Published in final edited form as:
Psychol Sci. 2009 August ; 20(8): 1019–1025. doi:10.1111/j.1467-9280.2009.02403.x.

The Color of SinWhite and Black Are Perceptual Symbols of Moral Purity and Pollution

Gary D. Sherman and **Gerald L. Clore**
University of Virginia

Abstract

Three studies examined automatic associations between words with moral and immoral meanings and the colors black and white. The speed of color naming in a Stroop task was faster when words in black concerned immorality (e.g., greed), rather than morality, and when words in white concerned morality (e.g., honesty), rather than immorality. In addition, priming immorality by having participants hand-copy an unethical statement speeded identification of words in the black font. Making immorality salient in this way also increased the moral Stroop effect among participants who had not previously shown it. In the final study, participants also rated consumer products. Moral meanings interfered with color naming most strongly among those participants who rated personal cleaning products as especially desirable. The moderation of the moral Stroop effect by individual differences in concerns about personal cleanliness suggests that ideas about purity and pollution are central to seeing morality in black and white.

Abstract ideas can be clarified by comparisons with aspects of the physical world. “Love is like a rose,” for example, invites people to appreciate the beauty and delicacy of love, and perhaps also the pain of its thorns. But beyond such rhetorical embellishment, some metaphors are so direct and compelling that their literal and metaphorical meanings may become conflated. For example, an admired person is often said to be “looked up to.” This spatial metaphor may be so powerful that assertions about “high” or “low” status automatically evoke some of the processes involved in the perception of spatial location. Such a metaphor is “perceptually grounded,” meaning that its comprehension involves an element of perceptual simulation appropriate to assertions about physical space (Barsalou, 1999; Lakoff & Johnson, 1980). For example, people have been found to attribute high status or power to individuals elevated in physical space and are able to identify powerful groups more quickly when those groups are positioned higher, rather than lower, than another group in space (Schubert, 2005). By being grounded in perceptual experience of the physical world, such analogical assertions achieve the authority of actual perceptions.

Moral cognition is embodied in this way. For example, physical purity is a metaphor for moral “purity” (Rozin, Millman, & Nemeroff, 1986). This explains why an evil person's clothing may be considered physically repulsive (Rozin, Markwith, & McCauley, 1994), and why reminders of one's moral transgressions can create desires for physical cleansing (Zhong & Liljenquist, 2006). An underappreciated, and understudied, aspect of this metaphor is that ideas of dirtiness and impurity are themselves grounded in the perceptual experience of the color black, which is seen not just as the opposite of white, but also as a potent impurity that can contaminate whiteness (Adams & Osgood, 1973; Williams & Roberson, 1967). A white object, conversely, is universally understood to be something that can be stained easily and that must remain unblemished to stay pure. This is presumably at

Address correspondence to Gary Sherman, Department of Psychology, University of Virginia, P.O. Box 400400, Charlottesville, VA 22904-4400, e-mail: gds6d@virginia.edu.

the heart of the culturally widespread practice of dressing brides in white, which by calling to mind the experience of physical purity, provides a compelling symbol for moral purity. One can see with one's own eyes that a drop of dark paint discolors white paint more readily than the reverse. By analogy, a single immoral act can counteract an otherwise exemplary reputation, whereas a single moral act cannot compensate for a life of questionable behavior.

Little is known about associations between immorality and blackness. Most of the relevant work has focused more generally on valence. That research has revealed that children tend to assume that black boxes contain negative objects and white boxes contain positive objects (Stabler & Johnson, 1972). Also, people are quicker to evaluate a negative word when it appears in black, rather than white (Meier, Robinson, & Clore, 2004), and perceive gray patches as darker after evaluating a negative word than after evaluating a positive word (Meier, Robinson, Crawford, & Ahlvers, 2007). More relevant to morality is a study in which sports players were perceived as more aggressive, and behaved more aggressively, when wearing black uniforms than when wearing nonblack uniforms (Frank & Gilovich, 1988).

Although associations between valence and blackness operate across many domains, the aforementioned research has focused on the domain-general aspects of these associations. Black has negative connotations for many reasons; it is the color of night, uncertainty, and danger. In the case of morality, however, its association with impurity is particularly noteworthy. Because of the shared connection of blackness and immorality with impurity, associations between darkness and valence in the moral domain have a metaphorical quality. Accordingly, the concept of immorality should activate “black,” not because immoral things tend to be black, but because immorality acts like the color black (e.g., it contaminates).

In addition, past research has not examined how valence-blackness associations vary with contextual factors or individual differences. Making immorality salient is enough to evoke the moral-purity metaphor: In one study, people who recalled, or hand-copied a first-person account of, unethical behavior desired physical cleansing (Zhong & Liljenquist, 2006). It is during these times—when one is currently concerned with being morally “clean”—that immorality-blackness associations should be most evident. But such associations may also relate to more chronic concerns with purity and pollution. That is, they may be especially evident among people generally concerned with cleanliness. Support for these two predictions would provide multimethod, converging evidence that immorality-blackness associations exist and are a meaningful part of the moral-purity metaphor.

The Stroop (1935) color-word task served as our measure of word-color association (MacLeod, 1991). In this task, color names or color-related words appear in different colors. Color naming is slowed when the word and color are incongruent (e.g., “lemon” in blue ink; Klein, 1964) and speeded when they are congruent. Consequently, the more one associates immorality with black, the longer it should take to identify the color of immoral words (e.g., sin) when they appear in white, rather than black. After first documenting such a moral Stroop effect (Study 1), we tested whether experimentally priming immorality—a procedure known to encourage physical cleansing—would amplify the effect (Study 2) and whether the effect would be strongest for people who particularly like cleaning products (Study 3).

STUDY 1

Meier et al. (2004, Study 4) adapted the Stroop task to the study of valence-darkness associations and found that word color did not interact with valence (coded dichotomously) to predict naming times. We reanalyzed their data, taking into account the moral (rather than merely evaluative) connotation of the words.

Method

Participants—Participants were 22 undergraduates at North Dakota State University. Meier et al. (2004, Study 4) did not report the racial composition of their sample, but did note that their participant pool was 95% Caucasian.

Word Ratings—Two independent coders rated the words on the following dimensions: immoral versus moral, wrong versus right, unpleasant versus pleasant, and undesirable versus desirable. For each dimension, 1 represented one extreme (e.g., very immoral), 4 represented the neutral midpoint (e.g., neither immoral nor moral), and 7 represented the other extreme (e.g., very moral). There was substantial agreement between the raters (αs > .91), so their ratings were averaged. The first two dimensions formed a morality composite (α = .98), and the latter two a pleasantness composite (α = .99).

Stimuli and Procedure—Each of 100 words (50 positive, 50 negative; see Meier et al., 2004) appeared once in black or white font (randomly assigned) on a computer screen. Participants indicated the color of each word using the "1" ("black") and "9" ("white") keys.

Results and Discussion

Before analyzing the data, we adjusted reaction times (RTs) below 300 ms to 300 ms and RTs more than 3 standard deviations above the mean to that value (we followed the same procedure for cleaning the RT data in Studies 2 and 3). Additionally, RTs on the initial trials tended to be highly irregular; in Trials 1 and 2, a substantial percentage of participants took longer than 3 standard deviations above the mean to respond (86% for Trial 1, 27% for Trial 2). By Trial 3, participants' responses stabilized (0% > 3 SDs above the mean). We therefore excluded data from Trials 1 and 2 from analysis. (The same pattern characterized the other two studies, so we excluded Trials 1 and 2 in those studies as well).[1]

Because the data were nested (trials within people), we used multilevel modeling (hierarchical linear modeling, HLM; Raudenbush, Bryk, Cheong, & Congdon, 2001). We predicted RT for correct trials (98%) from the word's color (-1 = white, 1 = black), its rated morality, and their interaction. There were no main effects of either color or morality (ts < 1.38, p_{rep}s < .76), but a significant Color × Morality interaction, $\beta_3 = 8.10$, $t(2106) = 2.99$, $p_{rep} = .97$, indicated that the effect of morality on RT depended on word color. As predicted, for words in black, greater morality predicted slower RTs, $\beta_1 = 6.26$, $t(1054) = 1.83$, $p_{rep} = .86$. For words in white, greater morality predicted faster RTs, $\beta_1 = -12.72$, $t(1052) = -3.01$, $p_{rep} = .97$ (see Fig. 1).[2] A separate analysis substituting pleasantness for morality found that pleasantness did not interact with color ($t < 1$), a finding consistent with the absence of an interaction between valence (coded dichotomously) and color in predicting RT in the original analysis reported by Meier et al. (2004, Study 4).

This is the first evidence that immorality-blackness associations operate quickly and automatically. These associations influenced performance on the Stroop task, a color-identification task that requires no moral evaluation and can be performed quickly (RTs around 500 ms). Just as the word lemon activates "yellow," so too do immoral words activate "black" and moral words activate "white."

[1]Because RT data are often positively skewed, we also analyzed the data using log-transformed RTs. The results were nearly identical to those reported here.

[2]This interaction remained significant when we controlled for word extremity (provided by Meier et al., 2004) and written frequency (Kucera & Francis, 1967).

STUDY 2

In Study 2, we sought to (a) replicate Study 1 ourselves with a new set of words and (b) test whether the moral Stroop effect is sensitive to conditions that make immorality salient. If immorality-blackness associations are part of the moral-purity metaphor, then they should be most evident when people are feeling morally dirty. That is, the same sort of manipulations that elicit the "Macbeth effect" (Zhong & Liljenquist, 2006) should also evoke immorality-blackness associations.

Method

Participants—Forty University of Virginia undergraduates (19 female, 21 male) participated for partial course credit. Two participants (1 female, 1 male) experienced a computer malfunction, leaving a final sample of 38. Of these, 27 were self-identified as Caucasian (71%), 6 as Asian (16%), 3 as African American (8%), and 2 as Hispanic (5%).

Word Ratings—At the end of the experiment, participants rated each word for morality and pleasantness (7-point scale, as in Study 1). We used each participant's ratings to predict his or her RTs.

Stimuli and Procedure—We generated a new list of 50 words that spanned the entire range of moral connotations (Table 1). Each word was presented once (order and color assigned randomly). Participants were instructed to indicate the color of each word as quickly and as accurately as possible. After incorrect responses, "incorrect" appeared on the screen in red font for 1.5 s. Five practice trials preceded the task.

To prime immorality, we asked participants to hand-copy a story, written in the first person. The story was about a junior partner at a law firm who was competing against a colleague for a promotion and found a document of great value to the colleague. The story ended with the character either giving the document to the colleague (ethical version) or shredding it (unethical version). The materials and cover story for this task (that it measured individual differences in handwriting) were identical to those used by Zhong and Liljenquist (2006, Study 2).

The four tasks in this study were completed in the following order: baseline Stroop task, writing task, postmanipulation Stroop task, and word-rating task.

Results and Discussion

To determine whether a moral Stroop effect was again present, we first analyzed baseline Stroop performance. In the model predicting RT for correct trials (98%), there were no main effects of either color or morality ($\underline{t}$s < 1.23, $\underline{p}_{rep}$s < .72), but the Color × Morality interaction was significant, $\beta_3 = 7.90$, $\underline{t}(1792) = 2.30$, $\underline{p}_{rep} = .93$. As in Study 1, the effect of morality depended on word color (see Fig. 1). Separate models for the white and black fonts revealed that the effect was due primarily to white words, for which greater morality was associated with faster RTs, $\beta_1 = -10.72$, $\underline{t}(923) = -2.33$, $\underline{p}_{rep} = .92$. For words in black, the opposite pattern did not reach statistical significance, $\beta_1 = 4.73$, $\underline{t}(869) = 0.92$, $\underline{p}_{rep} = .60$.

We tested the effect of the writing task with a model predicting RT on the postmanipulation Stroop task from word color, word morality, and their interaction. Condition was a Level 2 (between-participants) predictor. To account for baseline Stroop performance, we computed a separate linear regression model for each participant, predicting RTs on the baseline Stroop task from word color, word morality, and their interaction. The standardized

interaction coefficient—an estimate of that participant's Stroop effect—served as a Level 2 predictor, along with its interaction with condition (see Table 2).

Compared with hand-copying an ethical story, hand-copying an unethical story slowed RTs overall, $\gamma_{01} = 27.24$, $t(34) = 2.21$, $p_{rep} = .90$, and speeded the color identification of (a) immoral, relative to moral, words (Condition × Morality), $\gamma_{21} = 7.00$, $t(1781) = 2.13$, $p_{rep} = .90$, and (b) black, relative to white, words (Condition × Color), $\gamma_{11} = -5.64$, $t(1781) = -2.19$, $p_{rep} = .91$. That is, the priming manipulation primed both immorality and blackness, providing converging evidence that people automatically associate immorality with blackness.

Additionally, condition interacted with baseline Stroop effect to predict the Color × Morality interaction, $\gamma_{33} = -7.94$, $t(1781) = -3.80$, $p_{rep} > .99$. That is, the effect of the writing task on the Stroop effect depended on baseline Stroop performance. Simple-slopes analysis (Aiken & West, 1991) testing the effect of condition at two levels of baseline Stroop effect (1 SD below and 1 SD above the mean) revealed that for participants who did not show the Stroop effect initially, the effect of condition was as predicted, $\gamma_{31} = 8.05$, $t(1781) = 2.80$, $p_{rep} = .96$: Participants who hand-copied the unethical story subsequently exhibited a significantly larger Color × Morality interaction (i.e., Stroop effect) than those who hand-copied the ethical story (see Fig. 2). For participants who did show the Stroop effect initially, hand-copying the unethical story had the opposite effect: That is, it decreased the magnitude of the Stroop effect, $\gamma_{31} = -7.87$, $t(1781) = -2.30$, $p_{rep} = .92$.

This latter effect was unexpected and is particularly interesting. Stroop effects can be diminished by several factors (see MacLeod, 1991, for a review). Manipulations that decrease the attention-drawing power of the semantic content are especially effective. For example, exposing participants to a word before the trial in which it appears (Dyer, 1971) dampens its capacity to interfere with color naming. Our priming manipulation was designed to increase the salience of moral meaning in order to create Stroop interference, but among participants for whom moral meaning was already salient, hand-copying the unethical story may have made moral content sufficiently familiar to reduce its power to draw attention away from color naming. This could account for the observed decrease in the magnitude of the Stroop effect.

Together, these findings attest to our measure's sensitivity. For people who showed no Stroop effect initially, simply exposing them to an instance of unethical behavior was sufficient to make immorality salient, which in turn allowed the morally relevant words in the Stroop task to activate their associated color. This finding suggests that whenever concerns about immorality (and perhaps also the sense of feeling morally dirty) are salient, so too are the purity-related colors of black and white. The unexpected finding for participants who had shown the Stroop effect initially suggests that moral content may lose its power with overexposure. If so, such “moral overexposure” might have troublesome behavioral consequences in that repeated thoughts or experiences of unethical behavior may cease to activate ideas of pollution and dirtiness.

Our immorality-salience manipulation is the same manipulation that in past research induced a desire for physical cleansing (Zhong & Liljenquist, 2006, Study 2). That this manipulation also primes “black” and alters the moral Stroop effect provides indirect evidence for the proposed link between immorality-blackness associations and notions of purity and contamination. In Study 3, we tested this link more directly.

STUDY 3

If associating sin with blackness reflects, in part, a concern with its polluting powers, then people who tend to make such associations should be those who are generally concerned with purity and pollution. Because purity concerns can manifest themselves as desires for physical cleansing (Zhong & Liljenquist, 2006), we assessed participants' liking of various products, including several cleaning products. We predicted that participants who considered cleaning products to be especially desirable would also show the moral Stroop effect.

Method

Participants—Fifty-three University of Virginia undergraduates (28 female, 25 male) participated for partial course credit. Two male participants did not complete the ratings task, leaving a final sample of 51. Of these, 30 were self-identified as Caucasian (59%), 11 as Asian (22%), 5 as African American (10%), 2 as Hispanic (4%), and 3 as "other" (6%).

Word Ratings, Stimuli, and Procedure—We created a new list of 24 words (8 immoral, 8 neutral, and 8 moral; see Table 1). To verify that the words had the intended moral connotation, at the end of the study we asked participants to rate the words themselves (as in Study 2). The ratings confirmed our categorization: All moral words had a mean rating greater than 6, all immoral words had a mean rating less than 2, and all neutral words were rated in between (minimum = 4.25, maximum = 5.66). Each word was selected from the MRC Psycholinguistic Database (Machine-Usable Dictionary, Version 2.00; see Wilson, 1988), which supplies values for various word attributes. The different categories did not differ in concreteness, familiarity, imageability, written frequency, number of letters, or number of syllables (Fs < 1).

The Stroop task was the same as in Study 2, except for the new words. Because we used fewer words than in Studies 1 and 2, we set the number of trials to 48. Each trial was randomly assigned 1 of the 24 words and one of the two colors. Also, participants were randomly assigned to one of two pairings of color and response key ("1" = black, "9" = white; "1" = white, "9" = black). Because the assigned pairings did not influence any result, we collapsed across them for all analyses.

After the Stroop task, participants rated the desirability of five cleaning products (Dove shower soap, Crest toothpaste, Lysol disinfectant, Windex cleaner, and Tide detergent) and five non-cleaning products (Post-it notes, Energizer batteries, Sony CD cases, Nantucket Nectars juices, and Snickers bars) on a 6-point scale (1 = completely undesirable, 6 = completely desirable). This measure was identical to the one used by Zhong and Liljenquist (2006, Study 2), who found that priming immorality increased the desirability of cleaning products.

At the end of the experiment, participants indicated their race, their political orientation (7-point scale: 1 = very liberal, 4 = moderate, 7 = very conservative), and the frequency with which they attended religious services (8-point scale: 0 = never in my life, 7 = multiple times per week). The latter two measures were included to test whether any relation between the moral Stroop effect and liking of cleaning products could be explained by individual differences in religion or politics.

Results and Discussion

In an HLM model predicting RT for correct trials (99%), Level 1 predictors were word color, word morality, and their interaction. At Level 2 (between participants), we entered

participants' average rating for the cleaning products and average rating for the non-cleaning products. At Level 1, there were no significant main effects of either color, $\gamma_{10} = 7.41$, $t(628) = 1.63$, $p = .10$, or morality, $\gamma_{20} = -6.46$, $t(628) = -1.69$, $p = .09$, although both trends were notable. Unlike in Studies 1 and 2, the Color × Morality interaction was not significant, $\gamma_{30} = 5.90$, $t(628) = 1.46$, $p_{rep} = .77$, but it was in the predicted direction. Most important, this interaction was moderated by cleaning-product desirability, $\gamma_{31} = 22.36$, $t(628) = 4.04$, $p_{rep} > .99$, such that participants who rated cleaning products as more desirable had a larger Color × Morality interaction (i.e., moral Stroop effect). No such relationship was observed for non-cleaning products, $\gamma_{32} = -5.38$, $t(628) = -1.19$, $p = .24$. When political orientation and religious attendance were added as Level 2 predictors, they were also unrelated to the moral Stroop effect ($ts < 1$).

In supplementary analyses, each participant's interaction coefficient served as an estimate of his or her moral Stroop effect (as in Study 2). A series of multiple linear regression models predicted this estimate from product-desirability ratings. A model including the cleaning and noncleaning composite ratings replicated the HLM results: The cleaning composite was again a significant, positive predictor, $\beta = .39$, $p_{rep} = .90$, whereas the noncleaning composite was unrelated to the moral Stroop effect, $\beta = -.07$, $p = .72$. To see which cleaning products were responsible for this relationship, we tested another model, with all 10 products as separate, simultaneous predictors. The only significant predictors were Crest toothpaste, $\beta = .46$, $p_{rep} = .94$, and Dove shower soap, $\beta = .35$, $p_{rep} = .90$. All other products were unrelated to the moral Stroop effect ($ts < 1$). Notably, the two items that were significant predictors are the only products that deal specifically with cleaning oneself. This result fits nicely with Zhong and Liljenquist's (2006) finding that people who had recalled a past unethical behavior preferred a hand-sanitizing antiseptic wipe to a pencil as a gift and that those who had actually cleansed their hands felt absolved of their moral guilt. Together, these findings suggest that the moral-purity metaphor may be particularly important for regulating one's own moral behavior. If the thought of acting immorally evokes images of dark, dirty impurities, it may facilitate avoidance of such behavior, thus protecting against moral contamination and ensuring that one's moral self stays clean and pure (i.e., “white”).

GENERAL DISCUSSION

There exists a moral-purity metaphor that likens moral goodness to physical cleanliness (Rozin et al., 1986; Zhong & Liljenquist, 2006). In three studies, we explored an unstudied, and underappreciated, aspect of this metaphor—its grounding in the colors black and white. We documented a moral Stroop effect indicating that people make immorality-blackness associations quickly and relatively automatically (Studies 1 and 2). Moreover, a manipulation known to induce a desire for physical cleansing primed both immorality and the color black (Study 2). The increased salience of immorality, in turn, altered the magnitude of the Stroop effect. Finally, individuals who showed the moral Stroop effect considered cleaning (especially self-cleaning) products to be highly desirable (Study 3), a finding indicating a direct link between immorality-blackness associations and purity concerns.

Although the metaphor of moral purity is well documented, this is the first demonstration that black and white, as representative of negative contagion (black contaminates white), are central parts of this metaphor. Sin is not just dirty, it is black. And moral virtue is not just clean, but also white. Our most unexpected finding—that the effect of priming immorality depended on an individual's baseline Stroop effect—contributes to understanding of embodied moral cognition by suggesting that seeing moral purity in black and white is not always a given. Just as easily as the metaphor can be evoked in people who do not generally show it, it can be diminished in those who do.

These findings may have implications for understanding racial prejudice. The history of race-related practices in the United States (e.g., the “one drop of blood” rule for racial categorization and segregation) has demonstrated that the tendency to see the black-white spectrum in terms of purity and contamination extends to skin color (for a discussion, see Rozin & Royzman, 2001). Given that both blackness and immorality are considered powerful contaminants to be avoided, and that the category labels “black” and “white” are often applied to race, dark skin might also be easily associated with immorality and impurity. This may explain, in part, why stereotypes of darker-skinned people often allude to immorality and poor hygiene, and why the typical criminal is seen as both dark skinned and physically dirty (MacLin & Herrera, 2006).

A morally virtuous person is said to be as “pure as the driven snow.” In contrast to the pure whiteness of newly fallen snow, impurities are dirty, are dark, and visibly stain otherwise pristine surfaces. Equating immorality with these contaminants animates the abstract notions of sin and evil by grounding them in visceral, evocative qualities of one's experience of the physical world (Lakoff & Johnson, 1980). More than merely a rhetorical device for moral discourse, the moral-purity metaphor is a deep, embodied phenomenon covertly shaping moral cognition.

Acknowledgments

This research was supported in part by a National Science Foundation Graduate Research Fellowship to Gary Sherman and by National Institute of Mental Health Research Grant MH 50074 to Gerald Clore. We thank Brian Meier and Michael Robinson for providing the data for the reanalysis reported in Study 1.

REFERENCES

AdamsFMOsgoodCE (1973). A cross-cultural study of the affective meanings of color. Journal of Cross-Cultural Psychology4135156

AikenLSWestSG (1991). Multiple regression: Testing and interpreting interactionsThousand Oaks, CASage

BarsalouLW (1999). Perceptual symbol systems. Behavioral and Brain Sciences22577609 [PubMed: 11301525]

DyerFN (1971). The duration of word meaning responses: Stroop interference for different preexposures of the word. Psychonomic Science25229231

FrankMGGilovichT (1988). The dark side of self- and social perception: Black uniforms and aggression in professional sports. Journal of Personality and Social Psychology547485 [PubMed: 3346809]

KleinGS (1964). Semantic power measured through the interference of words with color-naming. American Journal of Psychology77576588 [PubMed: 14255565]

KuceraHFrancisW (1967). Computational analysis of present-day American EnglishProvidence, RIBrown University Press

LakoffGJohnsonM (1980). Metaphors we live byChicagoUniversity of Chicago Press

MacLeodCM (1991). Half a century of research on the Stroop effect: An integrative review. Psychological Bulletin109163203 [PubMed: 2034749]

MacLinMKHerreraV (2006). The criminal stereotype. North American Journal of Psychology8197207

MeierBPRobinsonMDCloreGL (2004). Why good guys wear white: Automatic inferences about stimulus valence based on brightness. Psychological Science158287 [PubMed: 14738513]

MeierBPRobinsonMDCrawfordLEAhlversWJ (2007). When 'light' and 'dark' thoughts become light and dark responses: Affect biases brightness judgments. Emotion7366376 [PubMed: 17516814]

RaudenbushSBrykACheongYFCongdonR (2001). HLM5: Hierarchical linear and nonlinear modelingChicagoScientific Software International

RozinPMarkwithMMcCauleyC (1994). Sensitivity to indirect contacts with other persons: AIDS aversion as a composite of aversion to strangers, infection, moral taint, and misfortune. Journal of Abnormal Psychology103495504 [PubMed: 7930049]

RozinPMillmanLNemeroffC (1986). Operation of the laws of sympathetic magic in disgust and other domains. Journal of Personality and Social Psychology50703712

RozinPRoyzmanEB (2001). Negativity bias, negativity dominance, and contagion. Personality and Social Psychology Review5296320

SchubertTW (2005). Your highness: Vertical positions as perceptual symbols of power. Journal of Personality and Social Psychology89121 [PubMed: 16060739]

StablerJRJohnsonEE (1972). The meaning of black and white to children. International Journal of Symbology31121

StroopJR (1935). Studies of interference in serial verbal reactions. Journal of Experimental Psychology18643662

WilliamsJERobersonJK (1967). A method for assessing racial attitudes in preschool children. Educational and Psychological Measurement27671689

WilsonM (1988). MRC Psycholinguistic Database: Machine-usable dictionary, version 2.00. Behavior Research Methods, Instruments & Computers20610

ZhongCLiljenquistKA (2006). Washing away your sins: Threatened morality and physical cleansing. Science31314511452 [PubMed: 16960010]

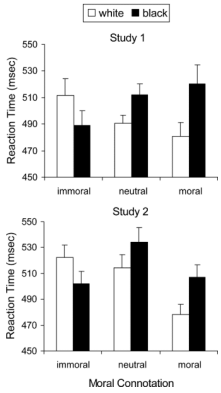

Fig. 1.

Reaction time during the Stroop color-word task as a function of font color and moral connotation in Study 1 (top) and the premanipulation phase of Study 2 (bottom). Although moral connotation was a continuous variable (7-point scale) in both studies, for illustrative purposes the words are binned into three categories: immoral (1-3), neutral (3.01-5), and moral (5.01-7). Error bars represent standard errors of the means.

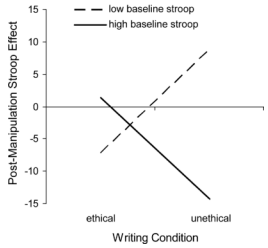

Fig. 2.

Regression slopes from the hierarchical linear modeling analysis in Study 2: postmanipulation Stroop effect (Color × Morality interaction) as a function of baseline Stroop effect (1 SD below and 1 SD above the mean) and writing condition.

TABLE 1

Words Used in Studies 2 and 3

Study 2
abstain, abusive, brag, cheat, compete, confess, cruel, dieting, discipline, duty, erotic, evil, exciting, forgive, freedom, gambling, gossip, gratify, greed, hate, helping, honesty, humble, indulge, justice, kind, laugh, liar, lust, money, obey, pain, partying, pleasure, polite, pray, pride, profit, respect, revenge, sacrifice, seduce, selfish, sin, smile, steal, torture, vice, virtuous, work
Study 3
Immoral: cheat, crime, devil, hell, neglect, sin, torment, vulgar Neutral: aspect, calm, concert, east, forecast, motion, recall, sum Moral: aid, angel, brave, charity, grace, honesty, saint, virtue

TABLE 2

Hierarchical Linear Model Predicting Postmanipulation Stroop Performance (Reaction Time) in Study 2

Variable	Coefficient	t	df	p
Intercept, β_0				
Intercept, $\gamma 00$	470.94 (12.09)	38.95	34	< .001
Condition, $\gamma 01$	27.24 (12.31)	2.21	34	< .05
Baseline Stroop effect, $\gamma 02$	4.22 (11.23)	0.38	34	.71
Condition × Stroop Effect, $\gamma 03$	-18.60 (11.23)	-1.66	34	.11
Color, β_1				
Intercept, $\gamma 10$	-2.01 (2.58)	-0.78	1781	.44
Condition, $\gamma 11$	-5.64 (2.58)	-2.19	1781	< .05
Baseline Stroop effect, $\gamma 12$	-0.91 (2.17)	-0.42	1781	.68
Condition × Stroop Effect, $\gamma 13$	-0.47 (2.17)	-0.22	1781	.83
Morality, β_2				
Intercept, $\gamma 20$	-1.31 (3.33)	-0.39	1781	.69
Condition, $\gamma 21$	7.00 (3.28)	2.13	1781	< .05
Baseline Stroop effect, $\gamma 22$	1.42 (2.45)	0.58	1781	.56
Condition × Stroop Effect, $\gamma 23$	-1.43 (2.45)	-0.58	1781	.56
Color × Morality, β_3				
Intercept, $\gamma 30$	-2.82 (2.31)	-1.22	1781	.22
Condition, $\gamma 31$	0.09 (2.37)	0.04	1781	.97
Baseline Stroop effect, $\gamma 32$	-3.62 (2.09)	-1.73	1781	.08
Condition × Stroop Effect, $\gamma 33$	-7.94 (2.09)	-3.80	1781	< .001

Note. Standard errors are given in parentheses.