Power Changes How the Brain Responds to Others

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Power dynamics are a ubiquitous feature of human social life, yet little is known about how power is implemented in the brain. Motor resonance is the activation of similar brain networks when acting and when watching someone else act, and is thought to be implemented, in part, by the human mirror system. We investigated the effects of power on motor resonance during an action observation task. Separate groups of participants underwent a high-, neutral, or low-power induction priming procedure, prior to observing the actions of another person. During observation, motor resonance was determined with transcranial magnetic stimulation (TMS) via measures of motor cortical output. High-power participants demonstrated lower levels of resonance than low-power participants, suggesting reduced mirroring of other people in those with power. These differences suggest that decreased motor resonance to others' actions might be one of the neural mechanisms underlying power-induced asymmetries in processing our social interaction partners.

Keywords: power, motor resonance, human mirror system, TMS, social cognitive neuroscience

The profound evolution of primate neocortex was influenced by the computational demands of living in a complex social environment (Dunbar & Shultz, 2007). For primates, a key factor creating structure within the social environment is power. In nonhuman primates, an animal's power is partly determined by the degree to which they dominate conspecifics. Those that are able to exert dominance over others gain greater access to valuable resources like food and potential mates (Dunbar, 1980; Lewis, 2002; Watts, 2010). In human societies, power similarly creates "dependence asymmetries," wherein the powerless depend heavily on the powerful for resources, whereas the powerful enjoy relatively unabated access to resources (Russell & Fiske, 2010). This asymmetry results in differences in how the powerful and the powerless

process other individuals. Despite what we know about the effects of power on social information processing, the majority of the evidence is indirect, and the mechanisms underlying power's influence remain a mystery. To begin to address this issue, we used transcranial magnetic stimulation (TMS) to provide a direct and online measure of power's impact on how the brain responds to observed action.

The Psychological Impact of Power

The psychological literature on power indicates a reliable relationship between power and information processing style (Ames, Rose, & Anderson, 2006; Fiske, 1993; Fiske & Dépret, 1996; Guinote, 2007a, 2007b; Obhi, Swiderski, & Brubacher, 2012; Smith & Trope, 2006; van Kleef et al., 2008). High-power individuals are able to ignore peripheral information and focus on task relevant details, thereby improving goal pursuit (Guinote, 2007a, 2007b), cognitive flexibility (Smith & Trope, 2006), and executive functioning (Smith, Jostmann, Galinsky, & van Dijk, 2008). Therefore, when powerful individuals ignore peripheral information during a nonsocial task, it may improve their performance. Conversely, when the powerful ignore "peripheral" information in social settings, the outcome can be quite negative from the perspective of the powerless.

The powerful, because they already control resources, tend not to process individuating information about the less powerful. In contrast, the powerless, because they do not control resources, *are* motivated to process individuating information about the powerful (Fiske & Dépret, 1996; Goodwin, Gubin, Fiske, & Yzerbyt, 2000). Power-driven differences in the processing of others are also evident in the inability of high-power-primed participants to take the visual, cognitive, and emotional perspectives of others, relative to participants who feel relatively powerless (Anderson, Keltner,

& John, 2003; Galinsky, Magee, Inesi, & Gruenfeld, 2006). Similarly, socioeconomic status (SES) has been linked to empathic accuracy, with high-SES individuals making less accurate judgments about others' affective states than low-SES individuals (Kraus, Côté, & Keltner, 2010). As a result, the powerful often form a relatively shallow understanding of others, compared to the less powerless.

Despite the strong evidence that high power leads to reduced processing of others' actions and emotions, there are conflicting findings in the literature. For example, Schmid Mast, Jonas, and Hall (2009) found that high power actually improves empathic accuracy, and Côté et al. (2011) have also shown that high power, combined with a prosocial orientation, leads to improved empathic ability. Therefore, the relationship between power and the degree to which people process their social interaction partners is not straightforward. In the present investigation, we begin to address this ambiguity using a direct index of the degree to which people process others' actions.

The Neural Representation of Observed Actions

In recent years, researchers have shown that the human brain is exquisitely tuned to the perceptual and cognitive demands of processing others (Hari & Kujala, 2009). One reliable finding from this work that appears to be important for human social perception is resonant or vicarious activity, whereby perceiving an interaction partner automatically activates neural circuits that would underlie their experience (Keysers & Gazzola, 2009). For example, with respect to action observation, neural circuits that are related to action execution become active when the person observes someone else making the same action; in other words, the observer's brain resonates with the model's motor behavior (Hogeveen & Obhi, 2011; Iacoboni, 2009; Oberman & Ramachandran, 2007; Obhi & Hogeveen, 2010; Rizzolatti & Sinigaglia, 2010). We refer to the network of brain regions involved in this process as the motor resonance system (cf. Hogeveen & Obhi, 2012). Motor resonance includes the human parietofrontal mirror system, and many believe that resonance reflects mirror system activity (Fadiga, Craighero, & Olivier, 2005; Fadiga, Fogassi, Pavesi, & Rizzolatti, 1995).

A reliable index of resonance is the amplitude of motor-evoked potentials (MEPs) recorded from a specific muscle via electromyography (EMG), while a person observes another person acting.

An MEP is elicited by applying a single, fixed intensity TMS pulse over an area of the motor cortex that corresponds to a muscle underlying the observed action. For a given intensity of stimulation, changes in MEP amplitude reflect changes in the excitability of motor cortical representations (see Figure 1; for a review, see Fadiga et al., 2005).

Power and Motor Resonance: The Present Study

Researchers suggest that motor resonance provides a scaffold for understanding the actions of our interaction partners (cf. Brass, Ruby, & Spengler, 2009; Decety & Sommerville, 2009; Grafton, 2009; Spunt & Lieberman, 2012), and those actions are frequently less important to those with high-power status (Fiske, 1993; Fiske & Dépret, 1996; Goodwin et al., 2000; Russell & Fiske, 2010). Yet, previous investigations of power and the processing of others' actions and emotions have yielded conflicting results, sometimes suggesting an increase (e.g., Côté et al., 2011), and elsewhere a decrease (e.g., Galinsky et al., 2006), in interpersonal sensitivity. In the present study, we examine whether power can increase or decrease interpersonal sensitivity by examining the effects of power priming on motor resonance.

The present study had participants write an essay documenting a high-, neutral-, or low-power experience, and then used a direct and online technique to index motor resonance during a passive observation task. The power priming procedure—recalling a memory with or without power—is a well-established technique that has demonstrated a wide range of downstream effects, with the high-power condition often found to decrease interpersonal sensitivity relative to low-power priming (Galinsky, Magee, Gruenfeld, Whitson, & Liljenquist, 2008; Galinsky et al., 2006). To the extent that resonance is an automatic response when observing the actions of others, any changes in resonance as a function of power can be construed as a "default" effect of power on the brain. Again, as previous researchers have suggested, it is reasonable to expect that such differences in resonance may contribute to the differences in how high- and low-power individuals process other people. Specifically, given the balance of the literature suggests that people in positions of power tend to act in a self-interested manner and display reduced interpersonal sensitivity to their powerless counterparts (Fiske, 1993; Galinsky, Gruenfeld, & Magee, 2003; Galinsky et al., 2008, 2006; Keltner, Gruenfeld, & Anderson, 2003; Russell & Fiske, 2010), we hypothesized that high-power
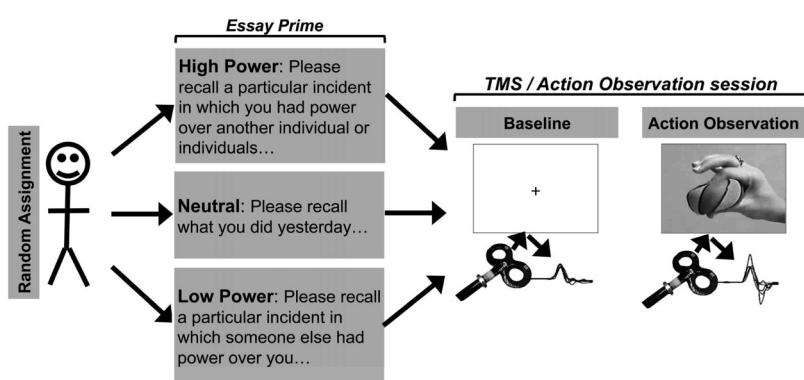

Figure 1. Schematic of the experiment. TMS = transcranial magnetic stimulation.

priming would decrease resonance, whereas low-power priming would increase it.

Method

Participants

Forty-five participants took part in the experiment for financial remuneration or partial course credit. On the basis of previous between-group MEP studies, it was determined that 36 participants would be sufficient to achieve statistical power of 80% ($d = 1.19$; Fitzgibbon et al., 2012; Fourkas, Bonavolontà, Avenanti, & Aglioti, 2008). However, since we were combining the MEP measure with a priming technique that typically demonstrates slightly smaller effects ($d = 0.80$; Galinsky et al., 2008, 2006), we ran nine additional participants to attain sufficient statistical power. Participants were assigned to the high-power ($n = 18$; 11 female, 7 male; $M = 20.59$ years, $SD = 2.12$), low-power ($n = 17$; 13 female, 4 male; $M = 20.65$ years, $SD = 2.12$), or neutral ($n = 10$; 8 female, 2 male; $M = 18.63$ years, $SD = 0.81$) condition. All participants had normal or corrected-to-normal vision, and all but five participants were right-handed. Participants were screened for contraindications to TMS prior to participation, and informed consent was obtained from all participants.

Apparatus and Stimuli

The TMS experiment was programmed with SuperLab (Version 4; Cedrus Corporation, San Pedro, California) and run on a Dell desktop computer with stimuli displayed on a 20-in. (50.8-cm) LCD monitor. TMS was carried out with a Magstim Rapid^2 system (Magstim Company Ltd., Wales). EMG data was recorded with a Biopac psychophysiological recording system (Biopac Systems Inc., Goleta, California). MEPs were measured with pairs of 8-mm surface electrodes placed in a belly-tendon arrangement over the abductor pollicis brevis muscle of participants' right hand. The EMG signal was acquired with a 1,000-Hz sampling rate, amplified (to 5.0 mV), and filtered (bandpass 10–500 Hz), and sent to a laptop computer for offline analysis.

Stimuli were videos depicting a right hand (palm facing down) squeezing a rubber ball between the thumb and index finger, such that the ball was substantially deformed (see Figure 1). The videos consisted of a single squeeze repeated three to seven times. Video editing was performed with Adobe Premiere Pro CS4 (Adobe Systems Inc., San Jose, California). All inferential statistical analysis was performed with SPSS statistics (Version 17; SPSS Inc., Chicago, Illinois).

Procedure

Participants entered the laboratory, were seated in front of the computer, and asked to write an essay. Participants in the low-power group wrote about an experience where someone had power over them; those in the neutral group wrote about what happened the day before they came in for the study; and lastly, participants in the high-power condition described an experience where they had power over someone else. In the literature, this essay writing procedure for priming power has demonstrated a profound and far-reaching impact on a variety of downstream behavioral mea-

sures, affecting participants' ability to recognize emotional facial expressions (Galinsky et al., 2006), their tendency to conform to others' behavior (Galinsky et al., 2008), and even something as fundamental as their sense of agency (Obhi et al., 2012). Therefore, we reasoned that it would be an apt technique for activating high, neutral, or low power prior to measuring motor resonance during a TMS/action observation session.

For the TMS setup, participants were seated in a Brainsight Gen 3 TMS chair (Rogue Research, Montréal, Canada). The experimenter located the vertex and hand area of left primary motor cortex (M1) using a standard landmark technique (Hogeveen & Obhi, 2012). A Brainsight neuronavigation system (Rogue Research, Montréal, Canada) ensured stable coil positioning throughout the experiment (Lepage, Tremblay, & Théoret, 2010). Lastly, akin to several studies in the literature, stimulator output was lowered to determine the minimum intensity capable of eliciting visible MEPs (~1 mV peak to peak) on more than 50% of TMS pulses, which was used as the protocol intensity rather than stimulating at 110%–120% of resting motor threshold (Enticott et al., 2012; Hogeveen & Obhi, 2012; Lepage et al., 2010). Stimulation intensity ranged from 49% to 75% ($M = 61\%$) of stimulator output.

In the first part of the TMS experiment, baseline corticospinal excitability was determined by delivering 30 TMS pulses while participants viewed a fixation cross. Next, participants began the action observation block, which contained 75 total trials, containing a fixation cross (2,000 ms), followed by videos of the hand-squeezing action (3,750–8,750 ms). TMS pulses were delivered at points of maximum squeeze intensity on 30 of the trials. During the baseline block, participants counted the number of seconds the fixation was presented. Similarly, during the action observation block, participants counted the number of squeezes contained in each video. TMS pulses in both blocks occurred 3,128, 4,328, 5,494, or 6,728 ms after trial onset. Therefore, the task and temporal information during baseline and action observation were matched, making fixation cross versus action videos the only difference between the two blocks.

Results

For each participant, raw MEPs greater than 3 standard deviations from their mean were omitted from analysis. This resulted in the removal of 1.38% of the data. Our main dependent measure of motor resonance was the change in MEP amplitude between the baseline block and the action observation block—henceforth referred to as MEP facilitation. For this measure, participants with a mean change falling outside 2.5 standard deviations of the group average for each experimental condition (high power, neutral, low power) were excluded. This procedure resulted in removal of one participant in the high-power condition.

MEP Facilitation: Power Groups

Our main analysis was a one-way analysis of variance with one factor at three levels (i.e., power: high, neutral, or low). Since we hypothesized that higher power would lead to a reduction in MEP facilitation, we ran a linear contrast to test this prediction. Accordingly, we obtained a significant linear effect of power on MEP facilitation, $F(1, 42) = 5.44$, $p = .03$, $d = 0.72$. Crucially,

participants in the high-power condition displayed lower MEP facilitation ($M = -4.10\%$, $SD = 28.51\%$) than participants in the low-power condition ($M = 26.06\%$, $SD = 35.84\%$), $t(32) = 2.72$, $p = .01$, $d = 0.96$ (see Figure 2A). Mean MEP facilitation for the neutral group ($M = 12.14\%$, $SD = 51.17\%$) fell between the two power groups. However, despite being numerically intermediate, MEP facilitation for the neutral group was not statistically different from either power priming condition: high power versus neutral, $t(26) = 1.08$, $p = .14$, $d = 0.42$; low power versus neutral, $t(26) = 0.85$, $p = .20$, $d = 0.34$. Thus, participants in the high-power group displayed significantly less MEP facilitation than participants in the low-power group, but the neutral condition did not differ from either of the power conditions significantly.

Since the number of female participants differed between the high- and low-power conditions, we ran targeted t tests to examine any potential gender differences in motor resonance in the present sample. There was no differences in MEP facilitation between male ($M = 6.47\%$, $SD = 49.47\%$) and female ($M = 13.20\%$, $SD = 34.88\%$) participants across the three experimental groups, $t(43) = -0.52$, $p = .61$, $d = 0.15$. Importantly, there were no gender differences for participants in the high- or low-power group (male, $M = 11.01\%$, $SD = 51.54\%$; female, $M = 10.96\%$, $SD = 27.49\%$), $t(32) < 0.01$, $p > .99$, $d < 0.01$. Therefore, the gender imbalance between the two power groups is unlikely to have mediated the effect of power priming on MEP facilitation.

Power, Valence, and Action in the Essays

Independent coders rated each essay for power and emotional valence, on a 7-point scale. Emotion was included because high power is correlated with positive affect (Keltner et al., 2003). Power was ranked from most powerless to neutral to most powerful, whereas emotion was ranked from most negative to neutral to most positive. Coders were given very basic instructions prior to scoring the essays:

Power: How much power did the participant hold in the essay? From -3 (least power) to $+3$ (most power).

Valence: How powerful was their description of emotion in the essay? From -3 (most negative valence) to $+3$ (most positive valence).
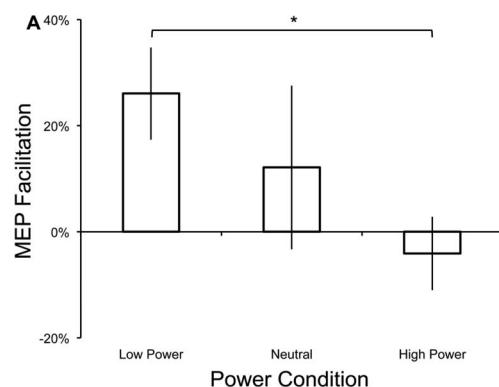
The coders provided reliable judgments of power ($r = .72$, $p < .001$) and valence ($r = .79$, $p < .001$), and therefore aggregate scores were adopted for further analyses. Aggregate power displayed a significant linear trend as a function of the power condition, $F(1, 42) = 117.25$, $p < .001$, $d = 3.34$, with a similar results for emotional valence, $F(1, 42) = 16.78$, $p < .001$, $d = 1.27$. Power scores in the high-power group ($M = 1.68$, $SD = 0.88$) were significantly higher than the low-power group ($M = -1.44$, $SD = 0.81$), $t(32) = 10.74$, $p < .001$, $d = 3.80$, and the neutral condition fell in between the two power conditions ($M = 0.23$, $SD = 0.82$): low power, $t(26) = 5.31$, $p < .001$, $d = 2.08$; high power, $t(26) = 4.36$, $p < .001$, $d = 1.71$. High-power essays ($M = 0.68$, $SD = 1.53$) also contained significantly more positive affect information than the low-power essays ($M = -1.24$, $SD = 1.09$), $t(32) = 4.19$, $p < .001$, $d = 1.48$. The neutral condition ($M = 0.04$, $SD = 1.46$) was statistically similar to the high-power condition in terms of emotional valence ($p > .2$), but was significantly more positive than the low-power condition, $t(26) = 2.66$, $p = .01$, $d = 1.04$. Thus, aside from neutral and high power containing similar emotional valence, the amount of power and emotional content of the essays was in accordance with our expectations, with high-power participants describing more powerful and emotionally positive experiences than low-power participants.

Next, to ensure that it was not the activation of a motoric memory that drove group differences in MEP facilitation, independent coders also judged the amount of action described in each essay. The coders were given the following instructions prior to scoring the essays:

Action: Amount of action described in the essay? From 1 (least action) to 7 (most action).

Unfortunately, the coders disagreed slightly on the amount of action described in each essay ($r = .21$, $p = .18$). However, since any argument that recalling an action-laden memory drove the effect of power priming on MEP facilitation would predict differences between the two power groups, and action was coded reliably for those conditions ($r = .38$, $p = .03$), aggregate scores were used for further analysis. Unlike power and emotional valence, the action content in the essays did not display a significant linear trend as a function of power priming, $F(1, 42) = 0.26$, $p = .61$. The amount of action described in each essay was significantly higher in the neutral condition ($M = 4.50$, $SD = 1.18$) than in the
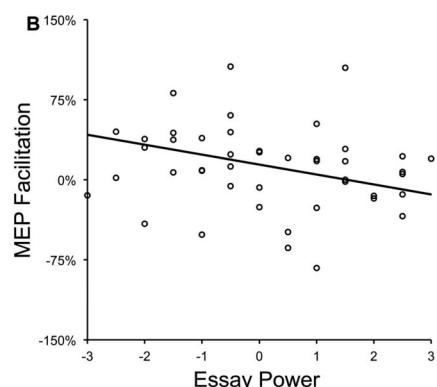

Figure 2. (A) Motor-evoked potential (MEP) facilitation and standard error of the mean (bars) for the three experimental conditions. * $p < .05$. (B) Degree of power described in the essays significantly predicted MEP facilitation.

high-power condition ($M = 2.56$, $SD = 1.14$), $t(26) = 4.33$, $p < .001$, $d = 1.68$, or low-power condition ($M = 2.76$, $SD = 1.21$), $t(26) = 3.371$, $p < .001$, $d = 1.46$. Crucially, there was no difference in the amount of action described by participants in the high- and low-power conditions, $t(32) = -0.51$, $p = .61$.

Relationship Between Rated Power and MEP Facilitation

In order to establish a continuous measure of the impact of power priming on MEP facilitation during action observation, a linear regression was run on all participants, regressing MEP facilitation onto coder-rated power, valence, and action. The overall model was not adequate, $F(3, 41) = 1.28$, $p = .30$, owing to the fact that the valence and action coefficients did not significantly differ from 0: $\beta_{valence} = 7.9\%$, $t(41) = 1.60$, $p = .06$; $\beta_{action} = 0.4\%$, $t(41) = 0.10$, $p = .46$. Interestingly, the power coefficient was significantly different from 0, $\beta_{power} = -9.3\%$, $t(41) = -1.89$, $p = .03$, $d = 0.59$, suggesting that, when valence and action are held constant, a one-unit increase in power (as operationalized by the degree of power described in the essays) predicts a significant drop in MEP facilitation (see Figure 2B). Furthermore, to ensure that the gender imbalance between groups was not mediating power's effect on MEP facilitation, we added gender to the regression. In this model, the power coefficient remained significant, $\beta_{power} = -9.7\%$, $t(40) = -1.97$, $p = .03$, $d = 0.62$.

Discussion

All behavior is the result of a confluence of internal drives and external influences (Obhi, 2012; Obhi & Haggard, 2004a, 2004b; Obhi, Matkovich, & Gilbert, 2009; Passingham, Bengtsson, & Lau, 2010). An important external influence is the behavior of conspecifics, and the degree to which an individual is prone to influence or be influenced by others is (at least partially) determined by their power (Galinsky et al., 2003). Given the suggestion that motor resonance provides a scaffold for understanding observed actions (Brass et al., 2009; Decety & Sommerville, 2009; Grafton, 2009; Spunt & Lieberman, 2012), and the powerful tend to be less inclined to gain a deep understanding of the less powerful (Anderson et al., 2003; C. M. Cheng & Chartrand, 2003; Dalton, Chartrand, & Finkel, 2010; Galinsky et al., 2006; van Kleef et al., 2008), we asked whether motor resonance would be less sensitive to observed actions in high-power relative to low-power individuals. Our results support this, and suggest a linear relationship between power and the motor resonance system, whereby increasing levels of power are associated with decreasing amounts of resonance.

These results support the view that rather than seek individuating information about new interaction partners, those with power tend to rely on stereotypes (Fiske, 1993; Fiske & Dépret, 1996; Russell & Fiske, 2010). Since stereotyping often serves to rationalize prejudice toward a group, our results may help to explain the previously reported link between increased prejudice and reduced resonance (Avenanti, Sirigu, & Aglioti, 2010; Gutsell & Inzlicht, 2010).

Though several researchers agree that high power leads to reduced processing of others' actions and emotions relative to low power (e.g., Fiske, 1993; Galinsky et al., 2006), some studies have

demonstrated an improved interpersonal sensitivity after high-power priming (Côté et al., 2011; Schmid Mast et al., 2009). By priming high or low power and measuring the downstream impact on motor resonance during passive action observation, the present study helps to resolve this issue, at least with respect to what we have termed the default effect of power. Specifically, reduced motor resonance in high-power, relative to low-power, individuals could represent one of the neural mechanisms underlying the tendency for increased power to result in decreased processing of social input in the majority of the psychological literature on power (see also Muscatell et al., 2012).

Given that our MEP results provide a direct and online read-out of motor resonance to a simple action stimulus, we propose that the default effect of high power appears to be reduced interpersonal sensitivity. That said, future work is needed to determine the individual and situational factors that might mediate the variable relationship between power and interpersonal sensitivity, as reported in the literature.

Future Directions

Future research will be needed to determine the mechanisms through which power impacts motor resonance. Though it is dangerous to rely solely on brain imaging to infer mental activity (cf. Poldrack, 2006), extant neuroimaging data are crucial for generating testable predictions for this work. In this vein, one possibility is that the posterior superior temporal sulcus (pSTS), a brain region that sends visual input to resonant brain areas, is inhibited or somehow deactivated by high power. This can be thought of as an input modulation account of our resonance effects (see also Hogeveen & Obhi, 2012; Obhi, Hogeveen, & Pascual-Leone, 2011). Correspondingly, one prediction is that in individuals with high power, brain activity related to perceiving observed actions (e.g., pSTS) might be negatively correlated with activity in regions involved in representing the self (e.g., medial prefrontal cortex). A similar modulatory mechanism has been put forward to explain how beliefs about another person's mental state might modulate gaze processing—that is, another important source of social sensory information—in a gaze cuing paradigm (Teufel et al., 2009).

Another, not necessarily mutually exclusive possibility is that resonant activity within the motor system is directly modulated by power priming. Such power-dependent direct modulation of motor cortical output could be achieved via prefrontal projections to premotor cortex (Amodio & Frith, 2006). Changes in premotor cortical activation could in turn reduce motor resonance for high-power individuals and increase it for low-power individuals. Clearly, on the basis of the present data, we cannot be certain whether any one, or some combination, of these proposed mechanisms underlies our findings.

Limitations

Regardless of the specific mechanisms, our results indicate that power is associated with different degrees of motor resonance during action observation, providing an important demonstration of how power impacts the neural representation of other people. Yet, as is the case with almost any study, there are several potential limitations that must be noted. First, it is possible that the essay writing procedure led to the activation of a powerful memory,

without necessarily inducing feelings of power. Although the episodic priming procedure has an established history of modulating a variety of downstream behaviors (Galinsky et al., 2003, 2008, 2006; Obhi et al., 2012), it has typically been assumed that this procedure activates a high- or low-power mind-set, but the extent to which this is true has not been established. Other power priming techniques requiring participants to think or act powerful, akin to what we might expect when one vividly recalls a high-power experience, have found that they do indeed trigger feelings of power (Carney, Cuddy, & Yap, 2010; Smith & Galinsky, 2010; Smith, Wigboldus, & Dijksterhuis, 2008). Though the present data cannot clarify that writing an essay recalling a vivid power experiences triggered a phenomenological experience of power, or activated a semantic network containing various concepts related to power, the fact that episodic memory recall has been found to reactivate elements of the brain network that was engaged in the original experience provides a solid theoretical basis for this type of manipulation (e.g., Gelbard-Sagiv, Mukamel, Harel, Malach, & Fried, 2008; Nyberg et al., 2001; Wheeler, Peterson, & Buckner, 2000). Furthermore, the results we observed on resonance are consistent with what would be predicted based on the balance of evidence on how power affects attunement to other social agents.

A second limitation of the present finding is that we cannot be sure whether resource depletion differences were created by the different power priming procedures (e.g., Inzlicht & Schmeichel, 2012; Muraven & Baumeister, 2000). Perhaps participants in the high-power group spent more time and effort during the writing phase compared to the other participants. According to this view, differences during the subsequent TMS/action observation session could result from a residual resource deficit in the high-power condition relative to the neutral and/or low-power conditions. However, essay word counts, our best estimate of time and effort spent on the task, did not significantly differ between the power groups (low power, $M = 301$, $SD = 96$; high power, $M = 259$, $SD = 110$; $p > .2$). Oddly, the neutral group wrote significantly longer essays than either power-priming group ($M = 400$, $SD = 142$), relative to high power, $t(26) = 2.96$, $p = .01$; low power, $t(26) = 2.19$, $p = .04$. If one were to argue that the level of effort devoted to essay writing, as indexed by essay word count, were driving the present results, the prediction would be a quadratic relationship between high-, neutral, or low-power priming and motor resonance. In contrast, our main analysis of variance demonstrates a significant linear relationship between power and motor resonance, which, to the extent that we can reasonably ascertain, is not consistent with a resource depletion account. Importantly, the power coefficient remains significant when word count is included in the regression model, $t(40) = -1.83$, $p = .04$, suggesting that resource depletion is not mediating the relationship between power (as coded in the essays) and MEP facilitation.

Finally, there was a gender imbalance between the two power groups, with the low-power condition containing more female participants ($n = 13$) than the high-power condition ($n = 11$). Since another neurophysiological index of motor resonance—suppression of the Rolandic alpha rhythm in the electroencephalogram—is reportedly greater in female relative to male participants (Y. Cheng et al., 2008), this might suggest that gender moderated the effect of power priming on motor resonance. However, we did not find any gender differences in MEP facilitation, and, to our knowledge, gender differences in MEP facilitation

during action observation have not been reported in the literature. Different patterns of results between alpha suppression and MEP facilitation are not surprising given the recent suggestion that M1 activity may be more accurately indexed by suppression of the adjacent beta frequency band (Hari, 2006; Lepage, Saint-Amour, & Théoret, 2008).

Conclusion

Despite these possible limitations, the main results we report are robust, and strongly suggest that power is negatively related to motor resonance. Indeed, anecdotes abound about the worker on the shop floor whose boss seems oblivious to his existence, or the junior sales associate whose regional manager never remembers her name and seems to look straight through her in meetings. Perhaps the pattern of activity within the motor resonance system that we observed in the present study can begin to explain how these occurrences take place and, more generally, can shed light on the tendency for the powerful to neglect the powerless, and the tendency for the powerless to expend effort in understanding the powerful.

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