROIMAGE.2016.02.024.
Cohen, J., 1992. A power primer. *Psychological Bulletin* 112 (1), 155–159. https://doi.org/10.1037/0033-2909.112.1.155.
Conway, L.G., Houck, S.C., Gornick, L.J., Repke, M.A., 2018. Finding the Loch Ness Monster: Left-Wing Authoritarianism in the United States. *Political Psychology* 39 (5), 1049–1067. https://doi.org/10.1111/POPS.12470.
Conway, L., McFarland, J., 2019. Do right-wing and left-wing authoritarianism predict election outcomes?: Support for Obama and Trump across two United States presidential elections. *Personality and Individual Differences* 138, 84–87. https://doi.org/10.1016/j.paid.2018.09.033.
Conway III, L.G., Zubrod, A., Chan, L., McFarland, J.D., Van de Vliert, E., 2023. Is the myth of left-wing authoritarianism itself a myth? *Frontiers in Psychology* 13, 8541. https://doi.org/10.3389/FPSYG.2022.1041391.
Costello, T.H., Bowes, S.M., Stevens, S.T., Waldman, I.D., Tasimi, A., Lilienfeld, S.O., 2022. Clarifying the structure and nature of left-wing authoritarianism. *Journal of Personality and Social Psychology* 122 (1), 135–170. https://doi.org/10.1037/PSPP0000341.
Cupaioli, F.A., Zucca, F.A., Caporale, C., Lesch, K.P., Passamonti, L., Zecca, L., 2021. The neurobiology of human aggressive behavior: Neuroimaging, genetic, and neurochemical aspects. *Progress in Neuro-Psychopharmacology & Biological Psychiatry* 106, 110059. https://doi.org/10.1016/J.PNPBP.2020.110059.
Cyders, M.A., Smith, G.T., Spillane, N.S., Fischer, S., Annus, A.M., Peterson, C., 2007. Integration of impulsivity and positive mood to predict risky behavior: development and validation of a measure of positive urgency. *Psychological Assessment* 19 (1), 107–118. https://doi.org/10.1037/1040-3590.19.1.107.
De La Vega, A., Chang, L.J., Banich, M.T., Wager, T.D., Yarkoni, T., 2016. Large-Scale Meta-Analysis of Human Medial Frontal Cortex Reveals Tripartite Functional Organization. *Journal of Neuroscience* 36 (24), 6553–6562. https://doi.org/10.1523/JNEUROSCI.4402-15.2016.
De Regt, S., Mortelmans, D., Smits, T., 2011. Left-wing authoritarianism is not a myth, but a worrisome reality. Evidence from 13 Eastern European countries. *Communist and Post-Communist Studies* 44 (4), 299–308. https://doi.org/10.1016/j.postcomstud.2011.10.006.
Depauw, H., Van Hiel, A., & Dierckx, K. (2022). The relationship between right-wing ideological attitudes and aggression in everyday life. *Personality and Individual Differences*, *186*(Part A), 111333. https://doi.org/10.1016/J.PAID.2021.111333.
Duckitt, J., 2010. Right wing authoritarianism. In: Levine, J.M., Hogg, M.A. (Eds.), *Encyclopedia of Group Processes & Intergroup Relations*. SAGE Publications, Inc, pp. 706–707. https://doi.org/10.4135/9781412972017.
Duckitt, J., 2022. Authoritarianism: Conceptualization, research, and new developments. In: Sibley, G., Osborne, D. (Eds.), *The Cambridge Handbook of Political Psychology*. Cambridge University Press, pp. 177–197.
Dunwoody, P.T., Funke, F., 2016. The Aggression-Submission-Conventionalism Scale: Testing a New Three Factor Measure of Authoritarianism. *Journal of Social and Political Psychology* 4 (2), 571–600. https://doi.org/10.5964/JSPP.V4I2.168.
Duriez, B., Klimstra, T.A., Luyckx, K., Beyers, W., Soenens, B., 2012. Right-Wing Authoritarianism: Protective Factor Against or Risk Factor for Depression? *European Journal of Personality* 26 (5), 536–549. https://doi.org/10.1002/PER.853.
Fan, Y., Duncan, N.W., de Greck, M., Northoff, G., 2011. Is there a core neural network in empathy? An fMRI based quantitative meta-analysis. *Neuroscience and Biobehavioral Reviews* 35 (3), 903–911. https://doi.org/10.1016/J.NEUBIOREV.2010.10.009.
Fasce, A., Adrián-Ventura, J., Avendaño, D., 2020. Do as the Romans do: On the authoritarian roots of pseudoscience. *Public Understanding of Science* 29 (6), 597–613. https://doi.org/10.1177/0963662520935078.
Fasce, A., Avendaño, D., 2020. Opening the can of worms: A comprehensive examination of authoritarianism. *Personality and Individual Differences* 163, 110057. https://doi.org/10.1016/j.paid.2020.110057.
Fasce, A., Avendaño, S., 2022. Attitudes Toward Civil Liberties and Rights Among Politically Charged Online Groups. *Social Psychology* 53 (4), 233–243. https://doi.org/10.1027/1864-9335/a000496.
Fasce, A., Avendaño, D., 2023. Left-wing identity politics and authoritarian attitudes: a correlational study of social media users. *Journal of Political Ideologies*. https://doi.org/10.1080/13569317.2023.2246914.
Gross, J.J., John, O.P., 2003. Individual Differences in Two Emotion Regulation Processes: Implications for Affect, Relationships, and Well-Being. *Journal of Personality and Social Psychology* 85 (2), 348–362. https://doi.org/10.1037/0022-3514.85.2.348.
Haas, I.J., Baker, M.N., Gonzalez, F.J., 2017. Who Can Deviate from the Party Line? Political Ideology Moderates Evaluation of Incongruent Policy Positions in Insula and Anterior Cingulate Cortex. *Social Justice Research* 30 (4), 355–380. https://doi.org/10.1007/s11211-017-0295-0.
Johnson, S.L., Carver, C.S., Joormann, J., 2013. Impulsive responses to emotion as a transdiagnostic vulnerability to internalizing and externalizing symptoms. *Journal of Affective Disorders* 150 (3), 872–878. https://doi.org/10.1016/J.JAD.2013.05.004.
Jost, J.T., Noorbaloochi, S., Van Bavel, J.J., 2014. The "chicken-and-egg" problem in political neuroscience. *The Behavioral and Brain Sciences* 37 (3), 317–318. https://doi.org/10.1017/S0140525X13002616.
Kaplan, J.T., Gimbel, S.I., Harris, S., 2016. Neural correlates of maintaining one's political beliefs in the face of counterevidence. *Scientific Reports* 6, 39589. https://doi.org/10.1038/srep39589.
Kingzette, J., Druckman, J., Klar, S., Krupnikov, Y., Levendusky, M., Barry Ryan, J., 2021. How affective polarization undermines support for democratic norms. *Public Opinion Quarterly* 85 (2), 663–677. https://doi.org/10.1093/poq/nfab029.
Kleppesto, T.H., Czajkowski, N.O., Sheehy-Skeffington, J., Vassend, O., Roysamb, E., Eftedal, N.H., Kunst, J.R., Ystrom, E., Thomsen, L., 2024. The genetic underpinnings of right-wing authoritarianism and social dominance orientation explain political attitudes beyond Big Five personality. *Journal of Personality* 92 (6), 1744–1758. https://doi.org/10.1111/jopy.12921.
Krispenz, A., Bertrams, A., 2024. Understanding left-wing authoritarianism: Relations to the dark personality traits, altruism, and social justice commitment. *Current Psychology* 43, 2714–2730. https://doi.org/10.1007/S12144-023-04463-X.
Langner, R., Leiberg, S., Hoffstaedter, F., Eickhoff, S.B., 2018. Towards a human self-regulation system: Common and distinct neural signatures of emotional and behavioural control. *Neuroscience and Biobehavioral Reviews* 90, 400–410. https://doi.org/10.1016/J.NEUBIOREV.2018.04.022.
Lantos, D., Molenberghs, P., 2021. The neuroscience of intergroup threat and violence. *Neuroscience & Biobehavioral Reviews* 131, 77–87. https://doi.org/10.1016/J.NEUBIOREV.2021.09.025.
Leong, Y.C., Chen, J., Willer, R., Zaki, J., 2020. Conservative and liberal attitudes drive polarized neural responses to political content. *Proceedings of the National Academy of Sciences of the United States of America* 117 (44), 27731–27739. https://doi.org/10.1073/pnas.2008530117.
Levitsky, S., Ziblatt, D., 2018. *How democracies die*. Crown Publishing.
Liu, W., Peeters, N., Fernández, G., Kohn, N., 2020. Common neural and transcriptional correlates of inhibitory control underlie emotion regulation and memory control. *Social Cognitive and Affective Neuroscience* 15 (5), 523–536. https://doi.org/10.1093/SCAN/NSAA073.
Love, S., Sharman, R., 2024. Perceived grievance and individualising moralities: exploring the psychological structure of left-wing authoritarianism. *Journal of Political Ideologies*. https://doi.org/10.1080/13569317.2024.2344755.
Ludeke, S.G., Krueger, R.F., 2013. Authoritarianism as a personality trait: Evidence from a longitudinal behavior genetic study. *Personality and Individual Differences* 55 (5), 480–484. https://doi.org/10.1016/j.paid.2013.04.015.
Lynam, D.R., Smith, G.T., Whiteside, S.P., Cyders, M.A., 2006. *The UPPS-P: Assessing five personality pathways to impulsive behavior (Technical Report)*. Purdue University.
Manson, J.H., 2020. Right-wing Authoritarianism, Left-wing Authoritarianism, and pandemic-mitigation authoritarianism. *Personality and Individual Differences* 167, 110251. https://doi.org/10.1016/J.PAID.2020.110251.
McCoy, J., Rahman, T., Somer, M., 2018. Polarization and the global crisis of democracy: Common patterns, dynamics, and pernicious consequences for democratic polities. *American Behavioral Scientist* 62 (1), 16–42. https://doi.org/10.1177/0002764218759576.

Miró-Padilla, A., Adrián-Ventura, J., Cherednichenko, A., Monzonís-Carda, I., Beltran-Valls, M.R., MolinerUrdiales, D., Ávila, C., 2023. Relevance of the anterior cingulate cortex volume and personality in motivated physical activity behaviors. *Communications Biology* 6 (1), 1106. https://doi.org/10.1038/s42003-023-05423-8.

Moore-Berg, S., Ankori-Karlinsky, L., Hameiri, B., Bruneau, E., 2020. Exaggerated meta-perceptions predict intergroup hostility between American political partisans. *Proceedings of the National Academy of Sciences* 117 (26), 14864–14872. https://doi.org/10.1073/pnas.2001263117.

Morawetz, C., Berboth, S., Kohn, N., Jackson, P.L., Jauniaux, J., 2022. Reappraisal and empathic perspective-taking - More alike than meets the eyes. *NeuroImage* 255, 119194. https://doi.org/10.1016/J.NEUROIMAGE.2022.119194.

Muhlert, N., Lawrence, A.D., 2015. Brain structure correlates of emotion-based rash impulsivity. *NeuroImage* 115, 138–146. https://doi.org/10.1016/j.neuroimage.2015.04.061.

Nash, K., Leota, J., 2022. Political Orientation as Psychological Defense or Basic Disposition? A Social Neuroscience Examination. *Cognitive, Affective and Behavioral Neuroscience* 22 (3), 586–599. https://doi.org/10.3758/s13415-021-00965-y.

Nicol, A.A.M., De France, K., 2016. The Big Five's relation with the facets of Right-Wing Authoritarianism and Social Dominance Orientation. *Personality and Individual Differences* 98, 320–323. https://doi.org/10.1016/j.paid.2016.04.062.

Oldfield, R.C.C., 1971. The assessment and analysis of handedness: The Edinburgh inventory. *Neuropsychologia* 9 (1), 97–113. https://doi.org/10.1016/0028-3932(71)90067-4.

Onraet, E., van Hiel, A., Dhont, K., 2013. The relationship between right-wing ideological attitudes and psychological well-being. *Personality & Social Psychology Bulletin* 39 (4), 509–522. https://doi.org/10.1177/0146167213478199.

Osborne, D., Costello, T.H., Duckitt, J., Sibley, C.G., 2023. The psychological causes and societal consequences of authoritarianism. *Nature Reviews Psychology* 2 (4), 220–232. https://doi.org/10.1038/s44159-023-00161-4.

Panish, A., Nam, H.H., 2024. The neurobiology of political ideology: Theories, findings, and future directions. *Social and Personality Psychology Compass* 18 (1), e12916. https://doi.org/10.1111/SPC3.12916.

Pearlstein, J.G., Johnson, S.L., Timpano, K.R., Stamatis, C.A., Robison, M., Carver, C.S., 2024. Emotion-related impulsivity across transdiagnostic dimensions of psychopathology. *Journal of Personality* 92 (2), 342–360. https://doi.org/10.1111/JOPY.12825.

Peris-Baquero, Moreno-Pérez, J. D., Navarro-Haro, M. V., Díaz-García, A., & Osma, J. (2023). Emotion dysregulation and neuroticism as moderators of group Unified Protocol effectiveness outcomes for treating emotional disorders. *Journal of Affective Disorders*, *331*, 313–321. https://doi.org/10.1016/J.JAD.2023.03.079.

Puiu, A.A., Wudarczyk, O., Kohls, G., Bzdok, D., Herpertz-Dahlmann, B., Konrad, K., 2020. Meta-analytic evidence for a joint neural mechanism underlying response inhibition and state anger. *Human Brain Mapping* 41 (11), 3147–3160. https://doi.org/10.1002/HBM.25004.

Schmitt, J.E., Alexander-Bloch, A., Seidlitz, J., Raznahan, A., Neale, M.C., 2024. The genetics of spatiotemporal variation in cortical thickness in youth. *Communications Biology* 7, 1301. https://doi.org/10.1038/s42003-024-06956-2.

Schurz, M., Radua, J., Aichhorn, M., Richlan, F., Perner, J., 2014. Fractionating theory of mind: A meta-analysis of functional brain imaging studies. *Neuroscience & Biobehavioral Reviews* 42, 9–34. https://doi.org/10.1016/J.NEUBIOREV.2014.01.009.

Sibley, C.G., Duckitt, J., 2008. Personality and prejudice: a meta-analysis and theoretical review. *Personality and Social Psychology Review* 12 (3), 248–279. https://doi.org/10.1177/1088868308319226.

Sibley, C.G., Duckitt, J., 2010. Big-Five Personality, Social Worldviews, and Ideological Attitudes: Further Tests of a Dual Process Cognitive-Motivational Model. *The Journal of Social Psychology* 149 (5), 545–561. https://doi.org/10.1080/00224540903232308.

Spielberger, C.D., Gorsuch, R.L., Lushene, R.E., 1982. *Manual STAI*. Cuestionario de Ansiedad Estado Rasgo, TEA Ediciones.

Teeuw, J., Brouwer, R.M., Koenis, M.M.G., Swagerman, S.C., Boomsma, D.I., Hulshoff Pol, H.E., 2019. Genetic Influences on the Development of Cerebral Cortical Thickness During Childhood and Adolescence in a Dutch Longitudinal Twin Sample: The Brainscale Study. *Cerebral Cortex* 29 (3), 978–993. https://doi.org/10.1093/CERCOR/BHY005.

Terrizzi, J.A., Shook, N.J., McDaniel, M.A., 2013. The behavioral immune system and social conservatism: a meta-analysis. *Evolution and Human Behavior* 34 (2), 99–108. https://doi.org/10.1016/J.EVOLHUMBEHAV.2012.10.003.

Twenge, J., Honeycutt, N., Prislin, R., & Sherman, R. (2016). More polarized but more independent: Political party identification and ideological self-categorization among U.S. adults, college students, and late adolescents, 1970-2015. *Personality and Social Psychology Bulletin, 42*(10), 1364–1383. https://doi.org/10.1177/0146167216660058.

Van Hiel, A., Duriez, B., Kossowska, M., 2006. The presence of left-wing authoritarianism in Western Europe and its relationship with conservative ideology. *Political Psychology* 27 (5), 769–793. https://doi.org/10.1111/j.1467-9221.2006.00532.x.

Van Hiel, A., Onraet, E., Bostyn, D.H., Stadeus, J., Haesevoets, T., Van Assche, J., Roets, A., 2020. A meta-analytic integration of research on the relationship between right-wing ideological attitudes and aggressive tendencies. *European Review of Social Psychology* 31 (1), 183–221. https://doi.org/10.1080/10463283.2020.1778324.

Van Prooijen, J., Krouwel, A.P.M., 2019. Psychological features of extreme political ideologies. *Current Directions in Psychological Science* 28 (2), 159–163. https://doi.org/10.1177/0963721418817755.

Warner, K., Tranel, D., Asp, E., 2016. The Henchman's Brain: Neuropsychological Implications of Authoritarianism and Prejudice. In: Absher, J.R., Cloutier, J. (Eds.), *Neuroimaging Personality, Social Cognition, and Character*. Academic Press, pp. 325–335.

Zhan, J., Ren, J., Sun, P., Fan, J., Liu, C., Luo, J., 2018. The Neural Basis of Fear Promotes Anger and Sadness Counteracts Anger. *Neural Plasticity* 2018, 3479059. https://doi.org/10.1155/2018/3479059.

Zhang, S., Dang, J., Tao, Y., Liu, X., 2024. The profiles of social anxiety and impulsivity among college students: differences in aggression. *Current Psychology* 43 (12), 10621–10630. https://doi.org/10.1007/S12144-023-05207-7/METRICS.

Zmigrod, L., 2021. A neurocognitive model of ideological thinking. *Politics and the Life Sciences* 40 (2), 224–238. https://doi.org/10.1017/PLS.2021.10.

Zmigrod, L., Eisenberg, I.W., Bissett, P.G., Robbins, T.W., Poldrack, R.A., 2021. The cognitive and perceptual correlates of ideological attitudes: a data-driven approach. *Philosophical Transactions of the Royal Society B* 376 (1822), 20200424. https://doi.org/10.1098/RSTB.2020.0424.

Zmigrod, L., Tsakiris, M., 2021. Computational and neurocognitive approaches to the political brain: key insights and future avenues for political neuroscience. *Philosophical Transactions of the Royal Society B* 376 (1822), 20200130. https://doi.org/10.1098/RSTB.2020.0130.