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Andy J. Yap¹, Abbie S. Wazlawek², Brian J. Lucas³,
 Amy J. C. Cuddy⁴, and Dana R. Carney⁵

¹Sloan School of Management, Massachusetts Institute of Technology; ²Columbia Business School, Columbia University; ³Kellogg School of Management, Northwestern University; ⁴Harvard Business School, Harvard University; and ⁵Haas School of Business, University of California, Berkeley

Abstract

Research in environmental sciences has found that the ergonomic design of human-made environments influences thought, feeling, and action. In the research reported here, we examined the impact of physical environments on dishonest behavior. In four studies, we tested whether certain bodily configurations—or postures—incidentally imposed by the environment led to increases in dishonest behavior. The first three experiments showed that individuals who assumed expansive postures (either consciously or inadvertently) were more likely to steal money, cheat on a test, and commit traffic violations in a driving simulation. Results suggested that participants' self-reported sense of power mediated the link between postural expansiveness and dishonesty. Study 4 revealed that automobiles with more expansive driver's seats were more likely to be illegally parked on New York City streets. Taken together, the results suggest that, first, environments that expand the body can inadvertently lead people to feel more powerful, and second, these feelings of power can cause dishonest behavior.

Keywords

design, dishonesty, embodiment, human factors, nonverbal behavior, power, environmental effects, morality, social structure, social behavior

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The ergonomics and physical geography of our everyday environments are powerful: They determine our social networks and relationships (Werner, Altman, & Brown, 1992), personal and interpersonal functioning (Altman, Taylor, & Wheeler, 1971), our workplace productivity (Knight & Haslam, 2010), and our subjective well-being (Kaplan & Kaplan, 2009; Leonard, 2012). The research reported here examined the impact of our environment on an important social behavior: dishonesty. Each day, our bodies are continually stretched and contracted by our working and living environments—by the seats and levers in our cars and by the furniture and work spaces in our homes and offices. Although we may pay very little attention to ordinary and seemingly innocuous shifts in our bodily posture, these subtle postural shifts can have a tremendous impact on our thoughts, feelings, and

behavior (Damasio, 1994; Niedenthal, 2007; Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005).

Most central to the current research is the finding that expansive body postures lead to a psychological state of power (Bohns & Wiltermuth, 2012; Carney, Cuddy, & Yap, 2010; Fischer, Fischer, Englich, Aydin, & Frey, 2011; Huang, Galinsky, Gruenfeld, & Guillory, 2011). And power—whether caused by laboratory manipulations or

Corresponding Authors:

Andy J. Yap, Sloan School of Management, Massachusetts Institute of Technology, 100 Main St., Cambridge, MA 02142
 E-mail: andy yap@mit.edu

Dana R. Carney, Haas School of Business, University of California, Berkeley, 573 Bakar Faculty Building, Berkeley, CA 94720
 E-mail: dcarney@berkeley.edu

real-world structural features—appears to be linked to increases in a wide range of dishonest behaviors (Boles, Croson, & Murnighan, 2000; Guinote, 2007; Keltner, Gruenfeld, & Anderson, 2003; Lammers, Stapel, & Galinsky, 2010; Lammers, Stoker, Jordan, Pollmann, & Stapel, 2011). Is it possible that expansive postures incidentally shaped by our environment could lead to dishonest behavior? This question was the focus of the current research.

The idea that the human body has the ability to shape the mind has piqued the interest of scholars for centuries. Darwin (1872/1904) and the father of experimental psychology, William James (1884), were among the first to theorize about mind-body connections. But it was not until the 1970s that the bidirectional connection between bodily displays and psychological states was empirically demonstrated (Duclos et al., 1989; Laird, 1974; Rhodewalt & Comer, 1979; Riskind, 1983; Riskind & Gotay, 1982; Strack, Martin, & Stepper, 1988; Wells & Petty, 1980). For example, in a study using facial electromyography, Laird (1974) asked participants to furrow their eyebrows (i.e., frown) or clench their teeth (i.e., smile). When participants clenched their teeth, they reported more happiness and humor. Strack et al. (1988) later replicated and extended this work. Similarly, Wells and Petty (1980) demonstrated that participants who nodded their heads (in a motion of agreement) while listening to messages found the messages to be more persuasive than did participants who shook their heads (in a motion of disagreement).

Powerful Postures

Across humans and animals, power and dominance are expressed through expansive, open-bodied postures (which involve spreading out and occupying more space), whereas powerlessness and subordination are expressed through relatively more contractive, closed-bodied postures (Carney, Hall, & LeBeau, 2005; Darwin, 1872/1904; de Waal, 1998; Ellyson & Dovidio, 1985; Hall, Coats, & Smith LeBeau, 2005; Tiedens & Fragale, 2003; Weisfeld & Beresford, 1982). Research has also shown that these expansive nonverbal “power poses” may activate mental concepts and emotions associated with power and even go so far as to initiate a trajectory of physiological changes associated with a powerful state (Bohns & Wiltermuth, 2012; Carney et al., 2010; Carney et al., 2013; Huang et al., 2011). These studies demonstrated that when men and women engaged in expansive (as opposed to contractive) postures, they felt more powerful, engaged in more approach-oriented and risk-seeking behavior, and appeared to evidence a physiological buffer against pain and stress. Similarly, Riskind and Gotay (1982) demonstrated that slumped and constricted postures, compared with upright and confident postures,

induced a state of helplessness and feelings of stress. Finally, Harmon-Jones and Peterson (2009) found that a supine body posture (i.e., lying down), compared with an upright body posture, reduced approach motivation.

Power and Dishonest Behavior

Regardless of how power is manipulated or observed in the lab or field, it is consistently related to dishonesty. For example, power is associated with cheating to improve one's odds of winning (Lammers et al., 2010), lying (Boles et al., 2000), lying more easily (Carney et al., 2013), hypocrisy (Lammers et al., 2010), and infidelity (Lammers et al., 2011). According to Keltner et al. (2003), power activates the behavioral approach system, which causes powerful individuals to focus on rewards and act in a self-interested and goal-consistent manner (Galinsky, Gruenfeld, & Magee, 2003; Guinote, 2007; Inesi, 2010).

If expansive postures can lead to a state of power, and power can lead to dishonest behavior, this suggests something of real concern—that ordinary expanded (and contracted) nonverbal postures forced on us by our environments, which we happen or choose to be in, could impact our decisions and actions in ways that render us less (or more) honest.

The Focus of the Current Research on the Ergonomics of Dishonesty

We tested the hypothesis that expansive postures would lead to dishonest behaviors in four studies conducted in the field and the laboratory. The first was a field experiment that examined whether expansive (compared with contractive) postures employed in previous research (Bohns & Wiltermuth, 2012; Carney et al., 2010; Huang et al., 2011) would lead to stealing in an “overpayment” paradigm. The second experiment manipulated the expansiveness of work spaces in the lab and tested whether *incidentally* expanded bodies (shaped organically by the environment) increased dishonesty on a test. The third experiment examined if participants in a more expansive driver's seat would be more likely to hit-and-run when incentivized to go fast in a video-game driving simulation; we also tested the mediating role of sense of power in these effects. Finally, to extend results to a real-world context, we conducted an observational field study to test the ecological validity of the effect by examining whether automobile driver's seat size predicted the violation of parking laws in New York City. Consistent with recommendations from Simmons, Nelson, and Simonsohn (2012), we report how we determined our sample size, all data exclusions, all manipulations, and all measures used in the studies.

Study 1 (Field Experiment)

Method

Eighty-eight¹ community members (57 men, 31 women) were recruited from South Station train station in Boston, Massachusetts, and from outside a library at the city campus of Columbia University to participate in a study that ostensibly examined the relationship between stretching and impression formation. Participants were told they would receive \$4 in return for participation. Postural expansiveness was manipulated using a procedure similar to that of Carney et al. (2010). We used a cover story about the effects of stretching on impression formation, and participants were randomly assigned to hold either an expansive or a contractive pose (Fig. 1) for 1 min while they formed impressions of faces shown to them by the experimenter. Next, to bolster the cover story, we had participants complete a survey on their impressions of a best friend.² Finally, although participants had been told they would receive \$4 in payment, the experimenter handed them \$8, which was comprised of three \$1 bills and one \$5 bill, fanned out (Fig. 2) and presented in such a way that participants would notice the “accidental” overpayment. The dependent measure was whether or not the participant kept the extra money. The experimenter coded for whether participants checked the money after they had received it.³

Results and discussion

Consistent with our theorizing, results from a chi-square analysis showed that participants who assumed the expansive pose, compared with the contractive pose, were significantly more likely to keep the extra money

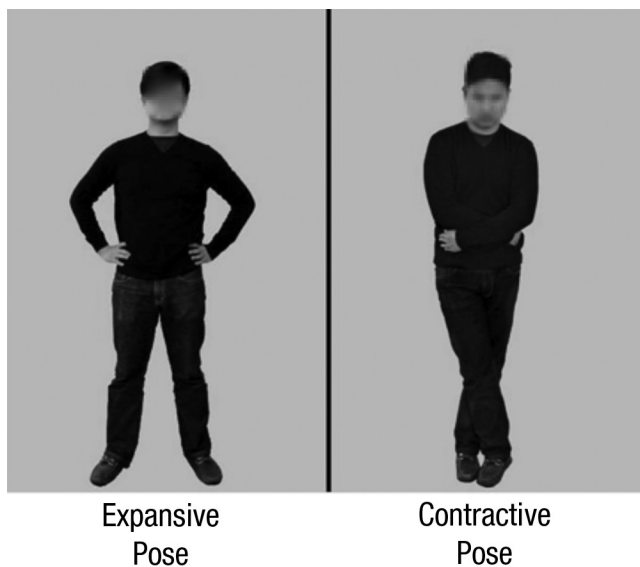


Fig. 1. Poses employed by participants in Study 1.

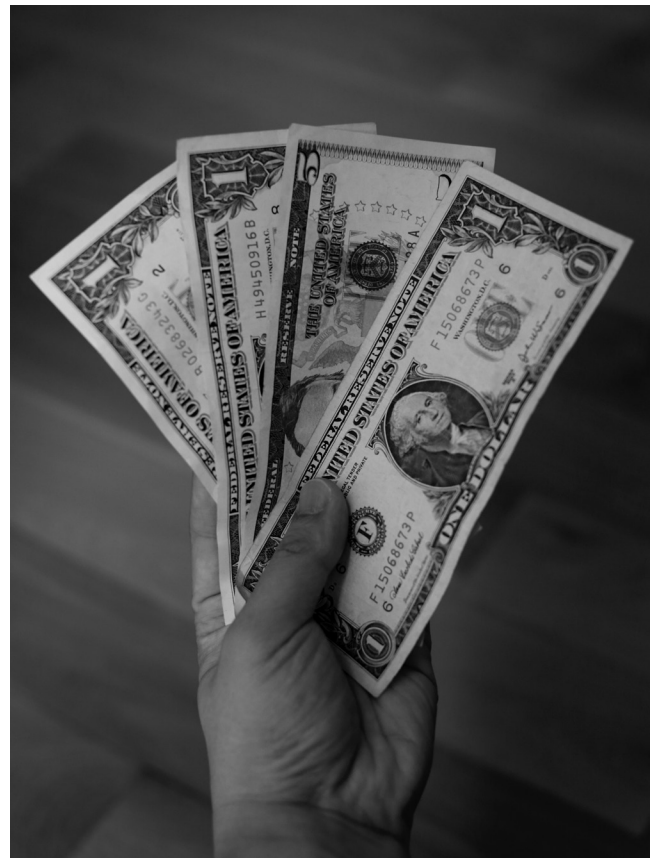


Fig. 2. Picture showing how money was presented to participants in Study 1.

(i.e., to “steal by omission”), $\chi^2(1, N = 78) = 13.0, p < .001, \Phi = .41$. Seventy-eight percent of the expanded-posture participants kept the extra money, compared with 38% of contracted-posture participants.

Study 1 yielded initial evidence that expansive postures can lead to dishonest behavior. Participants in this experiment were explicitly instructed to assume a specific pose, yet the main focus of our research was posture imposed by the ergonomics of the environment. With this first experiment establishing the link between posture and dishonesty, Studies 2 through 4 investigated the impact of incidentally induced expansive (relative to contractive) postures on dishonest behavior. Participants in these studies were not explicitly instructed to assume specific poses, nor were they made explicitly aware that their posture was being manipulated. Instead, posture was naturally shaped by ordinary chairs and work spaces.

Study 2 (Laboratory Experiment)

Method

In return for monetary compensation, 34 students⁴ (14 men, 20 women) from Columbia University participated

in a study that they were told examined how feng shui influences creativity.

Participants were seated in individual cubicles at desks with either a large (24 in. × 38 in.) or a small (12 in. × 19 in.) desk pad (Fig. 3). Participants saw only their own work space and not the work spaces of other participants. They were then instructed to complete two “creativity tasks.”

The first was an anagram test on which, unbeknownst to participants, they would later have an opportunity to cheat. This cheating paradigm was adopted from Ruedy and Schweitzer (2010). Participants received a packet of papers in a manila folder and were allotted 4 min to unscramble 15 anagrams that were printed on the first page. They were incentivized by the experimenter’s promise of \$1 for every anagram solved. When time was called, participants were instructed to detach and retain the first page and return the folder and its remaining contents to the experimenter. Participants were unaware that an imprint of their test answers had been created by a sheet of carbonless copy paper hidden at the back of the folder.

Incidental posture was manipulated in the next task, which ostensibly measured inductive creativity. Participants were allotted 7 min to create a collage using materials that were placed around the edges of their desk pad. During the task, participants were allowed to use only the space on the desk pad. Posture was incidentally manipulated by the size of participants’ desk pads. The large-desk-pad arrangement forced participants to stretch

and reach for materials, thus incidentally imposing expansive postures. These participants also had chairs that were high enough to help them reach for the materials. In contrast, the small-desk-pad arrangement constrained participants’ arm extensions because materials were within close reach, thus incidentally imposing contractive postures.

At the completion of the collage task, the experimenter, appearing very busy, rushed to each cubicle and handed participants the answer key for the anagram test. The experimenter explained that he had to manage another study in the adjacent lab and asked that each participant grade his or her own test. Participants were thus given an opportunity to alter their original answers in private. We used participants’ number of altered answers, which we identified by comparing their self-graded tests with the carbon copies containing their original answers, as a measure of cheating.

Results and discussion

We hypothesized that expanded-posture participants would alter more of their answers, which would earn them more money. As predicted, a one-way analysis of variance (ANOVA) revealed that expanded-posture participants altered more answers ($M = 1.20$, $SD = 1.70$) than did contracted-posture participants ($M = 0.27$, $SD = 0.59$), $F(1, 29) = 4.04$, $p = .05$, $d = 0.73$.⁵

Studies 1 and 2 found consistent evidence that expansive postures, whether consciously posed or incidentally



Fig. 3. Pictures showing the desk-space configurations for the expansive-posture (top row) and contractive-posture (bottom row) conditions of Study 2.

imposed, led to more dishonest behavior. In our third experiment, we examined whether driver's seat expansiveness led to more traffic violations in a driving simulation. Importantly, we also tested the mechanism underlying this effect. If expansive posture leads to a state of power, and power leads to increases in dishonest behavior, then the link between expansive posture and dishonest behavior should be mediated by participants' sense of power.

Study 3 (Laboratory Experiment)

Method

Seventy-one students⁶ (23 men, 48 women) from the University of California, Berkeley, were recruited to participate in a study that was ostensibly about physiology and video games. A realistic driving simulator was set up with a PlayStation 3 (Sony, Tokyo, Japan) and a Logitech Driving Force GT Racing Wheel (Logitech, Romanel-sur-Morges, Switzerland), which included a steering wheel and foot pedals. Participants were randomly assigned to sit in an expansive or contractive driver's seat (see Fig. 4 for a visual display of the setup).⁷ Participants played the game *Need for Speed: Hot Pursuit*, which challenges players to race to the finish line as fast as possible. Participants were allotted one initial practice race to become accustomed to the game's controls. They were then offered a chance to win \$10 if they could complete the same race within 5 min. Importantly, we implemented a rule that participants had to stop and count to 10 after a collision with any object in the race. Violation of this rule would shorten participants' total race time and thus help them to win the money. Rule violation—specifically,

the number of times a participant hit an object and did not stop—served as our measure of cheating. Races were video recorded and coded by two research assistants for the number of hit-and-runs. Interrater reliability was determined by having the two coders rate the same subset of videos (10%). Once interrater reliability was established ($r = .95$), the remaining videos were divided equally between coders. After the race, participants reported how powerful they felt, using a Likert-type scale from 1 (*not at all*) to 5 (*extremely*).

Results and discussion

Consistent with our theorizing, results showed that being seated in an expansive seat lead participants to drive somewhat more recklessly (mean number of objects hit = 7.11, $SD = 8.51$) than being seated in a contractive seat did ($M = 4.33$, $SD = 3.60$), $F(1, 67) = 3.02$, $p = .087$. Importantly, participants in the expansive seat were more likely to hit-and-run (mean number of hit-and-runs = 6.31, $SD = 8.45$) than were those in the contractive seat ($M = 2.94$, $SD = 2.61$) after controlling for the number of objects hit, $F(1, 66) = 4.12$, $p = .046$, $d = 0.54$. The effect was significant when number of objects hit was not included as a covariate, $F(1, 67) = 4.81$, $p = .032$.⁸

We also predicted that participants' sense of power would mediate this effect. Bootstrapping analyses (Preacher & Hayes, 2004) based on 5,000 samples were conducted to estimate direct and indirect effects. The total effect of expansive posture on incidence of hit-and-runs (total effect = 3.37, $p = .03$) became nonsignificant when sense of power was included in the model (direct effect of expansive posture = 2.65, $p = .09$). Additionally, the total indirect effect (i.e., the difference between the total and direct effects) of expansive posture on incidence of hit-and-runs through sense of power was significant (point estimate = 0.72, bias-corrected bootstrap 95% confidence interval = [0.0197, 2.775])—the fact that zero fell outside the confidence interval indicated a significant mediation effect⁹ (Fig. 5).

Three experiments yielded consistent evidence that expansive posture, whether posed consciously or shaped incidentally by one's desk space or driver's seat, can lead to dishonest behavior. Although the emergence of these effects in the lab may have been intriguing, to understand their generalizability and pervasiveness, we examined whether the same pattern of results would occur naturally—in the real world—in Study 4.

Study 4 (Observational Field Study)

Having conducted three experiments, we thought it was critical to test the real-world generalizability of the incidental-posture effect. Thus, in Study 4, we used

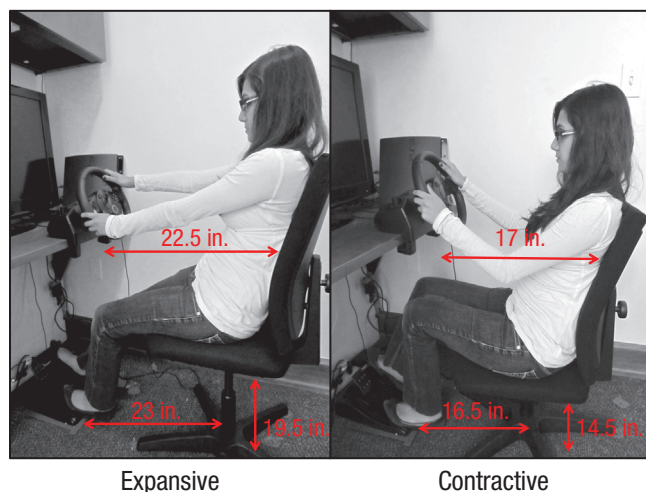


Fig. 4. Pictures showing the driver's seat configurations for the expansive-posture and contractive-posture conditions of Study 3.

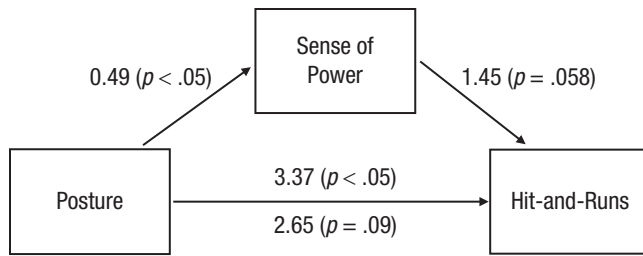


Fig. 5. Results from Study 3: mediation model showing the effect of posture on incidence of hit-and-runs (a measure of rule violation), as mediated by sense of power. Values shown are unstandardized regression coefficients. On the lower path, the values below and above the arrow show results for when the mediator was included and was not included in the model, respectively.

observational field-study methods to investigate whether drivers in expansive automobile seats were more likely than drivers in contractive seats to commit parking violations, an established measure of corrupt behavior in the economics literature (Fisman & Miguel, 2007). Specifically, we focused on double-parking—the parking of a car in an open lane such that adjacent, already parked vehicles are blocked in and active driving space is partially obstructed, which forces other drivers to maneuver through tighter spaces.

Method

Two hypothesis-blind research assistants recorded instances of double-parking on East–West streets between 116th Street and 102nd Street in New York City from 12 p.m. to 7 p.m. on weekdays. The research assistants recorded information about each double-parked vehicle as well as information about the legally parked adjacent vehicle (in the event that more than one legally parked vehicle was blocked in by the double-parked vehicle,

information about the legally parked vehicle blocked most by the double-parked car was recorded). The legally parked vehicles served as our control sample. Data were recorded for a total of 126 automobiles.

Measure of driver's seat (space) size. To create an index of the expansiveness of each automobile's driver's seat, we calculated the volume of the space using information posted on respective car manufacturers' Web sites. Volume was computed by halving the product of the wheelbase (length between the front wheels and the back wheels), height, and width of the car (Fig. 6).

Measure of status of automobile brand. Because social status has been found to predict unethical behavior (Piff, Stancato, Cote, Mendoza-Denton, & Keltner, 2012), we controlled for the status of vehicle brands by including it as a covariate in our analyses. To create an index of status, we conducted a study in which American participants ($N = 95$) rated the status of each of the observed vehicle brands using scales from 1 (*extremely low status*) to 7 (*extremely high status*). Responses were averaged to form a measure of vehicle status for each brand.

Results and discussion

Consistent with our theorizing, results from a binary logistic regression controlling for status¹⁰ of cars indicated that vehicles with larger driver's seats were more likely to be double-parked, $b = 0.020$, $SE = 0.005$, $p < .001$. At 1 standard deviation above the mean in driver's seat size, the probability that the vehicle would be double-parked increased from 51% to 71%.

To account for the fact that drivers of lengthy cars might be more likely to double-park given the increased difficulty of finding large enough parking spots in a

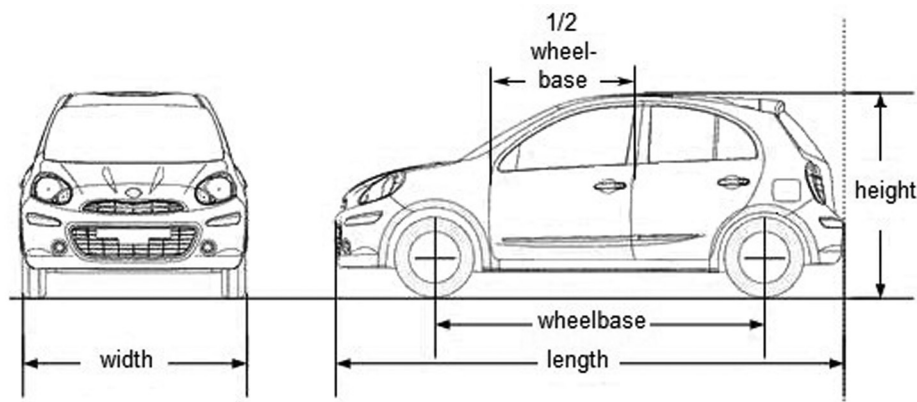


Fig. 6. Schematic showing the dimensions of automobiles considered in the size computation in Study 4.

congested city such as New York, we controlled for status and car length in another regression. The relationship between driver's-seat size and double-parking remained marginally significant, $b = 0.015$, $SE = 0.009$, $p = .087$, despite the fact that length was strongly correlated with driver's seat size, $r = .83$, $p < .001$.

Although the results of this study provide some insights on the ecological validity of this phenomenon, the methodology has clear limitations (as is often the case with observational work). For example, we were unable to ascertain driver demographics, such as gender or body size, and drivers could not be randomly assigned to the conditions. Without professional appraisal of each car in our sample, we were also unable to accurately determine the cars' present value. However, when Study 4 is taken together with the three experiments, the package offers a more complete picture. It is important to note that Study 3 offset the limitations of Study 4 because in Study 3 participants were randomly assigned to expansive or contractive driver's seats, and vehicle attributes such as length and price were not an issue because the expansiveness of driver's seat was the only variable manipulated across conditions.

General Discussion

Together, the results from these four studies provide multimethod evidence from both the lab and the real world that expansive postures incidentally shaped by the environment can lead to dishonesty. Studies 1 through 3 provided consistent evidence for the causal relationship between postural expansiveness and dishonest behavior. The use of different participant populations and real-world parking data suggests that the effect is ecologically valid.

Whereas researchers in design and human factors (Stokols, 1978; Werner et al., 1992) would not be surprised at our findings, very little research in psychology has ventured into the domain of ergonomics and social behavior. The current research suggests that catalysts for dishonesty could be lurking in people's ordinary, everyday environments—such as cars, workstations, and offices. Our bodies are perpetually enslaved by the structure of our physical spaces, and the findings reported here suggest that when our bodily postures are incidentally expanded by these spaces, we could be lured into behaving dishonestly.

That said, incidentally induced expansive postures could also produce beneficial effects, such as resilience against pain and stress, and bolster executive functioning, much as the research on social power has shown (Bohns & Wiltermuth, 2012; Carney et al., 2013; Smith, Jostmann, Galinsky, & van Dijk, 2008). The theoretical argument in Carney et al. (2013) is that power induces physiological changes that render people more willing

and able to engage in all acts—whether honest or dishonest. Consistent with this idea, power does seem to promote ethical and socially responsible behaviors under certain conditions (e.g. Chen, Lee-Chai, & Bargh, 2001; DeCelles, DeRue, Margolis, & Ceranic, 2012). How do we reconcile these differences? There are some additionally useful theoretical ideas to consider.

Hirsh, Galinsky, and Zhong (2011) proposed that power could be a catalyst that reveals people's true selves. Recent research has also found that power enhances moral awareness among individuals with a strong moral identity but decreases moral awareness in those with a weak moral identity (DeCelles et al., 2012). Similarly, individuals with a communal relationship orientation are more socially responsible than those with an exchange relationship orientation, because power amplifies dominant dispositional cues (Chen et al., 2001).

Power can also shape a person by amplifying the dominant situational cue (Hirsh et al., 2011). Powerful individuals tend to focus on contextually activated goals (Guinote, 2007). They are more likely to cheat and take risks when the rewards, like those in the current research, are attractive (Anderson & Galinsky, 2006; Galinsky, Magee, Inesi, & Gruenfeld, 2006; Inesi, 2010; Lammers et al., 2010). However, when the most dominant contextual cue is to be cooperative, power should correspondingly promote behaviors that are more other-focused and less self-interested (Handgraaf, Van Dijk, Vermunt, Wilke, & De Dreu, 2008). Therefore, it seems that although power and expansive posture may lead to self-focused and dishonest behaviors, they do also lead to prosocial and socially responsible outcomes if the situational cues for such goals are salient.

One prescriptive point that could be offered from this work is that we may need to consider the science of ethics more holistically—taking into consideration not only the sometimes toxic effect of power itself, but also the nefarious impact of incentivizing the wrong things. Finally, the very ways in which offices and furniture are designed need examination and consideration. Future research could explore ways in which we could capitalize on even the simplest features of our physical environments, toward the goal of promoting ethical, prosocial, and healthy workplace behaviors.

Author Contributions

All authors contributed to the study design. Data were collected by A. J. Yap, A. S. Wazlawek, and D. R. Carney's lab manager under the guidance of A. J. Yap. A. J. Yap and A. S. Wazlawek analyzed and interpreted the data under the supervision of D. R. Carney. A. J. Yap and D. R. Carney drafted the manuscript, and A. S. Wazlawek, B. J. Lucas, and A. J. C. Cuddy provided revisions. All authors approved the final version of the manuscript for submission.

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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Notes

1. This study included two samples. Sample size was not predetermined, but the data were analyzed after the completion of each data-collection period. Both samples were subject to the same procedure with the exception that participants in one sample were administered the Regulatory Focus Questionnaire (Higgins et al., 2001) before the posture manipulation. We followed Schimmack's (2012) recommendation to combine data from these two samples into a single analysis. A meta-analytic approach to combining the samples was also undertaken to verify that our effect was as strong as it seemed when the raw data were combined. Toward that goal, the phi coefficients for effect size (which are equivalent to Pearson correlations for effect size in a 2×2 chi-squared analysis) were Fisher's z transformed, weighted by sample size, and then averaged. The average Fisher's z -transformed r value was then converted back into a Pearson r . The average effect-size r was .41, and the associated combined z value was 5.03, $p < .001$.

2. This survey was administered as part of our cover story. The data were not analyzed.

3. Eight participants did not count the money, and 2 reported awareness of our dishonesty measure. We made an a priori decision to exclude these participants from our analysis. Results remained significant when these participants were included, $\chi^2(1, N = 88) = 7.28, p = .007$.

4. We had aimed to recruit 40 participants, but because of logistical laboratory issues (i.e., an initially small subject population that was further reduced by competition for participants with two other researchers using the same dishonesty paradigm), we were able to recruit only 34 participants during the time frame for recruitment.

5. Debriefing checks revealed that 3 participants were aware of our dishonesty paradigm, so their data were excluded from analyses. One of these participants also altered the work-space layout without permission. One outlier whose number of altered answers was more than 3 standard deviations above the overall mean was also excluded. Results were not significant when these participants were included, $F(1, 33) = 0.29, p > .1$.

6. We had aimed to recruit between 70 and 80 participants; we stopped at 71 participants because the time frame for recruitment ended.

7. We asked participants to report on the difficulty of the task, using a 7-point Likert-type scale. Results revealed no significant difference between conditions.

8. Video recordings showed that 2 participants had problems maneuvering the car, which resulted in their repeatedly crashing into objects throughout the race. We made an a priori decision to exclude these participants. Results were not significant when these participants were included, $F(1, 69) = 0.50, p > .1$.

9. Bootstrapping analyses considering incidence of hit-and-run as a mediator between posture and sense of power as the outcome yielded marginally significant results. However, further analyses revealed that incidence of hit-and-run did not significantly predict sense of power for either expansive or contractive participants when analyzed separately.

10. There was no effect of status, $b = 0.45, SE = 0.34, p = .18$. When status was not included as a covariate, the effect remained significant, $b = 0.019, SE = 0.005, p = .001$.

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