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# Intellectual arrogance and intellectual humility: Correlational evidence for an evolutionary-embodied-epistemic account

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**ABSTRACT**

We outline an evolutionary-embodied-epistemic (EEE) account of intellectual arrogance (IA), proposing that people psychologically experience their important beliefs as valued possessions – *mental materialism* – that they must fight to keep – *ideological territoriality* – thereby disposing them toward IA. Nonetheless, IA should still vary, being higher among people taking a hostile and domineering epistemic stance (rejecting reality, resisting evidence) than among those taking an open and deferential one (embracing reality, respecting evidence). Such variations can be predicted from people's standing on the *communion-agency circumplex* at multiple levels of analysis (i.e. from their social inclusion and status; dispositional warmth and competence; and behavioral amiability and assertiveness). Using pre-validated indices of mental materialism and ideological territoriality, and an argument evaluation task permitting the quantification of rational objectivity and egotistical bias, we obtained consistent correlational evidence that, as hypothesized, IA is the highest when agency is high and communion low, validating the EEE account.

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As Wilde (1895) once observed, 'truth is rarely pure and never simple' (p. 10). One reason is that the world is hard to understand in itself (Blackburn, 2005). But there is another reason: human minds can operate in a way that obscures apprehension of reality (McGinn, 1993; Wolpert, 2013). Indeed, decades of research document abundantly the myriad ways in which human cognition falls short of optimal rationality (Ariely, 2009; Gilovich, Griffin, & Kahneman, 2002; Nickerson, 1998), even if mental shortcuts may operate tolerably well in practice (Gigerenzer & Goldstein, 1996). Moreover, much evidence points to human irrationality being at least partly the product of motivational biases (Gregg, Sedikides, & Gebauer, 2011; Kunda, 1990; Molden & Higgins, 2012). People are prone to promote and protect their own preferred opinions (Ditto & Lopez, 1992; Edwards & Smith, 1996; Sedikides & Strube, 1997; Stanovich & West, 2008; Taber, Cann, & Kucsova, 2009).

Specifically, in evaluating the quality of arguments bearing on some issue, people's prior opinions on that issue sway their evaluations of those arguments, independently of the objective quality of those arguments (Sá, West, & Stanovich, 1999; Stanovich & West, 1997). Such compromised evaluations may be characterized in terms of their psychological (as opposed to philosophical) *direction of fit* (Gregg & Sedikides, in press; Tenenbaum, 2006). Not only is this fit *mind-to-world* – disinterestedly reflecting how things actually are – but also *world-to-mind* – prejudicially reflecting how one sees things. Belief is corrupted, among other things, by the operation of the *self-enhancement motive* (Alicke & Sedikides, 2011; Sedikides & Gregg, 2008), resulting in a surfeit of regard for one's own perspective – an *egotistical bias* – combined with a deficiency of regard for reality – a *lack of objectivity*. Such epistemic transgressions can be seen as hallmarks of *intellectual arrogance* (IA), or as counter-indications of *intellectual humility* (IH). (See Gregg & Mahadevan, 2014; and the other contributors to this Special Issue, for additional discussion of these constructs.) To the extent that IA prevails over IH among a community of discussants, genuine understanding may be compromised, and practical catastrophes may result (Johnson, 2013; Shermer, 2015). Hence, it is important to develop a deeper understanding of the nature of IA and IH, including as a means of predicting their occurrence.

## Evolutionary accounts

One approach to these issues is *evolutionary* (Coyne, 2010; Darwin, 1859). Our human nature came to be what it is, at least in part, because it was conducive to the survival and reproduction of our ancestors. Accordingly, we can helpfully construe current aspects of our mind and behavior in terms of their ultimate *function* – as adaptations that were

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systematically selected for (Cosmides & Tooby, 2013) – or in terms of their historical *precursors* – as sophisticated elaborations of more primitive substrates (Tallis, 2003). To take but one example, self-esteem may have evolved partly to help optimize social competition (Mahadevan, Gregg, Sedikides, & De Waal-Andrews, 2016; Petersen, Sznycer, Sell, Cosmides & Tooby, 2013; Sedikides, Skowronski, & Dunbar, 2006) and be rooted in simpler judgments of the capacity to hold onto valued resources (Price, Sloman, Gardner, Gilbert, & Rohde, 1994; Sedikides & Skowronski, 1997).

Note that, despite the integrative power of the evolutionary framework (Neuberg, Kenrick, & Schaller, 2010), not everything about mind and behavior may be fully interpretable in terms of genetically-coded biological evolution. In particular, it is unclear how exactly the capacity to *explicitly recognize and seek truth* – which is arguably presumed by many definitions of IA and IH – arose (Nagel, 2012; Tallis, 2011). This unique capacity goes hand in hand with many others, such as expressing oneself linguistically (Pinker, 2008), apprehending oneself reflexively (Corballis, 2011), and engaging in reflective or propositional thought (Gawronski & Bodenhausen, 2011; Strack & Deutsch, 2004). To this extent, humans may exhibit a type of *emancipated cognition* (Gregg & Mahadevan, 2014) that defies complete naturalistic explanation.

Nonetheless, as Wittgenstein (1953) pithily put it, '[t]he human body is the best picture of the human soul' (p. 178). This insight is the basis of the field of *embodied cognition* (Barsalou, 2008). The key proposal here is that abstract or symbolic concepts have perceptual or physical roots, often foreshadowed in metaphorical correspondences (Lakoff & Johnson, 1980). For example, the vertical dimension of physical space symbolically conveys differentials in *power* – a phenomenon detectable in paradigms where targets are judged more readily as powerful to the extent that they occupy visibly higher positions (Schubert, 2005). Behaviorally, the bodily act of making a fist also makes men feel more powerful (Schubert & Koole, 2009). At the same time, the horizontal dimension of physical space conveys symbolically differentials in interpersonal *closeness* – a phenomenon capitalized on by measures that scale intimacy in terms of visual overlaps (Schubert & Otten, 2002). Behaviorally, the bodily act of approaching outgroup members also decreases people's implicit dislike of them (Kawakami, Phills, Steele, & Dovidio, 2007). In all these cases, a more primitive psychological phenomenon lies behind a more sophisticated one. Moreover, the evolutionary roots of the more primitive phenomenon may be easier to discern. Indeed, the basis of social cognition may be a set of embodied cognitive modules that specifically answer the adaptive problems set by evolution (Kaschak & Maner, 2009).

In a similar vein, theories have advanced more general accounts of cognition guided by evolutionary considerations. For example, human beings' reasoning capacities may have evolved, not to facilitate knowledge acquisition or good decision-making, but rather to facilitate *practical argumentation* – the purpose of which is to persuade peers to do one's bidding, or to screen their communications for trustworthiness (Mercier & Sperber, 2011). This theory accounts for, among other things, the existence of confirmation bias (which aids persuasion) and the superiority of reasoning in the context of dialectical discussion (i.e. its natural context). Equally, *self-deception* may have evolved as an anti-screening strategy: for no deception can be detected if one believes one's own lies (von Hippel & Trivers, 2011), which may explain why the objectively overconfident do receive better peer evaluations (Lamba & Nityananda, 2014). Finally, *error management theory* (Haselton, Nettle, & Andrews, 2005) explains many cognitive biases in terms of a natural selection for errors of judgment least likely to imperil the organism – those that yield many harmless false alarms but few fatal misses. Thus, heterosexual men, but not women, overestimate the opposite sex's erotic interest in them (Haselton, 2003).

The above research illustrates how construing human beings as biologically rooted creatures shaped by evolution has yielded some theoretically promising and empirically supported accounts of various psychological phenomena. Below, we attempt to do the same for IA and IH.

### *Mental materialism and ideological territoriality*

Much philosophical ink has been spilled in an attempt to resolve the classic *mind-body problem* (Descartes, 1637/1999; McGinn, 1993; Searle, 1992). In brief, it is not clear how something ethereal like the mind, with its abstract ideas, can be identical to something physical like the brain, with its concrete location. However, we propose here that people *intuitively* bridge the infamous mind-body dichotomy – at least for beliefs central to their identity (Gregg et al., 2011). In particular, at a psychological level, people *experience their important beliefs as valuable possessions that they must fight to keep* (Abelson, 1986). More formally, people exhibit both *mental materialism* and *ideological territoriality* (Gregg & Mahadevan, 2014). Mental materialism involves evaluating beliefs more positively because they are one's own, and consequently becoming more attached to those beliefs – much as people exhibit an *endowment effect*, valuing goods that are theirs more than others', and consequently asking for more money to relinquish the former than they offer to acquire the latter (Morewedge, Shu, Gilbert, & Wilson, 2009). Ideological territoriality, a natural outgrowth of mental materialism, involves a combative approach to argumentation: seeking

to prevail rhetorically rather than to arrive at the truth, so as to protect or promote one's own existing beliefs – much as people seek to defeat enemies vying for scarce resources, so as to maintain or expand control over some geographical area (Edney, 1974). We propose that mental materialism and ideological territoriality reflect a default mode of embodied cognition, a hangover from our evolutionary heritage, and that they lie at the root of IA.

Mental materialism and ideological territoriality are not, however, inevitable; human beings are, in principle, still capable of emancipated cognition – that is, of weighing the merits of beliefs from a detached and impartial perspective (*mental detachment*) and of treating argumentation as a cooperative means of getting at the truth (*ideological neutrality*). These relatively cultivated activities – which require logical and methodological discipline (e.g. philosophy or science) – lie at the root of IH (Blackburn, 2005; Wolpert, 2013). The embodied-emancipated dichotomy might also be considered yet another addition to the pantheon of dual-factor models of cognition (Evans, 2012; Kahneman, 2011). Let us call our general account of IA and IH the *evolutionary-embodied-epistemic* account, or *EEE* account for short.

### Existing evidence for the EEE account

Three lines of evidence provide initial support for the EEE account. The first is circumstantial and involves language. Clusters of linguistic terms metaphorically refer to belief in terms of physical objects, and to argumentation in terms of physical conflicts.

Like physical objects, beliefs can be *held*. Equally, they can be *acquired* or *discarded*, *picked up*, or *set aside*. As bits of stuff, they may also be *shaped* or *molded* over time; for having been initially *flexible*, they can eventually become *fixed*. Moreover, their close cousins – ideas – can be *grasped*. Like valued possessions, moreover, ideas can be *shared* or *traded*. However, if someone tries to *sell* you an idea, you may not *buy* it; it may be a *load* of nonsense, of which you need to *take stock*. Moreover, although you may *have your* beliefs, and I may *have mine*, it is not clear whether either of us is *entitled* to them. Either way, people may become *attached* to their beliefs. If they find a belief *attractive*, they may *cherish* it *dearly*, *clinging* to it and being loath to *give it up*.

Like physical conflicts, moreover, arguments can be *won* or *lost*, by people on *different sides* of an issue, who describe themselves as being either *for* or *against* some *bone of contention*. In terms of territory, *opponents* try to *attack* or *defend* each other's *positions*, which are either *strong* or *weak*, and which they may be inclined to *advance* or *retreat from*, because the *grounds* for *maintaining* them can be relatively *solid* or *shaky*. Indeed, argumentation itself is weaponized, with each side striving to make *incisive points* that cannot be *parried*, not matter how much their opponents seek to *deflect* or *dodge* them. Ultimately, the *rival claims* that are *disputed* need to be *supported* or *shored up*, lest they be *undermined* or *demolished*.

A second line of evidence for the EEE account is that several studies have already demonstrated a causal connection between physical and psychological construals. For example, people who are made to hold heavier objects regard the issues under consideration as more important (i.e. 'weightier') and think more carefully about them (Jostmann, Lakens, & Schubert, 2009). In addition, when people commit their beliefs to paper, those beliefs feature more strongly in their subsequent judgments when that paper is preserved (by being stored in their pockets) than when that paper is destroyed (by being torn up and discarded) (Brinol, Casdcol, Petty, & Horcajo, 2012). Finally, both affirming the self (by listing an important value), and threatening the self (by having participants summarize a very difficult passage), alters the prices that sellers and buyers initially announce they would prefer to trade a physical good at. The standard finding is that sellers, who own the product, announce a higher price than buyers, who intend to own it; yet affirming the self increases this price discrepancy whereas threatening the self reduces it, suggesting a communality between monetary and psychological currency (Chatterjee, Irmak, & Rose, 2013).

Gregg, Mahadevan, and Sedikides (2016) provided a third line of experimental evidence favoring the EEE account. Participants considered a hypothetical theory about two arbitrarily named alien species on a faraway planet. The theory stated that one species was the predator and the other its prey. Participants read, one by one, seven pieces of evidence bearing on this theory, each time estimating its likely truth or falsity on a sliding scale ranging from 100 (*certain to be true*) to 0 (*certain to be false*). The evidence initially supported the theory, but then cast doubt on it. Across different studies, the theory was subtly ascribed either to the participant themselves ('You have a theory'), to another person ('Alex has a theory'), or to no one at all ('There is a theory'). People estimated the theory to be more likely to be true when it was 'theirs'. This effect is consistent both with people being disposed to regard their own theories as superior (i.e. as true) and with being reluctant to abandon them, that is, with mental materialism.

### Expanding and testing the EEE account

The EEE account can be expanded to make further testable predictions. This can be done by invoking, on the one hand, additional considerations of embodiment, and, on the other hand, a key integrative model in psychology.

In principle, what traits would define someone high in IH – someone striving for objectivity, whose epistemic orientation is mind-to-world? Arguably two: she should *welcome* and *embrace* reality, in a spirit of *openness*; and she should *follow* the arguments and *respect* the evidence, in a spirit of *deference*. Indeed, reflective rationality can be defined as a self-imposed duty to constrain one's beliefs, and delusion as a failure to do so (Gregg, 2009). In embodied terms, someone high in IH would be *drawing closer* to some *higher* reality, and *obligingly* letting it impose its imprint *upon* her.

Conversely, what traits in principle would define someone high in IA – someone succumbing to egotistical bias, whose epistemic orientation is world-to-mind? Arguably two: he should *ignore* and *reject* reality, in a spirit of *hostility*; and he should *resist* arguments and *refuse to bow* to evidence, in a spirit of *dominance*. In embodied terms, he would be *looking down* on some *uncongenial* reality, and seeking *stubbornly* to impose his preferences *on* it.

These contrasting epistemic stances (hostile + dominant vs. open + deferential) can also be efficiently characterized in embodied terms – as being either *against and above* the world or *toward and below* the world (Figure 1). Note too how the two dimensions described have echoes in the embodiment literature (e.g. openness-hostility = closeness: Schubert & Otten, 2002; dominance - deference = hierarchy: Schubert, 2005).

Now, someone high in IA is arguably liable to exhibit more mental materialism and ideological territoriality than someone high in IH. In particular, the more one values and is attached to one's own beliefs, the less open one is to abiding by the indications of some contrary reality;

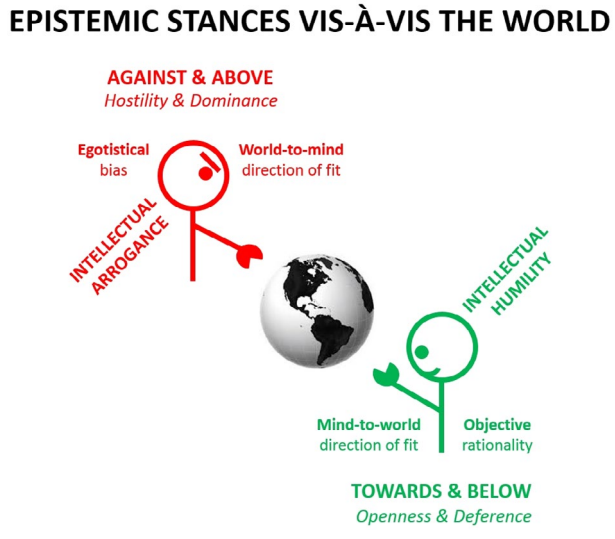


**Figure 1.** Contrasting epistemic stances vis-à-vis the world, and their theorized relation with intellectual arrogance and intellectual humility.

and adopting a combative approach to argumentation is one way to express a hostile and domineering attitude. In support of this view, other theorizing and research has characterized variations in IH and normative rationality in terms of each of the two dimensions above. The openness-hostility dimension arguably maps on to individual differences in *open-mindedness* versus *closed-mindedness* (Kruglanski, 2013) – which has been linked to IH both theoretically (Spiegel, 2012) and empirically (Ottati, Wilson, & Price, 2015). The deference-dominance dimension – which is theoretically linked to IH when characterized as a conspicuous lack of concern with status (Roberts & Wood, 2003) and low self-exaltation (Cleveland, 2015) – maps on to individual differences in *social dominance orientation* as a source of prejudice (Sidanius & Pratto, 1999) and *social vigilantism* (i.e. the 'tendency of individuals to impress and propagate their superior beliefs') as a source of resistance to persuasion (Saucier & Webster, 2010, p. 19).

Thus, although mental materialism and ideological territoriality may be built-in psychological proclivities, they also admit of variation that can be characterized along both an openness-hostility dimension and a dominance-deference dimension. How might such variation be predicted?

Both dimensions can be arranged in terms of the *circumplex* – a general model that features a pair of orthogonal super-dimensions characterizing a diversity of psychological phenomena (Abele & Wojciszke, 2014; Bakan, 1966; Cuddy, Fiske, & Glick, 2008; Foa, 1961; Huo, Binning, & Molina, 2010; McCrae & Costa, 1989; Moskowitz, 1994; Paulhus & John, 1998; Wiggins, 1979). These are *communion* and *agency*. Broadly speaking, they have to do, respectively, with relating to others and acting in the world. At different levels of analysis, moreover, they take different forms. At a *social* level, they manifest as *inclusion* and *status*; at a *dispositional* level, as *warmth* and *competence*; and at a *behavioral* level, as *amiability* and *assertiveness* (Mahadevan, Gregg, Sedikides et al., 2015). At each of these levels, a pattern of lower communion and higher agency should predict an epistemic stance that is against and above the world (i.e. high in IA), whereas a pattern of higher communion and lower agency should predict an epistemic stance that is toward and below the world (i.e. low in IA). In particular, people who are (a) low in inclusion but high in status, (b) low in warmth but high in competence, and (c) low in amiability but high in assertiveness, should exhibit greater IA, whereas people with a diametrically opposed standing should exhibit less IA (Figure 2). That is, people's social position, their personality disposition, and their behavioral inclination should facilitate the adoption of a hostile (as opposed to open) and domineering (as opposed to obliging) orientation that gets carried over into their epistemic stance toward the world.

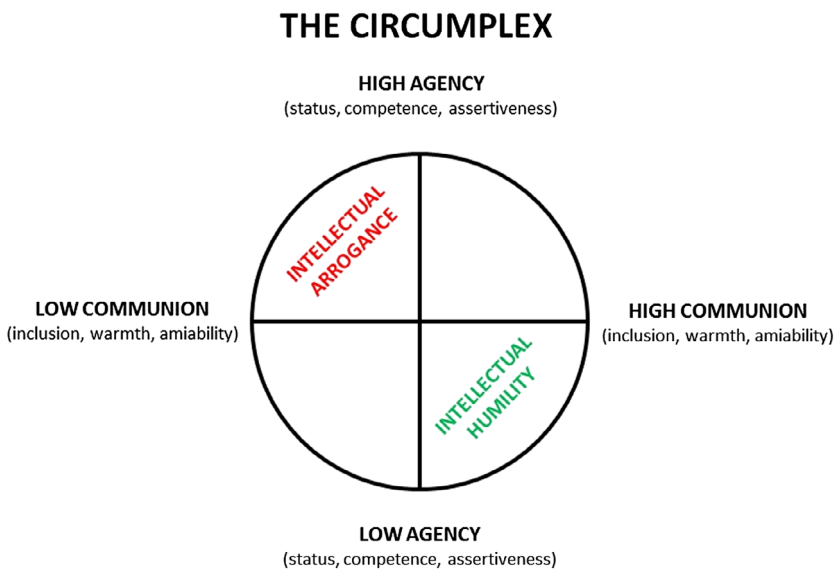


**Figure 2.** The circumplex, its orthogonal dimensions, and their predicted empirical relation with intellectual arrogance and intellectual humility.

To summarize: Human cognition is partly embodied. People have a default inclination to manifest mental materialism and ideological territoriality – that is, to treat their important beliefs as valuable possessions that they must fight to keep. This default inclination is a form of IA (as opposed to IH) and commonly manifests itself as an egotistical bias or a lack of objectivity. However, IA, so characterized, can also vary. Specifically, to the extent that people adopt an epistemic stance that is, in embodied terms, against and above world (i.e. more hostile than open, and more domineering than deferential), their IA will be higher. This epistemic stance can be predicted, moreover, from high levels of agency and lower levels of communion, at multiple levels of analysis.

### *Quantifying variations in IA and IH*

To test our predictions empirically, we employed a complementary pair of indices of IA/IH. The first index was a bespoke self-report inventory designed to assess individual differences in both mental materialism and ideological territoriality. Entitled the *Brief Intellectual Arrogance Scale* (*BIAS*), its purpose was to operationalize the constructs directly referenced in EEE theory themselves. The second index was a new version of a prior instrument (Stanovich & West, 1997), and was here used to operationalize a principal cognitive manifestation of IA/IH. Entitled *Gregg's Revised Evaluation of Arguments Task* (*GREAT*), its purpose was to quantify the extent to which people's evaluations, of the quality of arguments bearing on various issues, reflected either (a) the independently determined quality of those arguments (indicating rational objectivity), or (b) their own prior opinions on those issues (indicating egotistical bias). Importantly, both our indices of IA/IH had undergone prior validation (further details below).

### *Quantifying variations in agency and communion*

Following on from Mahadevan, Gregg, Sedikides et al. (2016), we operationalized communion and agency at three levels: socially, as inclusion and status; dispositionally, as warmth and competence; and behaviorally, as amiability and assertiveness. In all cases, we relied on respondents' self-reports, using scales and items derived from previous research (further details below).

### *Design, analysis, and predictions*

In a cross-sectional design, we sought to determine whether the pattern of relations that emerged between the operationalizations of agency and communion, on the one hand, and the BIAS and GREAT indices, on the one other, would be consistent with our expanded EEE account.

Our statistical strategy to uncover such relations was as follows. Each time, we regressed relevant scores reflecting IA/IH – from the BIAS and the GREAT – on a pair of predictors, with each pair corresponding to agency and communion at one of the three levels of analysis (i.e. social, dispositional, behavioral). We did this because, although the respective dimensions of the circumplex at each level are conceptually distinct, they can sometimes be empirically correlated, creating the need for mutual statistical control.[1] In line with our extended EEE account, we predicted the emergence, in each of these multiple

regressions, of (a) a negative beta weight for the communal variable (i.e. lower IA), and (b) a positive beta weight for the agentic variable (i.e. higher IA). The combination of these two beta weights would figuratively place higher IA in the upper left quadrant of the circumplex, and lower IA in the bottom right quadrant.

For completeness, we also included, in each of these regressions, an additional predictor representing a multiplicative combination of both predictors. This permitted us to test for the possibility of a synergistic interaction emerging that would also be consistent with our extended EEE account, such that lower agency and higher communion scores together predicted higher IA (or lower IH), above and beyond their individual additive contributions.

## Method

### Platform and procedure

We ran the study online, as part of a larger survey lasting about an hour. We created its content using the internet survey software *iSurvey* (University of Southampton, 2015). We crowdsourced participants via the leading platform *CrowdFlower*. They signed up voluntarily in exchange for payment of $3.00. We targeted Western and English-speaking participants using interface options. Before beginning, all participants viewed an information sheet. Thereafter, they indicated their consent by clicking a box. Finally, after completing the survey – mostly by clicking radio buttons on assorted questionnaires – they viewed a debriefing statement.

Crowdsourcing provides reliably an abundance of valid data, both rapidly and cheaply, from diverse participants (Buhrmester, Kwang, & Gosling, 2011; Paolacci & Chandler, 2014). Nonetheless, out of prudence, we still excluded cases that featured (a) skipping of survey content (i.e. fewer than 95% of items completed); (b) identical responses to any questionnaire with reversed-score items (suggesting mindless button-clicking); (c) duplicate IP addresses (suggesting multiple completions); (d) suspiciously short durations (i.e. in less than half the median survey time); (e) poor self-reported English proficiency; and (f) a self-reported age below 18 years. Our final sample contained 722 participants.[2] These were mostly female (61.1%), mostly young ($M_{AGE}$ = 36.0; $SD_{AGE}$ = 11.7), mostly North American or British (USA: 47.5%; UK: 26.6%; Canada: 18.4%; Others: 7.5%), and generally well educated (53.8% with a college degree, 99.7% with a high school or equivalent diploma).

### Indices of communion and agency

#### Inclusion and status

We assessed communion and agency at a social level – one's inclusion and status as accorded by peers – using 9-item ($\alpha$ = .93) and 8-item ($\alpha$ = .91) self-report scales, respectively. Both scales were based on those devised by Huo et al. (2010), but included new items and excluded existing items so as to streamline conceptual coverage, and to optimize a two-factor solution (Mahadevan, Gregg, & Sedikides, 2015). Both scales featured a 5-point response format (1 = *strongly disagree*, 5 = *strongly agree*). All items began with the same sentence stem ('Most of the time, I feel that people …') and ended with a different sentence completion. Sample items: 'see me as fitting in' (inclusion); 'see me as an important person' (status).

#### Warmth and competence

We assessed communion and agency at a dispositional level – one's warmth and competence as self-ascribed – using two 7-items self-report scales (with $\alpha$ = .89, and $\alpha$ = .84, respectively). We selected adjectives a priori from stimuli used in previous research on communal and agentic personality traits (Campbell, Rudich, & Sedikides, 2002). Both scales featured a 7-point response format (1 = *strongly disagree*, 7 = *strongly agree*). All items began with the same sentence stem ('On the whole, I see myself as …') and ended with a different trait adjective. Item lists: *caring*, *helpful*, *supportive*, *friendly*, *kind*, *gentle*, *nice* (warmth); *competent*, *effective*, *strong*, *powerful*, *capable*, *intelligent*, *talented* (competence).

These scales being newly formulated, we also conducted an exploratory factor analysis of all items together, using Principal Axis Factoring with a Direct Oblimin rotation. This revealed two factors, correlated at $r$ = .43, with eigenvalues above 1, together accounting for 56% of the variance. Validating the intended structure, the pattern matrix items loaded on matching factors with a minimum value of .50, and on mismatching factors with a maximum value of .15.

#### Amiability and assertiveness

We assessed communion and agency at a behavioral level – one's amiability and assertiveness as displayed in an interpersonal context – using a 32-item self-report inventory, the *International Personality Item Pool–Interpersonal Circumplex* (Markey & Markey, 2009), which has underdone prior validation (Markey, Anderson, & Markey, 2013). Its items were devised, not merely to divide the circumplex for interpersonal behavior into quadrants – via the double-bisection of the two main orthogonal dimensions – but additionally to divide it into octants, such that half its items assess blends of the two main dimensions, figuratively lying at 45° angles from each vertex (Wiggins, 1979). Nonetheless, by appropriate multiplicative weighting (i.e. main dimensions by +/−1; blended dimensions by +/−Sin 45°), we computed total scores corresponding to overall amiability and assertiveness.[3] Moreover, to

compute internal consistency, we divided the 32 items into parallel halves of 16, and computed parallel amiability and assertiveness totals, whose intercorrelations we then adjusted upwards in line with the Spearman-Brown prophecy formula (Eisinga, Grotenhuis, & Pelzer, 2013), yielding values of $r_{ADJ}$ = .86 and $r_{ADJ}$ = .89.

## Indices of IA and IH

### Brief Intellectual Arrogance Scale

We assessed our two proposed elementary constituents of IA – namely, mental materialism and ideological territoriality – at a dispositional level, using two corresponding 6-item self-report scales (with $\alpha$ = .70 and $\alpha$ = .80, respectively). Items from both scales – all of which took 7-point bipolar form, and featured contrasting terminal statements – were devised a priori to map on to their respective constructs. In particular, items on the mental materialism scale were designed to capture egotistically inflated evaluations of one's own beliefs (e.g. *my personal ideas are very valuable as they are* versus *my personal ideas still have room for improvement*) and undue attachment to one's own beliefs (e.g. *right or wrong, I am entitled to hold my beliefs* versus *I should probably abandon many of the beliefs I hold*). Items on the ideological territoriality scale were designed to capture a combative approach to argumentation (e.g. *the only point of a debate is to arrive at the truth* versus *I enjoy defeating weaker opponents in debates*) and a tendency to want one's beliefs to prevail (e.g. *I would like to see my own opinions becoming widely shared* versus *I doesn't bother me that many people see things differently to me*).

A series of studies (Gregg, Mahadevan, & Pegler, 2015a) has yielded support for the construct validity of the BIAS. Crucially, both the mental materialism and ideological territoriality subscales correlated positively with a standard measure of materialistic desire for physical goods (Richins & Dawson, 1992), as well as a standard measure of physical aggression (Buss & Perry, 1992). In addition, both correlated positively with social vigilantism (Saucier & Webster, 2010), with reactance proneness (Shen & Dillard, 2005), as well as with psychological variables that promote cognitive bias, such as dogmatic and categorical thinking (Stanovich & West, 1997). Thus, both the BIAS subscales fit neatly into the nearby nomological web.

### Gregg's Revised Evaluation of Arguments Task

We assessed a principal cognitive manifestation of IA using GREAT, a completely updated version of the *Argument Evaluation Test* (*AET;* Sá et al., 1999; Stanovich & West, 1997). The purpose was the same: to estimate the extent to which participants' evaluations of a set of arguments is objectively rational, reflected in the degree of correspondence with normative evaluations of those arguments, or egotistically biased, reflected in the degree of correspondence with personal opinions related to those arguments. This task ran as follows. Participants began by indicating, on 7-point scales, their level of agreement or disagreement (1 = *strongly disagree,* 7 = *strongly agree*) with a set of statements expressing a variety of controversial political opinions (e.g. *Every worker should be legally guaranteed a minimum wage whatever job they do*; *Ordinary civilians should be legally permitted to own a standard firearm for personal use*). Next, they re-read every statement, now supplemented by series of three additional statements: an *argument* for it; a *counterargument* against that argument; and a *rebuttal* to that counterargument. In each case, participants then judged 'how weak or strong […] the rebuttal […] is, while ignoring [their] own opinion' (1 = *extremely weak,* 7 = *extremely strong*). Subsequently, the mean ratings of the quality of the rebuttals were computed to estimate the normative quality of those arguments (Surowiecki, 2004).

On the basis of these three sets of ratings – individual prior opinions, individual argument evaluations, and normative argument evaluations – we computed a multiple regression for each participant (Figure 3). We used the beta weight corresponding to the prediction of individual argument evaluations from individual prior opinions in order to operationalize each participant's level of egocentric bias; and we used the beta weight corresponding to the prediction of individual argument evaluations from normative argument evaluations (constant across participants) in order to operationalize each participant's level of rational objectivity (Stanovich & West, 1997). Thus, we derived separate estimates for egocentric bias and rationality objectivity. The statistical control afforded by such beta weights makes them more specific indices than raw

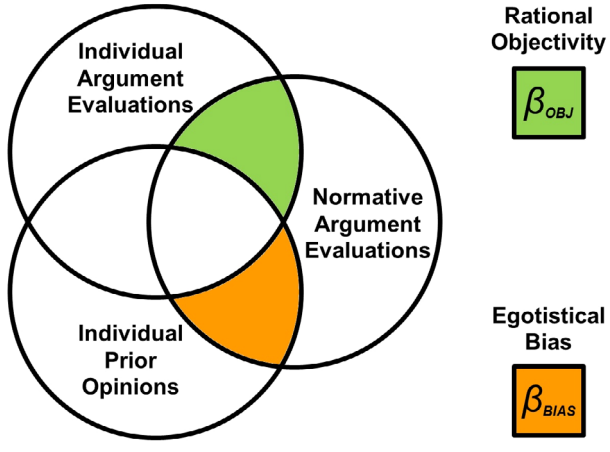


**Figure 3.** Schematic diagram representing the variables featuring in the within-participants regression for Gregg's Revised Evaluation of Arguments Task (GREAT), yielding separate coefficients designed to capture egotistical bias and rational objectivity, respectively.

correlational coefficients would be.[4] We also took care to exclude any anomalous beta weights in excess of .99, which multicollinearity occasionally produced.

The content of GREAT, which was entirely novel, had been designed to be briefer, more standardized, more ideologically balanced, and more internationally accessible than the original AET. First, unlike the original AET, whose statements and arguments contained up to 49 words, and varied greatly in length, no statement or argument in the GREAT contained more than 16 words, and most were nearly that long. In addition, whereas the AET repeated instructions with every item, the GREAT supplied them up front. Second, the GREAT, unlike the AET, did not require the participants to assume that any supplemental facts were true, or that any people were uttering them: arguments alone were presented. Third, in the GREAT, we designed half the statements to express left-wing points of view, and half right-wing ones; in contrast, political content in the AET was not explicitly balanced. Finally, whereas several items in the AET related specifically to US issues (e.g. *Interviews should be given a higher weighting in graduate school admissions than GREs or undergraduate GPAs*), items in the GREAT were relevant to developed nations generally (e.g. *When the economy is in a slump, the government should spend money to get it going*). In addition, the GREAT featured 24 items and 7-point scale, as opposed to the AET's 23 items and 4-point scale.

Several studies (Gregg, Mahadevan, & Pegler, 2015b) found support for the construct validity of the GREAT. First, in two samples, we asked participants to indicate additionally the extent to which they identified with each underlying issue on the GREAT, expressed as a label (e.g. *Minimum Wage*, *Gun Control*) on a three-point scale (1 = *I don't identify with this issue at all: it hardly matters to me*, 2 = *I somewhat identify with this issue: it somewhat matters to me*, 3 = *I strongly identify with this issue: it really matters to me*). We then computed separate aggregate indices of egotistical bias and rational objectivity based on issues idiosyncratically selected to be at each level of identification. In both samples, we obtained a predicted interaction: whereas aggregate levels of egotistical bias rose when computed on the basis of topics that mattered more rather than less to participants, aggregate levels of objectivity fell. Thus, identification promoted bias, where indifference promoted objectivity. These findings – which constitute a type of internal validation of the GREAT – replicate many others showing that self-enhancement biases are greater when the topic at hand is more central rather than more peripheral to people's identity (Gebauer, Wagner, Sedikides, & Neberich, 2013; Gregg et al., 2011; Sedikides & Green, 2009).

We also obtained some additional evidence of the GREAT's construct validity from external correlations. In particular, the rational objectivity coefficient – incidentally, the only one reported by Stanovich and West (1997) – correlated positively with openness to experience (Benet-Martínez & John, 1998) and with flexible thinking (Stanovich & West, 1997), but correlated negatively with the overclaiming bias (i.e. claimed recognition of fictitious relative to real words; cf. Paulhus, Harms, Bruce, & Lysy, 2003) and with questionnaire items assessing the self-deceptive enhancement of one's intellectual abilities (Paulhus, 1998). However, no such pattern of confirmatory correlations emerged for the egotistical bias coefficient.

## Results and discussion

### *Preliminary analyses*

Table 1 displays intercorrelations between the dependent variables, designed to capture IA/IH, namely, the mental materialism and ideological territoriality indices of the BIAS, and egotistical bias and rational objectivity indices of the GREAT. Table 2 displays intercorrelations between the independent variables designed to capture communion and agency at different levels: inclusion and status (social); warmth and competence (dispositional); and amiability and assertiveness (behavioral).

As would be expected, the mental materialism and ideological territoriality indices intercorrelated positively, consistent with the former being the hypothesized source of the latter. Also as expected, the egotistical bias and rational objectivity indices correlated negatively, consistent with each tending to exclude the another. Furthermore, as would be expected if both the BIAS and GREAT converged in assessing IA/IH (and despite the pronounced methodological dissimilarity of the instruments), their indices intercorrelated. Specifically, greater mental materialism and

**Table 1.** Correlations between indices of intellectual arrogance / intellectual humility.

| | Mental materialism (BIAS) | Ideological territoriality (BIAS) | Egotistical bias (GREAT) |
|---|---|---|---|
| Mental materialism (BIAS) | – | | |
| Ideological territoriality (BIAS) | .56*** | – | |
| Egotistical bias (GREAT) | −.01 | −.01 | – |
| Rational objectivity (GREAT) | −.13* | −.14** | −.26*** |

Notes: $N = 708–716$. Mental materialism and ideological territoriality are subscales of the Brief Intellectual Arrogance Scales (BIAS). The egotistical bias and rational objectivity are indices are yielded by Gregg's Revised Evaluation of Arguments Task (GREAT). Both indices are derived from simultaneous linear regressions computed individually for each participant, in which individual argument evaluations were regressed on individual prior opinions (yielding a $\beta$ for Egotistical Bias) and normative argument evaluations (yielding a $\beta$ for Rational Objectivity). The normative argument evaluations were averages of individual argument evaluations across the entire sample, and were constant for each individual.

*$p < .001$.;
**$p < .0005$.
***$p < .0001$.

ideological territoriality both correlated negatively with rational objectivity. In other words, the more participants professed to valuing and being attached to their beliefs, or to taking a combative approach to arguments and wanting their beliefs to prevail, the less their individual evaluations of arguments were predicted by 'correct' normative evaluations of those arguments, independently of their own opinions on argument-related topics. All else equal, then, this empirical convergence adds to the construct validity of both instruments. However, contrary to expectation, neither mental materialism nor ideological territoriality correlated significantly with egotistical bias. These null results, however, were in keeping with the absence of correlations between egotistical bias and other constructs during earlier validation (Gregg et al., 2015b), as well as the absence of any reports of such correlations by Stanovich and West (1997).

The various indices of agency and communion also exhibited a mostly positive manifold, with one or two minor exceptions. Moreover, though the coefficients were large enough to suggest affinities, they did not indicate redundancies. Correlations at different levels between matched variables (i.e. both communion or both agency: regular font in Table 2) generally exceeded those between mismatched variables (i.e. one communion and the other agency: italic font in Table 2). In addition, correlations between the agentic and communal variables at the same level of analysis (e.g. status and inclusion: bold font in Table 2; also see Footnote) were almost identical to those observed by Mahadevan, Gregg, Sedikides et al. (2016). Thus, at least at social and dispositional levels of analysis, some mutual control was warranted between the overlapping communal and agentic variables used to predict levels of IA/IH.

### *Main analyses*

We used the communal and agentic variables at each level of analysis, plus their derived interaction term, to separately predict each of our four indices of IA/IH, following the hierarchical multiple regression procedures recommended by Aiken and West (1991) – in particular, centering all the predictors, and entering the interaction terms last. Table 3 displays the corresponding beta weights and their significance. For three of our indices of IA/IH, findings were entirely in accord with our hypotheses: significant betas for the agentic variable and the communal variable emerged in the right direction. As regards the GREAT, the higher people's inclusion, warmth, and amiability, the more their individual evaluations of arguments were predicted by

**Table 2.** Correlations between indices of communion and agency at different levels of analysis.

| | Inclusion | Status | Warmth | Competence | Assertiveness |
|---|---|---|---|---|---|
| Inclusion | – | | | | |
| Status | **.68***** | – | | | |
| Warmth | .54*** | *.37**** | – | | |
| Competence | *.49**** | .68*** | **.40***** | – | |
| Amiability | .55*** | *.34**** | .61*** | *.24**** | – |
| Assertiveness | *.09** | .23*** | *–.14*** | .21*** | **.03** |

Notes: $N = 717–719$. Inclusion and status reflected communion and agency at a social level (ratings of self in the eyes of others). Warmth and competence reflected communion and agency at a social level (ratings of self on personality traits). Amiability and assertiveness reflected communion and agency at a behavioral level (ratings behaviors typical of for the self). Coefficients in bold represent intercorrelations between communion and agency variables at the same level of analysis. Coefficients in regular font represent intercorrelations between matched variables (i.e. both status, both communion) at different levels of analysis. Coefficients in italic font represent intercorrelations between mismatched variables (i.e. one status, the other communion) at different levels of analysis.
* $p < .05$.;
** $p < .001$.
*** $p < .0001$.

**Table 3.** Standardized weights (betas) from the regression of indices of intellectual arrogance/intellectual humility on two indices of communion and agency, and their interaction, at different levels of analysis.

| | Mental materialism $\beta$ | Ideological territoriality $\beta$ | Egotistical bias $\beta$ | Rational objectivity $\beta$ |
|---|---|---|---|---|
| Inclusion | –.18*** | –.32*** | .05 | .12** |
| Status | .34*** | .24*** | –.07 | –.18*** |
| Inclusion × Status | 05 | .06 | .04 | .02 |
| Warmth | –.09* | –.17*** | .01 | .08* |
| Competence | .37*** | .11** | –.05 | –.10* |
| Warmth × Competence | –.03 | –.01 | .01 | .01 |
| Amiability | –.10* | –.28*** | –.04 | .11** |
| Assertiveness | .16*** | .21*** | .04 | –.12** |
| Amiability × Assertiveness | –.03 | –.08* | –.05 | .05 |

Notes: $N = 711–716$. Variables are the same as those labeled in Tables 1 and 2. The values shown represent beta weights results from the simultaneous regression of each index of intellectual arrogance/intellectual humility.
* $p < .05$.;
** $p < .01$.
*** $p < .0001$.

'correct' normative evaluations of those arguments (i.e. they more they exhibited rational objectivity); furthermore, the higher their status, competence, and assertiveness, the less this was the case. As regards the BIAS, the higher people's status, competence, and assertiveness, the higher their mental materialism and ideological territoriality scores were; furthermore, the higher the inclusion, warmth, and amiability, the lower those scores were. In other words, two main effects emerged across also levels of analysis, such that higher agency and lower communion independently predicted higher levels of IA. Accordingly, our data suggest that IA 'belongs' in the top left corner of the circumplex, and IH in the bottom right (Figure 2). In addition, inspection reveals a further pattern in our data. For rational objectivity, links to agency and communion variables were comparable; for mental materialism, links to agency were relatively larger; and, for ideological territoriality, links to communion were relatively larger. Thus, agency may characterize better the more intrapsychic nature of mental materialism, whereas communion may characterize better the more interpersonal nature of ideological territoriality.

Only one statistical interaction emerged (for assertiveness × amiability predicting ideological territoriality), but this just reached significance and so may be artifactual. However, we found no link between egotistical bias on the GREAT and any of the predictor variables. This flush of null effects again echoes previous findings.

## General discussion

The philosopher Russell (1950) once ruefully remarked that '[m]an is a rational animal – so at least I have been told […] I have looked diligently for evidence in favour of this statement, but so far I have not had the good fortune to come across it […]' (p. 82). He went on to catalog an array of 'intellectual rubbish' that often translated into evil and tragedy. One primary source of man not being a rational animal, in this consequential way, is IA: people prefer, under the influence of the self-enhancement motive, to cleave to opinions at variance with argument and evidence (Alicke & Sedikides, 2009; Kunda, 1990; Sedikides & Gregg, 2008). Accordingly, it is important to understand the nature and precursors of IA to help cultivate the countervailing virtue of IH.

Here, we took an approach that considers people's epistemic biases to be partly the result of human beings being embodied creatures whose ancestors were subject to evolutionary selection (Haselton et al., 2005; Lakoff & Johnson, 1980; Mercier & Sperber, 2011). Our EEE account (see also Gregg & Mahadevan, 2014) proposes that people psychologically experience their beliefs as valuable possessions that they must fight to keep. In particular, people exhibit both mental materialism – overvaluing their beliefs and becoming attached to them – and ideological territoriality – taking a combative approach to argumentation and wanting their beliefs to prevail generally. As fundamental features of embodied cognition (Barsalou, 2008), both mental materialism and ideological territoriality naturally tend to promote IA. In contrast, the emancipated cognition of which human beings are also capable, involving mental detachment and ideological neutrality, needs to be carefully cultivated.

Circumstantial evidence from linguistic metaphors (Abelson, 1986), and experimental research (Chatterjee et al., 2013; Gregg et al., 2016), supports the EEE account. Here, expanding that account, we postulated that individual differences in people's tendencies to adopt different epistemic stances toward the world would vary the degree to which they exhibited IA versus humility. In particular, we postulated that people could adopt an embodied stance that was *against and above the world*, characterized by the hostile rejection of reality and attempts to dominate recalcitrant data, or *toward and below the world*, characterized by the open embracing of reality and due respect for reason and evidence (Figure 1). Moreover, we postulated that these contrasting stances could be characterized in terms of the *communion-agency* circumplex (Figure 2), extensively used to organize many psychology phenomena at different levels of analysis (Abele & Wojciszke, 2014; Bakan, 1966; Mahadevan et al., 2015). In particular, we hypothesized that IA would be higher to the extent that levels of agency were higher and levels of communion lower.

To test these hypotheses, we used two indices of IA/IH. The first was the BIAS, comprising twin self-report measures of mental materialism and ideological territoriality. The second was the GREAT, yielding separate indices of egotistical bias and rational objectivity, in the evaluation of arguments bearing on controversial issues. Both indices had undergone prior validation (Gregg et al., 2015a, 2015b). In addition, we used a set of prior measures of agency and communion at three different levels of analysis: social, dispositional, and behavioral (Mahadevan, Gregg, Sedikides et al., 2016).

In general – but excepting our index of egotistical bias – we observed patterns of correlation precisely in accord with the expanded EEE account. First, the measures of mental materialism and ideological territoriality both correlated with the rational objectivity index, in keeping with the contention that both reflect levels of IA/IH. Second, the measures of both mental materialism and ideological territoriality, as well as the rational objectivity index, related positively to communion but negatively to agency, at all levels of analysis. That is, the highest levels of IA were apparent among those participants who (a) believed they enjoyed high status among their peers, saw themselves as generally competent, and reported behaving in an

assertive manner, but who simultaneously (b) believed that they did not fit in with their peers, did not see themselves as generally warm, and reported not behaving in an amiable manner. These participants reported (a) overvaluing their beliefs and becoming attached to them, (b) taking a combative approach to argumentation and wanting their beliefs to prevail generally; they also evaluated arguments differently from the 'correct' normative evaluations of those arguments, independently of their own opinions on argument-related topics. Thus, people's capacity or proclivity to adopt a stance of being 'against and above' others – in terms of their social position, dispositional self-view, or behavioral orientation – also seem to adopt a matching epistemic stance – characterized by more mental materialism, increased ideological territoriality, and non-objective argument evaluation.

### *Limitations and qualifications*

One limitation of the present research was its cross-sectional character. We did not establish that variations in agency and communion at various levels of analyses were causally responsible for variations in mental materialism, ideological territoriality, and rational objectivity. Demonstrating this would require an experimental design – manipulating the former dimensions, as independent variables, and observing the result on the latter indices, as dependent variables. Nonetheless, the correlational patterns we obtained for these variables were precisely consistent with our theoretical hypotheses, which implied a specific joint prediction in involving directional effects for a pair of variables.

Moreover, one of the GREAT's indices – egotistical bias – yielded null effects, having earlier failed (unlike rational objectivity) to correlate with the measures of mental materialism and ideological territoriality. This is surprising, given that a bias toward evaluating arguments as being of higher quality to the extent that they match one's prior beliefs (independently of the normative quality of those arguments) would a priori seem to operationalize IA rather well. The interpretation of this anomalous null effect is complicated by the fact that other research has furnished contradictory signs as to the validity of the egotistical bias index. On the one hand, it routinely fails to correlate with a range of relevant variables (Gregg et al., 2015b); or else researchers only discuss correlates of the rational objectivity index (Sá et al., 1999; Stanovich & West, 1997). On the other hand, the egotistical bias index in this research does correlate inversely with the rational objectivity index, as would be expected; and in two samples, levels of egotistical bias duly increased as the rated importance of the topic increased instead – a clear sign of self-enhancement (Gregg et al., 2015b). Accordingly, it is difficult to put down these null effects simply to improper measurement, especially given that the rational objectivity index, which was based on identical regression data, yielded such consistent correlations. Yet it is also difficult to explain why the egotistical bias would show signs of validity internally but none externally.

Finally, our circumplex-based predictions were exceedingly broad. They concerned the adoption of agency-based and communion-based stances on the whole, and how that would influence one's epistemic approach to reality as a whole. As such, the predictions did not differentiate between specific situations or contexts, or between specific topics or targets. Yet, it is difficult to argue that the adoption of an open and deferential stance when engaged in inquiry is *always* appropriate – that it is the invariant hallmark of epistemic virtue. In particular, if a discussant argues for a position that all reason and logic indicates is far-fetched, or that violates bedrock moral scruples (e.g. chemotherapy causes cancer; children may be murdered), then responding in an 'intellectually arrogant' way seems appropriate. That is, the adoption of a hostile and domineering stance – representing a disdainful and steadfast rejection of offensive nonsense – can be virtuous (Fumerton, 2010), and indicate a fidelity to the truth, rather than an aversion to it. It may be precisely those who are situationally, dispositionally, or behaviorally higher in agency and lower in communion who help to keep a community of inquirers safe from lapsing into absurdity or falling victim to humbug.

## Coda

The philosopher Pascal (1958/1670) opined that 'man is a reed […] but he is a thinking reed' (p. 97). This phrase neatly captures the paradoxical nature of being human – somehow a part of nature, yet somehow apart from it. But even thinking *itself* may betray the 'indelible stamp of [its] lowly origins' (Darwin, 1871, p. 597). Specifically, people may experience their important beliefs in partly physical terms – as valued possessions that they must fight to keep. Moreover, people who are generally inclined to adopt domineering and inhospitable stance toward the world may be particularly inclined to experience their beliefs in this way. Such embodied tendencies, we have shown here, go together with signs of IA. The belligerent beast, jealously guarding his sustenance or territory, may not be so different from the hubristic human, eagerly defending his beliefs or ideology.

## Notes

1. For example, Mahadevan, Gregg, Sedikides et al. (2016) found correlations between inclusion and status of $r \approx .65$.

2. Due to logistical constraints in payment disbursement, we were obliged to run the same study multiple times in sequence. Due to the unexpected smallness of the online sampling pool, many more participants took part on more than one occasion than we anticipated. Among the participants making serious attempts at the survey (>95% of the items), the rate of IP duplication was high (35%). In addition, quite a few participants (26%) answered identically all items on at least one questionnaire that contained both forward-scored and reversed-scored item. The remaining screening criteria removed comparatively fewer participants (<5%). Overall, we retained 47% of the original 1540 participants.
3. Note that our labeling of the dimensions for interpersonal behavior differs from prior authors. We chose our labels to avoid potential confusion about levels of analysis. For example, the term *dominance*, although used to describe interpersonal behaviors (Markey & Markey, 2009; Wiggins, 1979; has also been used loosely to signify status or rank (Barkow, 1980; Sidanius & Pratto, 1999).
4. Almost identical results were obtained when alternative coefficients (e.g. semi-partial correlations) were used. We thus follow Stanovich and West (1997)'s approach for the sake of consistency.

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