The attracting power of the gaze of politicians is modulated by the personality and ideological attitude of their voters: an fMRI study

ARTICLE *in* EUROPEAN JOURNAL OF NEUROSCIENCE · AUGUST 2015

Impact Factor: 3.18 · DOI: 10.1111/ejn.13038 · Source: PubMed

5 AUTHORS, INCLUDING:

Valentina Cazzato
Liverpool John Moores University
24 PUBLICATIONS **153** CITATIONS
SEE PROFILE

Marco Tullio Liuzza
Stockholm University
24 PUBLICATIONS **95** CITATIONS
SEE PROFILE

Emiliano Macaluso
Foundation Santa Lucia
152 PUBLICATIONS **3,981** CITATIONS
SEE PROFILE

Salvatore Maria Aglioti
Sapienza University of Rome
249 PUBLICATIONS **9,417** CITATIONS
SEE PROFILE

Received Date : 29-Mar-2015
Revised Date : 24-Jul-2015
Accepted Date : 03-Aug-2015
Article type : Research Report

Proposed Journal Section: Cognitive Neuroscience

Title: The attracting power of the gaze of politicians is modulated by the personality and ideological attitude of their voters: an fMRI study

Valentina Cazzato [1,2*@], Marco Tullio Liuzza[1,2], Gian Vittorio Caprara[1], Emiliano Macaluso[2], Salvatore Maria Aglioti[1,2*]

[1] *Department of Psychology, University of Rome 'Sapienza', Rome, Italy*

[2] *Santa Lucia Foundation, Rome, Italy*

*Corresponding author: V. Cazzato or S.M. Aglioti, "Sapienza" University of Rome, Via dei Marsi 78, 00185, Roma. Tel: ++-6-49917635; Fax: ++-6-49917635; e-mail: v.cazzato@bradford.ac.uk or salvatoremaria.aglioti@uniroma1.it

[@] *Present Address: Psychology Division, University of Bradford, Bradford, UK*

Running title: Neural correlates of social gaze and politics

Keywords: Gaze-following; Frontal Eye Field; Personality traits; Ideological Attitude; Political affiliation; Embodied social cognition

Abstract

Observing someone rapidly moving their eyes induces reflexive shifts of overt and covert attention in the onlooker. Previous studies have shown that this process can be modulated by the onlookers' personality, as well as by the social features of the person depicted in the **cued**-face. Here, we investigated whether individual's preference for social dominance orientation (SDO), in-group perceived similarity (PS), and political affiliation of the cued-face modulate neural activity within specific nodes of the social attention network. During fMRI, participants were requested to perform a gaze-following task to investigate whether the directional gaze of various Italian political personages may influence the oculomotor behaviour of in-group or out-group voters. After scanning, we acquired measures of PS in personality traits with each political personage and preference for SDO. Behavioural data showed that higher gaze interference for in-group than out-group political personages was predicted by higher preference for social hierarchy. Higher BOLD activity in incongruent vs. congruent conditions was found in areas associated with orienting to socially salient events and monitoring response conflict, namely the left Frontal Eye Field (lFEF), the right Supramarginal Gyrus, the Mid-cingulate Cortex and left Anterior Insula. Interestingly, higher ratings of PS with the in-group and less preference for social hierarchy predicted increased activity in the lFEF during distracting gaze movements of in-group as compared to out-group political personages. Our results suggest that neural activity in the social orienting circuit are modulated by higher-order social dimensions like in-group perceived similarity and individual differences in ideological attitudes.

Introduction

Gaze-following (GF) behaviour, i.e. the automatic tendency to imitate the oculomotor behaviour of others (Ricciardelli et al., 2002, 2013), is an important proxy to mind reading

and intention sharing (Klein, Shepherd & Platt, 2009; Shepherd, 2010; Emery, 2000). Studies in monkeys indicate that GF involves both reflexive and voluntary attentional components, and that, although largely automatic, GF may be strongly influenced by group affiliation and social status (Shepherd, Deaner & Platt, 2006; see also Utevsky & Platt, 2014 for a comprehensive review). Interestingly, while low-status male macaques follow the gaze of all familiar conspecifics, dominant high-status macaques selectively follow the gaze of dominant high-status monkeys. This suggests that the ability to readily detect and respond to signals of social status is a key factor to successfully navigate within social groups (Shepherd, Deaner & Platt, 2006).

Human studies show that, albeit strongly automatic (Callejas, Shulman & Corbetta, 2014), GF may be permeable to individual differences in personality (i.e., extra/introversion, see Ponari et al., 2013). Furthermore, GF in individuals with high levels of social anxiety is more influenced by fearful faces (Fox et al., 2007). Interestingly, GF is also sensitive to physical dominance (Jones et al., 2010), social status (Dalmaso et al., 2012, 2014), physical (Porciello et al., 2014; Hungr & Hunt, 2012) and social similarity (i.e. racial group affiliation, see Pavan et al., 2011). More relevant for the present study, political and ideological differences across participants may influence the tendency to be distracted by a schematic face (Dodd, Hibbing & Smith, 2011; Carraro et al., 2015). Furthermore, voters endorsing conservative ideology (as compared to liberal) are more prone to follow the gaze of in-group vs. out-group leaders (Liuzza et al., 2011) and the relative interferential effect can be predictive of voting intention (Liuzza et al., 2013). Thus, a complex blend of situational and dispositional factors underlies automatic GF behavior.

An important, but thus far largely unaddressed, question is whether individual differences in endorsing hierarchy-enhancing ideologies, namely Social Dominance Orientation (SDO) (Sidanius & Pratto, 1999), and perceived similarity in personality traits between voters and

in-group political personages, which are core principles of intergroup relations (Pratto, Sidanius & Levin, 2006), may moderate the neural activity underlying GF behaviour. None of these dimensions have been previously examined in the social neuroscience literature on gaze-mediated orienting to in-group political personages. Moreover studies investigating the specific cortical network underlying the capture of reflexive GF exerted on voters by the gaze of in-group politicians are limited.

To date, two meta-analytic studies have recognized the importance of the fronto-parietal network (Grosbras et al., 2005; Nummenmaa & Calder, 2009) in gaze-related behaviours, and in goal-directed and involuntary stimulus-driven attentional orienting (Corbetta et al., 2002, 2008) with frontal eye field (FEF) representing an important node in this network. In a previous fMRI study, we have found that neural activity in the FEF, a region involved in the voluntary control of saccades, was maximal for distracting gaze when the task required a saccadic response (Cazzato et al., 2012). Furthermore, preliminary evidence coming from a causative transcranial magnetic stimulation study suggests that interfering with the neural activity of FEF changes the distracting power triggered by an oriented gaze during a saccadic task (Porciello et al., 2014a). Although these results provide valuable information on the active role of FEF in controlling the ability to ignore specific social stimuli (i.e. averted gazes), thus far no study has examined whether this brain region may also be modulated by the attracting power of the gaze of politicians and by the personality and ideological attitude of their voters.

In the present study, we addressed this issue by investigating how FEF involved in GF mechanism may be affected by the presentation of faces of either in-group or out-group political personages. In particular, we used a GF paradigm to explore whether the directional gaze of right- or left-wing Italian political personages could influence the oculomotor behavior of in-group or out-group voters. **To rule out the possibility that GF may be more**

pervious to political in-group membership than to the effect of leadership itself (which could be more susceptible to oscillations in terms of confidence/influence ratings), participants were presented with the face of two politicians who, at the time of data collection, led the two main coalitions in Italy (Silvio Berlusconi for the centre-right, Pierluigi Bersani for the centre-left) and of two opinion-makers leaning to the conservative vs. liberal political spectrum (Bruno Vespa and Giovanni Floris respectively).

Group membership was determined by asking participants to fill out questionnaires about their political preference and voting behaviour. Furthermore, we focused on a conceptual framework that highlighted the personality traits' similarity of voters with in-group and out-group political personages (Liuzza et al., 2011; Caprara & Zimbardo, 2004). A measure of perceived similarity (PS) between voters and each political personage was computed by asking participants to rate how much each item in a list of 25 adjectives representative of each dimension of the Big Five (De Digman, 1990; Caprara & Perugini, 1994) described themselves and the four different political personages. Differences between the ratings concerning self (the voter) and others (each of four personages) provided a measure of the PS between voters and politicians. We predicted that higher PS with the in-group political personages may induce stronger GF behavior (Liuzza et al., 2011) and the voters' PS with political in-groups may be signalled by an increase of FEF activity.

Finally, to test the hypothesis that individual differences in ideological attitudes such as the preference for social hierarchy would moderate the ability to ignore in-group GF behaviour, we also collected a measure of SDO. In particular, SDO is a measure of the preference of each individual for group-based hierarchy and maintenance of inequality (Sidanius & Pratto, 1999; Sidanius, Pratto & Mitchell, 1994). We anticipated that individual differences in the degree of preference for social dominance hierarchy would significantly

predict the activity in the FEF during distracting gaze movements of in-group as compared to out-group political personages.

Experimental Procedure

Participants

We recruited volunteers by placing flyers at public places in the university main campus (Città Universitaria at "Sapienza" University of Rome) and by posting information on Internet political discussion groups and in a virtual social network. Recruitment materials called for right-handed men and women, ages 18-36 years, who were supporting the **right- or left-wing coalitions** and were informed about main principal political events and the Italian political situation. We carried out all the screening and scanning sessions from late December 2009 until early April 2010. Potential participants were screened by phone using a questionnaire to rule out safety risks related to magnetic resonance imaging, neurological and psychiatric disorders and visual impairment. A preliminary political attitudes questionnaire to evaluate political orientation was also used. We included participants who strongly identified themselves as conservative (right-wing) and liberals (left-wing). After the scanning session, participants were asked to **fill out** several Likert scales assessing the attitude toward politics (see below for more details). In addition, we requested participants to rate each personage in terms of political orientation, influence and emotional valence. Furthermore, participants were requested to describe themselves using a list of 25 adjectives and provide their perceptions of each political personage's personality (see Stimuli and Procedure section). A total of thirty healthy participants were scanned (male: 19; mean age: 23.11 years, range: 19-29, female: 11; mean age: 23.73 years, range: 18-27). Two participants were excluded because of technical problems during data acquisition. Thus, the analyses were performed on the remaining 28 participants (14 right-wing: male, N= 8; female, N= 6; 14 left-wing people: male, N = 10; female, N = 4). All participants were Italian citizens, right-handed and native

Italian speakers. Both groups were matched in age [right-wing voters: M = 23.36, S.D. = 3.39; left-wing voters: M = 23.07, S.D. = 2.81; $t(1,26) = 0.241$, $p = 0.810$] and years of education [right-wing voters: M = 14.93, S.D. = 2.12; left-wing voters: M = 15.07, S.D. = 2.26; $t(1,26) = -0.172$, $p = 0.865$]. All participants had normal or contact-corrected-to-normal visual acuity and provided written consent to participate in the experiment after all the procedures were explained. The study was approved by the independent Ethics Committee of Santa Lucia Foundation in Rome (Scientific Institute for Research Hospitalization and Health Care).

Stimuli and Procedure

Gaze-following task

Participants were positioned in the scanner, in a dimly lit environment. The experimental visual stimuli were presented via a mirror mounted on the MRI head coil (total display size 19.5° × 14.6° degrees of visual angle, 1.024 × 768 screen resolution, 60 Hz refresh rate). The visual stimuli were back-projected on a screen behind the magnet. Stimulus presentation was controlled with Cogent2000 (www.vislab.ucl.ac.uk/Cogent/). Each trial started with the appearance of a black central FP (0.5° × 0.5° in size), presented centrally against a grey background**,** and of two black squares (1.4° × 1.4° in size), presented for 500 ms at 7.5° of eccentricity in the left and the right visual field. Twelve digital pictures, three for each face, were gathered from the news media via Internet. The distracting gaze consisted of digital modified photographs of the face of well-known Italian right- (Silvio Berlusconi, Bruno Vespa) or left-wing (Pier Luigi Bersani, Giovanni Floris) personages. It is important to note that, at the time of data collection: i) Silvio Berlusconi was Prime Minister and leader of the centre-right coalition, ii) Pier Luigi Bersani was the leader of the centre-left coalition and iii) Bruno Vespa and Giovanni Floris were both opinion-maker journalists, and were categorized by our participants as sympathizers of the **right- and left-wing coalition**, respectively (see

Results section). In addition, at the data-collection time, the index of trustworthiness in Berlusconi, prime minister of Italy and charismatic leader of the right-wing coalition that had won local and national elections as well as the elections for sending Italian representatives to the EU parliament, varied between 61% (January 2010) and 58% (April 2010). Instead, Bersani's (leader of the Italian Democratic Party) trustworthiness index, varied between 24% and 28% in the same period, as emerged by the "CRESPI Ricerche" phone CATI method survey (available at http://www.sondaggipoliticoelettorali.it/) on a 1.000 people sample stratified for sex, age, and geographic area.

The suitability of each personage's photograph was determined on the basis of the following criteria: a) the individual had no facial hair; b) the individual was facing the camera; c) the individual had a neutral or smiling expression (to control for emotional content, we chose for each political personage two neutral and one smiling photograph). For each face, the irises and pupils of the eyes were cut from the original photographs and pasted to fit on the right or left side of the eyes using Photoshop 8.0.1 (Adobe, CA). The first frame depicted a **direct** gaze, while the second frame depicted a left- or rightward oriented gaze. To maximize the attention-capture effect, stimuli were animated by presenting the two frames in rapid sequence. The direction of the distracting gaze and the one indicated by the instruction-cue were congruent in one half of the trials and incongruent in the other half. Before starting the fMRI acquisition each participant was asked to perform outside the scanner a familiarization task consisting of forty-eight trials.

In the scanner, each trial started with the presentation behind the black fixation mark of a **direct** gaze which lasted 500 ms. Then, a second frame, that depicted left- or right-ward oriented gaze, replaced the first one and created a strong animation effect. The directional distractors remained on until the end of the trial (for 800 ms). Seventy-five milliseconds after the oriented distractor's gaze shift, the black central fixation mark (imperative-cue) changed

to either blue or red colour (Ricciardelli et al., 2002; Crostella, Carducci & Aglioti, 2009). This was the instruction signal for the participants to make a saccade movement towards the left (change into red) or the right (change into blue) target square. Thus, the direction of the distractor and the instruction-cue could be congruent (left-red or right-blue) or incongruent (left-blue or right-red). In order to engage automatic processes and minimize expectations, the directional gazes were equiprobable (50 % congruent) and non-predictive. It is worth noting that participants were instructed to ignore the distracting gaze and to focus on the central fixation point colour change. Crucially, they were explicitly informed that the instruction cue was not informative on the direction of the distractors. In order to avoid participants anticipating stimuli, a random inter-trial interval ranging from 3.5s to 4.5s was used (See Figure 1).

Eight event types were organized in a 4 × 2 factorial Design: Political Personage (Berlusconi, Vespa, Bersani, Floris) × Congruence (congruent/incongruent). Imaging data were acquired via a mixed, blocked (Personage)/event-related (Congruence) protocol. Each participant completed 5 functional runs for a total of 720 trials. Each imaging session consisted of 36 repetitions for each of the four political personages (Berlusconi, Vespa, Bersani, Floris): 18 for congruent and 18 for incongruent conditions (balanced for left/right direction and red-blue imperative-cues), respectively. Each scanning session lasted approx. 10 min. Thus, the entire experiment lasted about 50 min.

Measures of Voters' dispositions and personality

Likert Scales

After scanning, the participants were asked to: a) rate their political orientation on a 7-points Likert scale, where 1 is extreme left-wing, 4 center and 7 is extreme right-wing; and b) express their voting behaviour in the last National political elections (April, 2008), the

European political elections (June, 2009) and the intention to vote in the future local political elections (March, 2010). These measures allowed us to ensure that participants' political ideology was coherent with their voting behaviour. None of the participants who declared to vote for the right- or left-wing coalition had ever voted for the opponent party in the past. Furthermore, we presented a photograph of each political personage and asked each participant to rate on a Likert scale:

a) *Political orientation* of each personage using a 1 to 7 scale (where 1 is 'extreme left-wing', and 7 is 'extreme right-wing'). This rating allowed us to ascertain that participants veridically categorized the political profile of the four personages.

b) *Influence*: by rating on a 1 to 5 scale how much they thought each personage was influent within the Italian political scenario (1 is 'not influential at all', 5 is 'very influential');

c) *Emotional valence* of each personage. In particular we asked participants to 'please rate how much you think this person triggers positive emotions' (1 'not positive at all' and 5 is 'very positive') and 'please rate how much do you think this person triggers negative emotions' (1 is 'not negative at all' and 5 is 'very negative'). Then we subtracted the negative emotion ratings from the positive ones in order to have a unique emotional index. Negative values indicate a negative emotional valence, while positive values indicate a positive emotional evaluation of each personage.

Social Dominance Orientation Scale

All participants completed the 16-items social dominance orientation (SDO) scale to assess their preference for social dominance hierarchy (Sidanius & Pratto, 1999). Participants responded on a scale ranging from 1 (do not agree at all) to 7 (strongly agree). The SDO scale exhibited adequate reliability (Cronbach's alpha = .84). Note that SDO is a stable ideological attitude across human cultures and appears to predict social and political attitudes (Duckitt & Sibley, 2010). For instance, people higher in SDO support political ideologies that promote

social hierarchy rather than egalitarianism (e.g., politico-economic conservatism) (Sidanius & Pratto, 1999). In addition, they tend to oppose public policies intended to attenuate group-based social inequality (e.g., civil rights, women's rights, gay and lesbian rights), and seek societal roles that reify dominance hierarchy within social institutions (e.g., law enforcement rather than social work).

Similarity between voters' and personages' personality

Participants described themselves using a list of 25 adjectives and provided their perceptions of Berlusconi, Bersani, Vespa and Floris using the same list. The list included markers of: Energy/Extraversion (happy, determined, dynamic, energetic, active); Agreeableness (cordial, generous, loyal, sincere, unselfish); Conscientiousness (efficient, scrupulous, precise, conscientious, diligent); Emotional stability (optimistic, self-confident, solid, relaxed, calm); and Openness to experience (sharp, creative, innovative, modern, informed). The adjectives were selected from a larger list of adjectives that have previously been identified in the Italian lexicon as being among the most frequently used to describe human personality and also the most representative of each of the dimensions of the Big Five (Caprara & Perugini, 1994). Each adjective was rated for how much it was characteristic of each target on a 1 (not at all) to 5 (very much) scale.

To measure similarity, we created an index representing the similarity between the self and each of the four personages (Caprara et al., 2007; Vecchione, González Castro & Caprara, 2011). First, perceived dissimilarity was computed for each adjective by using the generalized Euclidean distance measure, (*d*, Cronbach & Gleser, 1953) between the personality ratings of the self and the four personages. Dissimilarity was calculated at an overall level, averaging scores across all 25 adjectives. These scores were transformed into a dissimilarity index ranging from 0 to 1 by using the following equation: $\partial = d/dmax$, where ∂ is the normalized index, *d* is the raw dissimilarity index, i.e. the sum absolute difference

between the rating on the self and the rating on the personage for each adjective and *d* max is the maximum possible total difference. For example, since we used a 5 points Likert scale, the maximum absolute difference on each trial could be 4, multiplied by the 25 items to make a d max of 100. Finally, **we subtracted □ from 1** by converting the distance or dissimilarity scores into similarity scores, ranging from 0 (not similar at all) to 1 (completely similar). These scores were entered in the correlation analyses.

Eye movements recording

Before starting the fMRI acquisition, each participant was required to perform outside the scanner a practice session in order to familiarize with the association of the instruction signal (red or blue) with leftward or rightward saccadic movements. During this training session, participants sat in front of a computer screen and eye position and saccadic movements were monocularly monitored using an infrared video camera (Sony EVI D31, colour video camera, Sony JP). During the fMRI session, participants' saccadic movements were monocularly monitored in real-time by means of an ASL eye-tracking system that was adapted for use in the scanner (Applied Science Laboratories, Bedford, MA; Model 504, sampling rate: 60 Hz). For each participant the eye-tracking system was calibrated before fMRI scanning. The calibration was repeated during the experiment whenever necessary. Eye-position traces were examined in a 2375 ms time window, beginning with the imperative cue onset until the end of the trial. Saccadic RTs were calculated from the target onset time to when a horizontal eye position exceeded 2° with durations at least 100 ms. Moreover, we did not compute RTs for the trials in which subjects made a saccade to the wrong side (e.g., saccade to the left target after the central cue turned into blue) or did not perform any saccade at all.

Image Acquisition and Analysis

A Siemens Allegra (Siemens Medical Systems, Erlangen, Germany) operating at 3T and equipped for echo-planar imaging (EPI) acquired functional magnetic resonance (MR)

images. A quadrature volume head coil was used for radio frequency transmission and reception. Head movements were minimized by mild restraint and cushioning. Thirty-six slices of functional MR images were acquired using blood oxygenation level dependent imaging (3.0 × 3.0 × 2.5 mm thick, 50% distance factor, TR = 2.34 s, TE = 30ms), covering the entire cortex. We used the statistical parametric mapping package SPM5 (www.fil.ion.ucl.ac.uk) implemented in MATLAB (v 7.1, The MathWorks, Natick, MA) for data pre-processing and statistical analyses. For all participants, we acquired 1275 fMRI volumes, 255 for each run. The first four image volumes of each run were used for stabilizing longitudinal magnetization and were discarded from the analysis. Pre-processing included rigid-body transformation (realignment) and slice timing to correct for head movement and slice acquisition delay. Residual effects of head motion were corrected by including the six estimated motion parameters for each participant as regressors of no interest. Slice-acquisition delays were corrected using the middle slice as a reference. All images were normalized to the standard SPM5 EPI template, resampled to 2 mm isotropic voxel size, and spatially smoothed using an isotropic Gaussian kernel of 8 mm FWHM. Statistical inference was based on a random effects approach (Penny & Holmes, 2004).

First, at participant level, the data were best fitted at every voxel using a combination of effects of interest. These were delta functions representing the onsets of the 8 conditions given by the crossing of our 4 × 2 factorial design: Political Personage [Berlusconi, Vespa, Bersani, Floris] × Congruence [congruent, incongruent] convolved with the SPM5 hemodynamic response function. The onset of the hemodynamic response function was aligned with the onset of the imperative cue with duration = 0. Onsets of trials in which an erroneous response or an eye movement toward the wrong side occurred were included in the design matrix as covariates of no interest, but excluded from any further analysis. At group level, linear contrasts were used to determine differential brain responses for incongruent

minus congruent conditions (IE = Interference Effect) separately for the four political personages (e.g. [Berlusconi (Incong) > Berlusconi (Cong)]). Hence, throughout the manuscript, when we report effects related to 'IE' we are referring to the differential activation of 'Incongruent > Congruent' trials. Four contrasts images were entered in the 4 × 2 factorial design with political personages [Berlusconi, Bersani, Vespa, Floris] and voters groups [right-wing, left-wing] separately for each analysis. Finally, linear contrasts were used to compare the IE, using between-participants variance (rather than between scans). Correction for non-sphericity (Friston et al., 2002) was used to account for possible differences in error variance across conditions and non-independent error terms for the repeated measures.

The analysis aimed at determining: a) brain regions called into action when the directional cue and the Distractor' gaze provided conflicting directional information (Main effect of Incongruence: all incongruent > all congruent stimuli), and b) whether shared political group membership exerts modulations in the FEF's activity (IE of in-group). Initial voxel-level statistical maps were thresholded at $p < 0.001$ (uncorrected) and corrected for multiple comparisons at cluster level $p < 0.05$ (FWE).

Region of interest Analyses

Given our a-priori hypothesis of a relationship between in-group political affiliations with neural activity associated with greater IE-related activation in the bilateral FEF, two regions of interest (ROIs) were identified based on independent data presented by Cazzato et al. (2012). To this aim, MarsBar (MARSeille Boîte A` Région d'Intérĕt' SPM toolbox) was used to obtain spherical ROIs with a radius of 8 mm (to match the Gaussian kernel used for the smoothing) from the MNI coordinates (left FEF: x=-28, y=0, z=54; right FEF: x=36, y=0, z=56) reported in the previous study (Cazzato et al., 2012). For this comparison, the SPM threshold was set to *p*-corr. < 0.05 at cluster level (cluster extent estimated a *p*-uncorr. <

0.001), considering the whole brain as the volume of interest. The mean beta weights on a single subject basis were then extracted from the ROIs and analysed in SPSS. In particular, we tested whether FEF contained voxels that were activated more by in-group than by out-group political personages, respectively for right- and left-wing voters. This analysis allowed us to explore whether observing incongruent saccades of the distracting gaze of a political personage induced higher FEF brain response according to in-group political membership.

Correlation Analysis

In order to investigate the psychological constructs underlying the observed neural response in the FEF, we carried out regression analyses between FEF' brain activity relatives to the IE of in-group personages (contrast: [IE of in-group] > [IE of out-group]), saccadic movements, PS and SDO, respectively. Average BOLD signals from relevant clusters were extracted and used as dependent measures in separate multiple regression models. The predictors used were the PS scores (as the differential ratings of in-group - out-group personages scores), and the SDO scale.

Results

Measures of Voters' dispositions and personality

Political orientation of the participants

A composite score was computed by averaging participants' political orientation score on a 7-points Likert scale and the voting behaviour scores in the last National political elections (April, 2008), the European political elections (June, 2009) and the intention to vote in the future local political elections (March, 2010). Voters expressing ratings below 4 (center 'midpoint') were identified as left-wingers; voters expressing ratings above 4 were identified as right-wingers. Based on this calculation, the entire sample consisted of 14 participants who self-identified as right- (mean rating 4.93, significantly higher than 4, $t(1,13)=4.304$, $p <$

0.001) and 14 participants, who self-identified as left-wing voters (mean rating 2.62, significantly lower than 4, $t(1,13)=-11.076$, $p < 0.001$).

Ratings of political orientation of political personages

Participants correctly classified Berlusconi and Vespa as belonging to the right-wing coalition (ratings 5.57 and 5.15, significantly higher than 4, $ts < 14.52$, $ps < 0.001$) and Bersani and Floris as belonging to the left-wing coalition (ratings were 2.68 and 2.50, significantly lower than 4, $ts < -14.71$, $ps < 0.001$).

Ratings concerning different characteristics of the personages

Each rating was entered in a mixed 2 × 2 × 2 ANOVA with 2 within-participant factors of political affiliation (right-wing, left-wing), social status (leader, opinion-Maker) and voters group (right-wing, left-wing) as between-group factor. The source of all significant ANOVA interactions was analysed using the Duncan post-hoc test. A significance threshold of $p < 0.05$ was set for all effects. Effect sizes were estimated using the partial eta square measure (η^2_p). All data are reported as Mean (M) and Standard Error of the Mean (S.E.M.). The participants' self-reported Likert scores as a function of political affiliation, status and groups are reported in Table 1.

Ratings of influence of the personages

The 3-way ANOVA on the influence ratings yielded a significant main effect of political affiliation [$F(1,26) = 27.95$, $p < 0.001$; $\eta^2_p = 0.52$], with **right-wing** political personages (2.64 ± 0.16) rated as more influential than **left-wing** political personages (1.536 ± 0.12; $p = 0.001$). Furthermore, the significant main effect of social status [$F(1,26) = 32.39$, $p < 0.001$; $\eta^2_p = 0.555$], revealed that leaders (2.70 ± 0.11) were rated as more influential than the opinion-makers (1.48 ± 0.172; $p = 0.001$). These effects were further qualified by a significant 2-way interaction between political affiliation and status [$F(1,26) = 20$, $p < 0.001$; $\eta^2_p = 0.43$]. Not surprisingly, post-hoc comparisons showed that the **right-wing** leader

Berlusconi (3.61 ± 0.20) was considered the most influential with respect to the other political personages (all *ps* < 0.001). Oppositely, no difference was found between the influence rating of the **right-wing** opinion-maker Vespa (1.68 ± 0.23) and both **left-wing** political personages (leader: 1.79 ± 0.160; opinion-maker: 1.286 ± 0.178; all *ps* > 0.094). Moreover, a significant difference between leader and opinion-maker of left-wing affiliation was found, with Floris rated as the most influential (p = 0.04). No other main effect or interactions **were** significant [all *Fs* < 1.42; *ps* > 0.24; $\eta^2_p < 0.05$].

Ratings of emotional valence of the personages

The 3-way ANOVA on the emotional valence ratings revealed a significant 2-way interaction between political affiliation and voters group [$F(1,26) = 56.28$, $p < 0.001$; $\eta^2_p = 0.686$], further qualified by a significant 3-way interaction of political affiliation, status and voters group [$F(1,26) = 9.24$, $p = 0.005$; $\eta^2_p = 0.262$]. Post-hoc comparisons showed that although both groups demonstrated a 'positive emotional bias' towards their in-group political representatives, right-wing voters rated more positively the in-group leader (1.65 ± 0.46) than the in-group opinion-maker (0.15 ± 0.4, p = 0.012). No such difference was observed for left-wing voters (leader: 0.65 ± 0.47; opinion-maker: 0.86 ± 0.454; p = 0.682). No other main effect or interactions **were** significant [all *Fs* < 3.23; *ps* > 0.084; $\eta^2_p < .110$]. Most importantly, these results confirmed an 'in-group bias' for the emotional valence score, with higher positive emotions attributed to the in-group than to the out-group political affiliation (see Table 1).

SDO

A significant difference between voter groups was found in SDO scores [$t(1,26) = 4.034$, $p < 0.001$] with the right-wing group (M = 4.13, SD = 0.94) showing stronger preference toward social hierarchy than egalitarianism, as compared to the left-wing group (M = 2.61, SD = 1.06).

Perceived Similarity

The 3-way ANOVA revealed a trend toward significance of the main effect of political affiliation [$F(1,26) = 3.59$, $p = 0.07$; $\eta^2_p = 0.12$] due to a higher PS **with left-wing** (0.71 ± 0.02) than **right-wing** (0.67 ± 0.02) political personages. The significant main effect of status [$F(1,26) = 6.53$, $p = 0.02$; $\eta^2_p = 0.20$] revealed that participants identified themselves more with opinion-makers (0.71 ± 0.02) than with political leaders (0.67 ± 0.019). Importantly, the 2-way interaction between political affiliation and voter groups **were** highly significant [$F(1,26) = 55.12$, $p < 0.001$; $\eta^2_p = 0.68$]. Post-hoc comparisons showed that, irrespective of social status, right-wing voters perceived themselves as more similar to their in-group (0.76 ± 0.03) than out-group personages (0.65 ± 0.03, $p = 0.001$); the same pattern was found for left-wing voters as indexed by the higher significant difference of similarity with in-group (0.77 ± 0.03) than out-group (0.58 ± 0.03, $p < 0.001$). These results hint at a clear political 'in-group bias'. No other main effect or interactions **were** significant [all $Fs < 2.78$; $ps > 0.1$; $\eta^2_p < 0.01$].

Behavioural performance during scanning session

Saccadic RTs and Error rates (ERs) were calculated collapsing left and right directional target trials. We did not compute those saccadic movements that followed distracting gazes instead than instruction cues (incorrect responses), were misses (no response), or anticipations (RTs < 100 ms) or retards (RTs > 1500 ms). Overall, we discarded 9% of the trials. In order to test GF behaviour in both saccadic measures, we subtracted the mean of congruent trials from the mean of the incongruent trials, respectively for RTs and ERs. Therefore, the higher the GF values the higher the interference effect.

Error rates

Independent-Samples Mann-Whitney T-test showed no significant difference between

Leaders and Opinion-makers in either group (*p*s > 0.09) (See Supporting Information SI 1). In line with our previous results (Liuzza et al., 2011), we found that right-wing participants followed their in-group more (Mdn= 0.025; Mean Rank=17.68) than out-group (Mdn= -0.015; Mean Rank=11.32; U=53.5, z =-2.05, p =0.039, r = -.39). Importantly, the Sign-Test comparison between right- and left-wing personages was significant for right-wingers (higher GF for political in-group personages in 12 out of 14 participants, $p < 0.05$), but not for left-wing voters, whose performance was completely at chance level (6 out of 12, 2 ties, $Z = 0.27$, $p = 1$) (See Table 2). Interestingly, we found a significant positive correlation between the voters' SDO scores and the attracting influence of in-group gaze on their oculomotor behaviour (Spearman's rho = 0.51, $p = 0.03$). Therefore, the higher the preference for social dominance hierarchy, the stronger the proneness of voters to follow the gaze of their in-group.

Reaction Times

No statistically significant difference between the two groups was found (right-wing: Mdn= -3.8 ms; Mean Rank=12.14; left-wing: Mdn= 0.4 ms; Mean Rank=16.86; U=131, z =1.52, p =0.13, r = 0.29). The comparison between leaders and opinion-makers did not show any significant difference in the right-wing group (8 out of 14 participants followed the opinion-makers' gaze more than the leaders' gaze, $p > 0.7$). However, in the left-wing group, this effect approached the statistical significance, since 11 out of 14 participants followed more the leaders' than the opinion-makers' gaze ($p = 0.06$). Finally, we did not find any significant difference between the distracting powers of the in-group vs. out-group personages (*p*s > 0.18) (See Table 2).

fMRI Results

Main effect of Interference

The incongruent minus congruent contrast (IE) revealed the activation of several clusters in the dorsal and ventral fronto-parietal attentional network including anterior frontal regions. More specifically, activity in FEF with more predominant activation in the left hemisphere, posterior parietal regions and bilateral precuneus was found (See Table 3 and Figure 2). Frontal regions also included the superior frontal gyrus, the supplementary motor area extending to the mid-cingulate cortex in the right hemisphere and left anterior Insula. Furthermore, right parietal clusters included supramarginal gyrus extending to superior temporal sulcus. Finally, a wide cluster in bilateral occipital and temporal areas spreading bilaterally from the calcarine scissure to the lingual gyri was also activated.

Group-membership

We expected that our critical manipulations of IE would affect neural responses within FEF depending on the in-group political affiliation. To test this prediction, we first analysed the differences in brain responses when participants performed saccadic movements **incongruent** with respect to the gaze direction of in-group political personages (IE for in-group). Only lFEF showed a trend toward significance for the 2-way interaction of political affiliation × group [$F(1,26) = 3.371$, $p = 0.078$; $\eta^2_p = 0.115$] suggesting that the activation for the IE triggered by in-group political personages was larger than the activation for the IE triggered by out-group political personages. Although non-significant, this result may suggest the involvement of lFEF in the automatic imitation of in-group political personages in both voter groups.

Finally, the correlations between the interaction terms of the behavioural measure (IE error rates for in-group – IE error rates for out-group) with the relative interaction terms for the beta weights in our ROIs showed no significant effect (rs < 0.22, ps > 0.25). It is worth

noting however, that while our behavioural effects rely on the ERs, the fMRI analysis has been performed on correct trials, so that the relationship between our behavioural dependent variable and the BOLD analysis may not be straightforward.

Correlation with SDO

We correlated the interaction term for the effect of in-group in our ROIs (IE of in-group vs. IE of out-group) with SDO scores (See SI 2). A significant negative correlation between SDO and left FEF was found (r = -51, p_{corr} = 0.03). This result indicates that less preference for social hierarchy paralleled greater engagement of lFEF as a function of IE for in-group personages (more than out-group personages). Since the visual inspection of the scatter plots suggested that the relationship between SDO and the activity in the ROIs might have been moderated by the group membership, we ran an additional moderation analysis by mean of the PROCESS for SPSS (@ Hayes, 2013; 2014). Interestingly, our results confirmed that in the left FEF, SDO negatively predicted IE in-group activity [B = -0.83, t(24) = -3.63, p = 0.001]. Also, group membership weakly predicted the activity in the lFEF during shifts of attention triggered by in-group relative to out-group political personages [B = 1, t(24) = 1.8, p = 0.08]. These main effects were further qualified by an interaction between SDO and group membership [B = 1.14, t(24) = 2.51, p = 0.02]. Tests of conditional effects across different groups revealed a significant negative association between SDO and lFEF in left- [B = -1.4, t(24) = -4.6, p < 0.001] but not in right-wing voters [B = – 0.26, t(24) = -0.7, p = 0.5, ns]. In other words, left- but not right-wing voters (who showed a greater level of preference for hierarchy), showed lower responses in the lFEF when they had to inhibit the automatic gaze following response toward their in-group (vs. out-group) (See Figure 3B).

Correlation with Perceived Similarity

Following the same procedure as for SDO scores, we ran a moderation analysis on lFEF by entering perceived similarity of in-group vs. out-group as the independent variable and participants' group (left-wing vs. right-wing voters) as moderator (See SI 3). Neither the effect of group membership on the lFEF [B = 0.02, $t(24)$ = 0.03, p =1, n.s.], nor of the perceived similarity of in-group vs. out-group were found significant [B = 3.5, $t(24)$ = 1.63, p = 0.1]. Importantly, the 2-way interaction was significant [B = -8.63, t = -2.03, p = 0.05]. In this case the similarity for in-group vs. out-group positively predicted the IE of in-group related activity in lFEF in the left- [B = 7.8, t = 2.3, p = 0.03], but not in the right-wing voters [B = -0.9, t = - 0.3, p = 0.7, n.s., see Figure 3C]. In other words, only in the left-wingers higher ratings of PS with the in-group predicted increased activity in the lFEF during distracting gaze movements of in-group as compared to the out-group political personages.

Furthermore, we explored whether SDO and in-group (vs. out-group) PS were differently related to each other in the two groups. We found the in-group (vs. out-group) PS and SDO were correlated positively in the right- (r = .72, p = 0.003) and negatively in the left-wing voters (r = -.58, p = .03). This result suggests that left-wing voters who are higher in endorsing hierarchical values do not perceive themselves as similar to their in-group politicians.

Discussion

In the present study we used fMRI to investigate whether cortical activity in onlookers who observe gaze shifts of political personages is influenced by group membership, individual differences in perceived similarity in personality traits between voters and in-group political personages, and ideological attitude like the preference for social hierarchy. Specifically, our

design allowed us to highlight: i) the neural network associated with the interference effect (IE) triggered by the gaze of right- or left-wing political personages' on the gaze of **right- and left-wing voters**; and ii) the role played by preference for social hierarchy (SDO) and perceived similarity on the brain response to in-group *vs.* out-group distracting gazes in the FEF.

Behavioural and Neural Correlates of Gaze-Following

In line with our previous study (Liuzza et al., 2011), we found that right-wing voters gaze was captured (as indexed by higher number of errors in directionally incongruent vs. congruent trials) by the gaze of their in-group political personages (Berlusconi and Vespa) more than their out-group' personages (Bersani and Floris). Thus, the findings on error rates replicate and extend previous evidence showing permeability of GF to high-level social variables (Liuzza et al., 2011, 2013; Pavan et al., 2011). In an apparently similar study, Dodd and colleagues (2011) showed that magnitude of the gaze-cuing effect was larger for liberals relative to conservatives when measuring RTs at different stimulus onset asynchrony (SOAs; 100 ms, 500 ms and 800 ms). It should be noted however that, differently from Dodd et al. (2011), in our study participants were required to perform a directional saccadic movement instead of pressing the spacebar as quickly as they could once they detected the target. This seemingly tiny difference may instead account for substantial difference in motor programming and executing. In addition, the effects described by Dodd et al. (2011) are observed with schematic faces, while the effects obtained in our study may be stronger as they come from naturalistic digital photographs. Most importantly, the group membership of the face was not manipulated in that study. Therefore the results of these two studies are hardly comparable.

In particular, we did not find any modulation in the left-wing group, a result that is consistent with our previous finding (Liuzza et al., 2011). It is held that values like in-group loyalty

(Graham, Haidt & Nosek, 2009) and social conformity (Altemeyer, 1998) have a higher impact on **right- than on left-wing voters**. Thus, in our study social similarity might have affected **right- more than left-wing voters**. Similarly, ratings on the SDO scale confirm that right-wing voters endorse values like discrimination towards out-group more than left-wing voters do. This is in keeping with a considerable body of research showing that high SDO in conservatives is also associated with higher levels of intergroup bias and discrimination attitudes that are at the basis of real-world biases like racism, ethnocentrism, nationalism and sexism (Pratto et al., 1994; Sidanius & Pratto, 1993, 1999; Sidanius, Pratto & Bobo, 1994). SDO also plays a role in the 'minimal intergroup situations' associated bias, as investigated by social identity theorists (see Sidanius, Pratto & Mitchell, 1994; Sidanius, Pratto & Rabinowitz, 1994).

Importantly, the behavioural interference of directional incongruence between instruction signal and political personages (irrespective of political membership) was reflected in an increase of the BOLD signal in several brain regions belonging to the social attention network. In line with previous studies (Corbetta & Shulman, 2002; Cazzato et al., 2012), we found enhanced brain responses of specific ventral and dorsal portions of the fronto-parietal network including anterior frontal regions (more prominent in the left hemisphere) with an additional right parietal cluster encompassing the right supramarginal gyrus. Enhanced responses were also found in the mid-cingulate cortex and left anterior insula.

Previous studies highlight the importance of fronto-parietal networks in covert and overt reorienting of attention towards directions signalled by others' gaze (Grosbras et al., 2005) or by non-biological stimuli, such as arrows (Sato et al., 2009; Corbetta & Shulman, 2002; Corbetta et al., 2008; Szczepanski et al., 2010). Here, we expand significantly previous studies by showing that averted gaze of political personages modulates attentional shift-related activity in different brain regions. Mostly importantly, highly complex cognitive and

social dimensions, such as political affiliation, in-group perceived similarity and ideological attitude, strongly impact the activity of frontal brain regions in the dorsal attention network and the lFEF in particular.

We found the IE of in-group political personages was stronger in the left than in the right FEF a result that is in keeping with our previous study (Cazzato et al., 2012) where lFEF was specifically modulated by the interaction between the distracting 'gaze' and the matched effector 'eye' during the saccadic task (while rFEF showed only a trend toward significance). Studies about hemispheric asymmetries in the dorsal attention network during spatial selective attention and target detection (Shulman et al., 2009, 2010; Szczepanski & Kastner, 2013) found little evidence of right hemisphere dominance that, however, was found during covert visuospatial orienting (Siman-Tov et al., 2007) and visually guided saccades (Anderson et al., 2012; Petit et al., 2009) tasks. It is worth noting here, that evidence for a dominant role of left FEF during spatial conflict in a Simon Task has recently been provided (Bardi et al., 2012), suggesting that the left FEF may constitute a crucial node of a left hemisphere action selection network. Finally, it is worth emphasizing that our fMRI contrast of the Main effect of Incongruence (all incongruent > all congruent stimuli) does reflect a left hemisphere-dominant map of task activation (Table 3 and Fig. 2) in the dorsal attention network in particular for the FEF. In contrast, right hemisphere dominance in attention control has more often been attributed to the ventral and not dorsal attention network (Corbetta & Shulman, 2011).

Neural Responses to In-group Political Personages and voters' personality

An important result of this study is the greater engagement of lFEF specifically when both right- and left-wing voters are instructed to perform saccadic movements incongruently with respect to the gaze direction of personages belonging to the same political affiliation. In other words, the activation in the FEF for the interference triggered by in-group political

personages was larger than the activation for the interference triggered by out-group political personages.

It is worth noting that, besides being an oculomotor area (Bizzi, 1967), FEF is involved also in target selection (Lee & Keller, 2008), motor preparation (Bruce & Goldberg, 1984, 1985), internal monitoring (Sommer & Wurtz, 2002), adjustment of on-going saccades (Schall, Stuphorn, & Brown, 2002), inhibition of reflexive saccades (Munoz & Everling, 2004), and shifts of spatial attention (Moore & Fallah, 2001).

Our results demonstrate that the interference exerted by the politicians gaze' on in-group voters is reflected in lFEF's BOLD activity. Therefore, in line with the notion of a 'mirrored' oculomotor program, the cost of re-orienting to fully irrelevant political distractors' gaze is likely due to the interference with on-going oculomotor programs controlled by this frontal region. Taken together, our data suggest a close link between the programming and preparation of explicit eye movements and the orienting of covert attention (Greene et al., 2009).

The differential activity triggered by in-group vs. out-group in lFEF, a cortical area related to saccadic control, was negatively associated with SDO and positively with PS in the left-wing voters. This result might at first sight seem counter-intuitive. Nonetheless, a deeper scrutiny of this effect suggests that it can be explained by the political affiliation of the participants. In fact, in right-wing voters (who score higher in SDO), lFEF BOLD activity does not seem to be further modulated by preference for hierarchy. On the other side, in-group (vs. out-group) related lFEF BOLD activity is negatively predicted by SDO and positively by similarity of personality traits between left-wingers and in-group political personages. A possible explanation for these findings may be that participants with lower scores in SDO are also the most liberal ones and thus perceive the left-wing (liberal) politicians as more similar to them in terms of

personality traits and political values. However, this interpretation would predict an opposite pattern in the right-wing group, which is not the case. Another interpretation rests on the appraisal of the Italian political context at the time the experiments were performed. In fact, when collecting our data the group in power was the right-wing coalition. So it might be that people of the lower-status group (but not of the high-status one) were more sensitive to the cues from the high-status (possibly in the same way that monkeys follow only the gaze of high-social status conspecifics; Shepherd, Deaner, & Platt, 2006). Such behavior would be consistent with the political psychological construct of system justification (Jost & Benaji, 1994), that suggests people unconsciously justify and perpetuate existing social arrangements. Such an interpretation deserves further investigation. It may happen, for example, that an opposite pattern of results is found in a period when the **left-wing** coalition is in charge for the government of Italy. In such circumstance, we may expect that right-wing participants higher in SDO would be less sensitive to their (contextually low status) politicians as compared to higher (out-group) status ones. Such a pattern might suggest that authority acceptance, rather than in-group loyalty might be the moral foundation underlying the observed neural susceptibility to in-group *vs.* out-group distracting gazes in the domain of politics.

Limitations and Future directions

Although our research provides clear evidence for the influence of in-group political affiliation on the neural activity in the FEF, we acknowledge some possible limitations. First, it is unclear whether face-processing regions in occipital and temporal cortex (Haxby, Hoffman & Gobbini, 2000) might have contributed to the processing of in-group social stimuli. Therefore, we cannot discern whether these regions represent part of a specialized social orienting network or whether their role is restricted to feeding information to ventral and dorsal attentional systems when social stimuli are processed. Recently, Callejas and

colleagues (2014) reported that fronto-parietal regions show increased interactions with face-selective regions when the direction of attention is based on gaze information, suggesting that face-selective regions may extract gaze information and send it forward to the attentional networks. However, while connectivity studies have shown an overlap between specific nodes of the dorsal fronto-parietal network and the social brain (Schilbach et al., 2008; Mars et al., 2012), the overlap may not extend to the use of gaze information for controlling orienting.

Finally, a recent study by Gobel, Kim and Richardson (2015) tried to dissociate the dual function of social gaze (i.e., signalling intentions and perceiving eye movements) by means of a novel paradigm, which combined the socially relevant information present in real life interactions with a strict control of laboratory conditions. The authors found that eye movements systematically changed when looking at higher and lower ranked targets depending on whether gaze was being used to perceive or to signal social information. Thus, future investigations should consider the dual function of social gaze in different contexts, as well as whether cortical regions of the fronto-parietal system are coupled with specific regions of the 'face network' during social orienting of in-group and/or low/high social status individuals. Finally, we cannot exclude that our results have been affected by the facial attractiveness of our distractors. Attractive people are thought to naturally draw attention (Maner et al., 2003), and attractiveness has been found to predict high social status in some groups (Anderson, John, Keltner & Kring, 2001). All these variables have to be more carefully controlled in future studies.

To sum up, our findings show that high-level social categorization processes, such as the ones at play in political affiliation, are reflected in the activity of FEF that is an important node of the frontal attentional network. Our results suggest that neural activity in this area is modulated more by the gaze of in-group than out-group political personages, thus

corroborating the importance of the political membership in attracting social attention. Furthermore, a supposedly automatic behaviour like reflexive attention seems to be influenced by higher-order variables such as perceived personality similarity in personality traits between voters and in-group political personages and preference for social dominance. The present findings may open new research avenues for mapping high-level psychological features onto brain structure and function and for interpreting sociologically motivated constructs in terms of brain functions.

Acknowledgements: The financial contribution of EU Information and Communication Technologies Grant (VERE 411 project, FP7-ICT-2009-5, Prot. Num. 257695) and the Italian Ministry of Health (RF-2010- 412 2312912) to SMA is gratefully acknowledged. The Neuroimaging Laboratory of the Fondazione Santa Lucia is supported by The Italian Ministry of Health. We thank Dr Michele Vecchione, Dr Ruben Azevedo and Dr Vanda Viola for providing helpful comments.

All of the co-authors of this paper have no financial or other conflicts of interest

References

Altemeyer, B. (1998) The other "authoritarian personality." In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 30, pp. 47–92). Orlando, FL: Academic Press.

Anderson, E. J., Jones, D. K., O'Gorman, R. L., Leemans, A., Catani, M. & Husain, M. (2012) Cortical network for gaze control in humans revealed using multimodal MRI. *Cereb. Cortex*., **22**,765–775.

Anderson, C., John, O. P., Keltner, D. & Kring, A. M. (2001) Who attains social status? Effects of personality and physical attractiveness in social groups. *J. Pers. Soc. Psy.,* **81**, 116-132.

Bardi, L., Kanai, R., Mapelli, D. & Walsh V. (2012) TMS of the FEF interferes with spatial conflict. *J. Cogn. Neurosci*., **24**, 1305-1313.

Bizzi, E. (1967) Discharge of frontal eye field neurons during eye movements in unanesthetized monkeys. *Science,* **157**, 1588–1590.

Bruce, C. J. & Goldberg, M. E. (1985) Primate frontal eye fields. I. Single neurons discharging before saccades. *J. Neurophysiol*., **53**, 603-35.

Bruce, C.J. & Goldberg, M.E. (1984) Physiology of the frontal eye fields. *Trends Neurosci*., **7**, 436–441.

Callejas, A., Shulman, G. L. & Corbetta, M. (2014) Dorsal and ventral attention systems underlie social and symbolic cueing. *J. Cogn. Neurosci*., **26**, 63-80.

Caprara, G. V. & Perugini, M. (1994) Personality described by adjectives: Generalizability of the ‘‘Big Five’’ to the Italian lexical context. *Eur. J. Personality*., **8**, 357–369.

Caprara, G. V., Vecchione, M., Barbaranelli, C. & Fraley, R. C. (2007) When likeness goes with liking: The case of political preference. *Polit. Psychol*. **28**, 609–632.

Carraro, L., Dalmaso, M., Castelli, L. & Galfano, G. (2015) The politics of attention contextualized: gaze but not arrow cuing of attention is moderated by political temperament. *Cogn. Process.* 2015 Jun 9. [Epub ahead of print].

Cazzato, V., Macaluso, E., Crostella, F. & Aglioti, S. M. (2012) Mapping reflexive shifts of attention in eye-centered and hand-centered coordinate systems. *Hum. Brain Mapp*., **33**, 165-178.

Corbetta, M. & Shulman, G. L. (2002) Control of goal-directed and stimulus-driven attention in the brain. *Nat. Rev. Neurosci*., **3**, 201–215.

Corbetta, M., Patel, G. & Shulman, G. L. (2008) The reorienting system of the human brain: From environment to theory of mind. *Neuron*, **58**, 306–324.

Cronbach, L. J. & Gleser, G. C. (1953) Assessing similarity between profiles. *Psychol. Bull*., **50**, 456-73.

Crostella, F., Carducci, F. & Aglioti, S. M. (2009) Reflexive social attention is mapped according to effector-specific reference systems. *Exp. Brain Res.,***197**, 143–151.

Dalmaso, M., Galfano, G., Coricelli, C. & Castelli, L. (2014) Temporal dynamics underlying the modulation of social status on social attention. *PLoS One,* **9**(3): e93139.

De Digman, J. M. (1990) Personality structure: Emergence of the five-factor model. *Annu. Rev. Psychol.,* **41**, 417–44.

Dalmaso, M., Pavan, G., Castelli, L. & Galfano, G. (2012) Social status gates social attention in humans. *Biol. Lett.,* **8**, 450-452.

Dodd, M., Hibbing, J. & Smith, K. (2011) The politics of attention: gaze-cuing effects are moderated by political temperament. *Atten. Percept. Psychophys*., **73**, 24-29.

Duckitt, J. & Sibley, C. G. (2010) Personality, Ideological Attitudes, and Group Identity as Predictors of Political Behavior in Majority and Minority Ethnic Groups. *J. Pers*., **78**, 1861-1893.

Emery, N. J. (2000) The eyes have it: the neuroethology, function and evolution of social gaze. *Neurosci. Biobehav. Rev*., **24**, 581-604.

Fox, E., Mathews, A., Calder, A. J. & Yiend, J. (2007) Anxiety and sensitivity to gaze direction in emotionally expressive faces. *Emotion*, **7**, 478-86.

Friston, K. J., Penny, W., Phillips, C., Kiebel, S., Hinton, G. & Ashburner, J. (2002) Classical and Bayesian inference in neuroimaging: theory. *Neuroimage*, **16**, 465-83.

Gobel, M. S., Kim, H. S. & Richardson, D. C. (2015) The dual function of social gaze. *Cognition*, **136**, 359-64.

Graham, J., Haidt, J. & Nosek, B. (2009) Liberals and conservatives rely on different sets of moral foundations. *J. Pers. Soc. Psychol*., **96**, 1029-1046.

Greene, D. J., Mooshagian, E., Kaplan, J. T., Zaidel, E. & Iacoboni, M. (2009) The neural correlates of social attention: automatic orienting to social and nonsocial cues. *Psychol. Res*., **73**, 499-511.

Grosbras, M. H., Laird, A. R. & Paus, T. (2005) Cortical regions involved in eye movements, shifts of attention, and gaze perception. *Hum. Brain. Map*., **25**,140–154.

Haxby, J.V., Hoffman, E. A. & Gobbini, M. I. (2000) The distributed human neural system for face perception. *Trends Cogn. Sci*., **4**, 223–233.

Hungr, C. J. & Hunt, A. R. (2012) Physical self-similarity enhances the gaze-cueing effect. *Q. J. Exp. Psychol.,* **65**, 1250-9.

Jones, B. C., DeBruine, L. M., Main, J. C., Little, A. C., Welling, L. L. M., Feinberg, D. R. & Tiddeman, B. P. (2010) Facial cues of dominance modulate the short-term gaze-cuing effect in human observers. *Proc. R. Soc. B: Bio. Sci.*, **277**, 617-624.

Jost, J. T. & Banaji, M. R. (1994) The role of stereotyping in system- justification and the production of false consciousness. *Brit. J. Soc. Psychol*., **33**, 1–27.

Klein, J. T., Shepherd, S. V. & Platt, M. L. (2009) Social attention and the brain. *Curr. Biol*., **19**, R958-62.

Lee, K. M. & Keller, E. L. (2008) Neural activity in the frontal eye fields modulated by the number of alternatives in target choice. *J. Neurosci*., **28**, 2242-51.

Liuzza, M. T., Cazzato, V., Vecchione, M., Crostella, F., Caprara, G. V. & Aglioti, S. M. (2011) Follow my eyes: the gaze of politicians reflexively captures the gaze of in-group voters. *PLoS One*, **6**, e25117.

Liuzza, M. T., Vecchione, M., Dentale, F., Crostella, F., Barbaranelli, C., Caprara, G. V. & Aglioti, S.M. (2013) A look into the ballot box: Gaze following conveys information about implicit attitudes toward politicians. *Q. J. Exp. Psychol. (Hove).*, **66**, 209-16.

Maner, J. K., Kenrick, D. T., Becker, D. V., Delton, A.W., Hofer, B.,Wilbur, C. J. & Neuberg, S. L. (2003) Sexually selective cognition: Beauty captures the mind of the beholder. *J. Pers. Soc. Psychol*., **85**, 1107-20.

Mars, R. B., Neubert, F-X, Noonan, M. P., Sallet, J., Toni, I. & Rushworth, M. F. S. (2012) On the relationship between the "default mode network" and the "social brain." *Front. Hum. Neurosci*., **6**: 189.

Moore, T. & Fallah, M. (2001) Control of eye movements and spatial attention. *Proc. Natl. Acad. Sci. U.S.A.,* **98**, 1273-1276.

Munoz, D. P. & Everling, S. (2004) Look away: the anti-saccade task and the voluntary control of eye movement. *Nat. Rev. Neurosci*., **5**, 218-228.

Nummenmaa, L. & Calder, A. J. (2009) Neural mechanism of social attention. *Trends Cogn. Sci*., **13**, 135–143.

Pavan, G., Dalmaso, M., Galfano, G. & Castelli, L. (2011) Racial group membership is associated to gaze-mediated orienting in Italy. *PloS One.,* **6**, e25608.

Penny, W. & Holmes, A. P. (2004) Random-effects analysis. In: Frackowiak RSJ, Ashburner J.T., Penny W.D., Zeki S., Friston K.J., Frith C.D., Dolan R.J., Price C.J., (Eds). *Human Brain Function*. San Diego, Elsevier, pp. 843–850.

Petit, L., Zago, L., Mellet, E., Vigneau, M., Andersson, F., Mazoyer, B. & Tzourio-Mazoyer, N. (2009) Functional asymmetries revealed in visually guided saccades: An fMRI study. *J Neurophysiol.,* **102**, 2994–3003.

Ponari, M., Trojano, L., Grossi, D. & Conson M. (2013) "Avoiding or approaching eyes"? Introversion/extraversion affects the gaze-cueing effect. *Cogn. Process.*, **14**, 293-299.

Porciello, G., Crostella, F., Carducci, F. & Aglioti, S.M. (2014a) TMS-induced virtual lesion of the Frontal Eye Field (FEF) interferes with reflexive shifts of attention triggered by averted gaze. 79th Cold Spring Harbor Laboratory Symposium: “Cognition”. Cold Spring Harbor (NY) May 28th-June 2nd.

Porciello, G., Holmes, B. S., Liuzza, M. T., Crostella, F., Aglioti, S. M. & Bufalari, I. (2014) Interpersonal multisensory stimulation reduces the overwhelming distracting power of self-gaze: psychophysical evidence for 'engazement'. *Sci Rep.,* **20**, 4:6669.

Pratto, F. J., Sidanius, J., & Levin, S. (2006) Social dominance theory and the dynamics of intergroup relations: Taking stock and looking forward. Eur. *Rev. Soc. Psychol.,* **17**, 271-320.

Pratto, F. J., Sidanius, J., Stallworth, L. M. & Malle. B. F. (1994) Social dominance orientation: A personality variable predicting social and political attitudes. *J. Pers. Soc. Psychol.*, **67**, 741–763.

Ricciardelli, P., Bricolo, E., Aglioti, S. M. & Chelazzi, L. (2002) My eyes want to look where your eyes are looking: exploring the tendency to imitate another individuals' gaze. *NeuroReport.*, **13**, 2259-2264.

Ricciardelli, P., Carcagno, S., Vallar, G. & Bricolo, E. (2013) Is gaze following purely reflexive or goal-directed instead? Revisiting the automaticity of orienting attention by gaze cues. *Exp. Brain Res.*, **224**, 93–106.

Sato, W., Kochiyama, T., Uono, S. & Yoshikawa, S. (2009) Commonalities in the neural mechanisms underlying automatic attentional shifts by gaze, gestures, and symbols. *Neuroimage.*, **45**, 984–992.

Schall, J. D., Stuphorn, V. & Brown, J. W. (2002) Monitoring and control of action by the frontal lobes. *Neuron.*, **36**, 309–322.

Schilbach, L., Eickhoff, S. B., Rotarska-Jagiela, A., Fink, G. R. & Vogeley, K. (2008) Minds at rest? Social cognition as the default mode of cognizing and its putative relationship to the "default system" of the brain. *Conscious. Cogn.*, **17**, 457–467.

Shepherd, S. V. (2010) Following gaze: gaze-following behavior as a window into social cognition. *Front. Integr. Neurosci*., **4**: 5.

Shepherd, S., Deaner, R. & Platt, M. (2006) Social status gates social attention in monkeys. *Curr. Biol*., **16**, R119-R120.

Shulman, G. L., Astafiev, S. V., Franke, D., Pope, D. L. W., Snyder, A. Z., McAvoy, M. P. & Corbetta, M. (2009) Interaction of stimulus-driven reorienting and expectation in ventral and dorsal frontoparietal and basal ganglia-cortical networks. *J. Neurosci.,* **29**,4392–4407.

Shulman, G. L., Pope, D. L., Astafiev, S. V., McAvoy, M. P., Snyder, A. Z. & Corbetta, M. (2010) Right hemisphere dominance during spatial selective attention and target detection occurs outside the dorsal frontoparietal network. *J Neurosci.,* **30**, 3640–3651.

Sidanius, J. & Pratto, F. (1993) The dynamics of social dominance and the inevitability of oppression. In P. Sniderman & P. E. Tetlock (Eds.), *Prejudice, politics, and race in America today*. Stanford, CA: Stanford University Press. pp. 173-211.

Sidanius, J. & Pratto, F. (1999) Social dominance: An intergroup theory of social hierarchy and oppression. New York: Cambridge University Press.

Sidanius, J., Pratto, F. & Bobo, L. (1994) Social Dominance Orientation and the Political Psychology of Gender: A Case Of Invariance? *Soc. Psychol*., **67**, 998-1011.

Sidanius, J., Pratto, F. & Mitchell, M. (1994) In-group identification, social dominance orientation, and differential intergroup social allocation. *J. Soc. Psychol.*, **134**, 151-167.

Sidanius, J., Pratto, F. & Rabinowitz, J. (1994) Gender, Ethnic Status, In-group Attachment and Social Dominance Orientation. *J. Cross Cult. Psychol*., **25**, 194-216.

Siman-Tov, T., Mendelsohn, A., Schonberg, T., Avidan, G., Podlipsky, I., Pessoa, L., Gadoth, N., Ungerleider, L. G. & Hendler, T. (2007) Bihemispheric leftward bias in a visuospatial attention-related network. *J. Neurosci.* **27**, 11271–11278.

Sommer, M. A. & Wurtz, R. H. (2002) A pathway in primate brain for internal monitoring of movements. *Science*., **296,** 1480-1482.

Szczepanski, S. M., Pinsk, M. A., Douglas, M. M., Kastner, S. & Saalmann, Y. B. (2013) Functional and structural architecture of the human dorsal frontoparietal attention network. *Proc. Natl. Acad. Sci. USA,* **110**,15806–15811.

Szczepanski, S. M., Konen, C. S. & Kastner, S. (2010) Mechanisms of spatial attention control in frontal and parietal cortex. *J. Neurosci*., **30**, 148–160.

Utevsky, A.V. & Platt, M.L. (2014) Status and the Brain. *PLoS Biol* 12(9): e1001941.

Vecchione, M., González Castro, J. L. & Caprara, G. V. (2011) Voters and leaders in the mirror of politics: similarity in personality and voting choice in Italy and Spain. *Int. J. Psychol.*, **46**, 259-70.

FIGURE LEGENDS

Figure 1: Schematic timeline of the events in two representative trials. (A) Example of a congruent trial with the right-wing personage (Berlusconi) as distractor; (B) example of an incongruent trial with the left-wing personage (Bersani) as distractor. At the beginning of the trial, a **direct** gaze was presented behind a black fixation mark (500 ms). Turning the black fixation point into red was the imperative instruction signal for leftward saccades, turning the black fixation point into blue was the imperative instruction signal for rightward saccades.

Figure 2: Brain regions activated by Interference Effect [Incongruent > Congruent trials]. Clusters showing higher activity in the incongruent than congruent condition irrespective of observed-faces and political affiliation of voters are rendered on 3-dimensional (3D) views of the SPM template. This contrast revealed the activation of dorsal and ventral attentional fronto-parietal networks. The regions included the Frontal Eye Fields (FEF), with more prominent activation in the left hemisphere, and posterior parietal regions as the right Superior Parietal Lobule (SPL) and bilateral Precuneus. Frontal regions also included the Superior Frontal Gyrus (SFG), the Supplementary Motor Area (SMA) extending to the Mid-cingulate Cortex (MCC) in the right hemisphere and left anterior Insula. Furthermore, right parietal portion included Supramarginal Gyrus (SMG) extending to Superior Temporal Sulcus (STS). Finally, a wide cluster in bilateral occipital areas spreading bilaterally from the Calcarine Scissure to the Lingual gyri was also activated.

Figure 3: Correlations between left Frontal Eye Field activity with Social Dominance Orientation and Perceived similarity per voters' group. (A) 3D rendering of the canonical MNI template showing the localization of the ROI corresponding to the left FEF; (B) The y-

axis displays the difference of the parameter estimate associated with the interference effect **for in-group minus out-group** political personages in the left FEF. The x-axis displays the 'Social Dominance score' (mean centered) with higher values indicating stronger preference for social hierarchy than egalitarianism. Left-wing voters who showed a greater level of preference for hierarchy showed lower BOLD when they have to inhibit the automatic gaze following response toward their in-group (vs. out-group); (C) The y-axis displays the difference of the parameter estimate associated with the interference for in-group minus out-group political personages in the left FEF. The x-axis displays the 'Perceived Similarity score' difference (mean centered) calculated by subtracting the scores for in-group minus the scores for out-group political personages in each group. Higher values indicate stronger perceived similarity with respect to own in-group personages. In left-wing voters perceiving as more similar to their in-group (compared to the right-wing out-group), FEF was more engaged to inhibit the automatic gaze-following response for the in-group (vs. the out-group) personages. Notes: SDO = Social Dominance Orientation; FEF= frontal Eye Field.

TABLES

Table 1. Self-report measures. Mean scores (standard error of the mean) of influence, emotional valence and perceived similarity as a function of political coalition (Right/Left) and status of political personages (Leader/Opinion-maker) in Right- and Left-wing voters, respectively.

Self-report Measures				
	Right-wing personages		Left-wing personages	
	Leader	Opinion-maker	Leader	Opinion-maker
Influence				
Right-wing	3.86 (0.29)	1.72 (0.34)	1.72 (0.23)	1.15 (0.26)
Left-wing	3.36 (0.29)	1.65 (0.34)	1.86 (0.23)	1.43(0.26)
Emotional Valence				
Right-wing	1.65 (0.46)	0.15 (0.34)	-2 (0.47)	-1 (0.45)
Left-wing	-2.86 (0.45)	-2 (0.34)	0.65 (0.47)	0.86 (0.45)
Perceived Similarity				
Right-wing	0.75 (0.03)	0.77 (0.03)	0.64 (0.03)	0.653 (0.03)
Left-wing	0.54 (0.029)	0.61 (0.03)	0.74 (0.03)	0.79 (0.03)

Table 2. Behavioural performance during the Gaze-following Task. Mean error rates (%) and RTs (ms) for each subject (row mean) in incongruent minus congruent trials as a function of political coalition of the personage (Centre-right, Centre-left) in Right-wing and Left-wing voters, respectively.

	Error rates (%)		RTs (ms)	
	Right-wing personages	Left-wing personages	Right-wing personages	Left-wing personages
Right-wing Voters				
1	0.08	0.07	24.34	30.26
2	0.13	0.03	28.73	35.47
3	0.07	0.01	41.99	44.27
4	0.04	0.00	40.48	39.37
5	0.29	0.33	35.11	39.94
6	0.22	0.21	40.87	45.18
7	0.01	0.00	13.05	-4.78
8	0.16	0.12	17.82	16.60
9	0.09	0.06	25.34	25.34
10	0.01	-0.01	17.79	25.64
11	0.06	0.03	35.65	50.89
12	0.05	0.15	17.07	20.30
13	0.20	0.18	40.42	38.23
14	0.18	0.15	29.22	34.95
Left-wing Voters				
1	0.17	0.15	28.34	51.06
2	0.12	0.15	26.79	21.10
3	0.02	0.06	26.48	26.68
4	0.04	0.01	7.11	7.09
5	0.01	0.02	33.25	13.76
6	0.09	0.12	13.85	25.83
7	0.11	0.04	31.12	41.89
8	0.15	0.11	16.66	17.35
9	0.02	0.02	30.92	29.66
10	0.01	0.03	71.69	69.73

11	0.00	0.00	17.26	26.00
12	0.18	0.06	18.61	20.77
13	0.07	0.05	23.82	14.97
14	0.11	0.19	27.29	44.99

Table 3. Brain responses associated with Interference effect [Incongruent > Congruent trials]. Anatomical locations, peak coordinates in MNI space (Montreal Neurological Institute), and statistical values for the main effect of incongruence (incongruent > congruent trials, irrespective of in-group or out-group political affiliation). *p*-values are corrected for multiple comparisons at the cluster level, considering the whole brain as the volume of interest. Notes: R PPC = Right Posterior Parietal Cortex; R SMG = Right Supramarginal Gyrus; L FEF= Left Frontal Eye Field; R SMA = Supplemental Motor Area; MCC = mid-cingulate Cortex, lAI = left Anterior Insula; l Lingual G = left Lingual Gyrus.

Anatomical Area	**Cluster Size**	***p-corr***	**X**	**Y**	**Z**	**z-Scores**
Parietal Lobe						
R PPC	466	< 0.001	12	-58	58	4.84
	-		18	-64	58	4.58
R SMG	255	= 0.019	62	-38	38	4.06
	-		64	-40	24	3.85
Frontal Lobe						
L FEF	418	< 0.001	-24	-2	58	4.74
R SMA	958	< 0.001	18	0	62	4.63
Mid Cing Cortex			8	20	36	3.98
L Ant Insula	247	= 0.021	-32	20	6	3.84
Occipital Lobe						
L Lingual G	710	< 0.001	-10	-74	4	4.29