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Drawn to the Light:

Predicting Religiosity Using "God is Light" Metaphor

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Abstract

A prominent class of metaphors depicts that which is sacred (God, a spiritual path) in terms of lightness rather than darkness. Metaphors of this type should have systematic implications for religious cognition according to conceptual metaphor theory (CMT) and a new extension of this theory termed balanced CMT. Five studies (total $N = 761$) derived predictions from these models and then tested them. Consistent with balanced CMT, Studies 1-3 found that people who preferred light to dark believed in God to a greater extent and were more religious. Furthermore, priming thoughts related to God shifted perceptual responses in a light-ward direction (Study 4) and models wearing lighter, relative to darker, shirts were inferred to be more religious (Study 5). The findings provide novel evidence for the importance of light-dark metaphors in religious representations while highlighting a new class of processes that covary with, and therefore predict, religious belief.

KEYWORDS: Metaphor, Religiosity, Individual Differences, Light, Balance Theory

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Metaphors, which liken more abstract concepts (e.g., prominence or social power) to more concrete ones (e.g., size), used to be considered fanciful or poetic. This viewpoint seems to be wrong, however, because nearly everyone uses metaphors when speaking or writing, and does so frequently (Gibbs, 1994). Data of this type have given rise to a somewhat new theory of metaphor termed conceptual metaphor theory (CMT: Lakoff & Johnson, 1999). According to CMT, we frequently use metaphors when writing or speaking because we tend to think in metaphoric terms, especially with respect to abstract concepts like power, evaluation, or morality (Landau, Robinson, & Meier, 2014). From the perspective of CMT, that is, prominent linguistic metaphors reflect the manner in which we think rather than, or in addition to, the manner in which we communicate (Gibbs, 1994; Lakoff & Johnson, 1999).

Historically, language use patterns have constituted the primary source of data for CMT. People use metaphors often (Gibbs, 1994) and these metaphors consist of families of expression that implicate underlying mappings or models (e.g., IMPORTANT IS BIG, LOVE IS A JOURNEY: Lakoff & Johnson, 1999). Nonetheless, there are limitations to data of this type and researchers have therefore turned to other, largely experimental methodologies (Crawford, 2009; Landau, Meier, & Keefer, 2010). In a representative study of this type, Meier and Robinson (2004) found that positive (negative) words were categorized faster when they were presented higher (lower) on the computer screen, consistent with a large class of metaphors suggesting that positive affect is up (e.g., “things are looking up”) and negative affect is down (e.g., “I am

feeling down”). As another example, studies have shown that warmer temperatures lead to warmer, friendlier perceptions of others (e.g., IJzerman & Semin, 2009).

Although data are sparse, there are reasons for thinking that conceptual metaphors should be operative in the domains of spirituality and religion. Key concepts in this area – such as God, the afterlife, and the sacred – are either abstract or intangible, the precise sorts of conditions that should give rise to conceptual metaphors (Lakoff & Johnson, 1999). Consistent with this point, metaphors are frequently used within the Bible as well as other religious texts (El-Sharif, 2012; Jäkel, 2002) and God seems to be understood in largely metaphoric terms (DesCamp & Sweetser, 2005). Furthermore, metaphoric processes abound in the related area of moral cognition (Yu, 2015). Along these lines, studies have shown that people link physical disgust with moral disgust (Schnall, Benton, & Harvey, 2008) and want to clean themselves after thinking about immoral acts they have committed (Zhong & Liljenquist, 2006). These findings are consistent with metaphors linking morality to cleanliness (Zhong & House, 2014).

In specific terms, we build on conceptual metaphors related to light and dark (Winter, 2014; Yu, 2015). Metaphorically, dark is evil or morally bad and light is sacred or morally good (Sherman & Clore, 2009). Such metaphoric associations figure prominently in popular culture (e.g., Star Wars, Wizard of Oz; see Forceville & Renckens, 2013) and they also figure prominently in religious symbolism (Eliade, 1996; Weightman, 1996). In the Bible, for example, God separates light (good) from darkness (evil) and gives Jesus to humanity, who himself is the “light of the world” (Weightman, 1996). Similar light/dark symbolism can be found in other religious texts such as the Upanishads and the Koran (Eliade, 1996). To be faithful, this class of metaphors suggests, is to gravitate toward light rather than darkness (El-Sharif, 2012; Jäkel,

2002). Associations of this type seem operative with respect to ethical behavior, which is more prominent within lighter environments (Chiou & Cheng, 2013).

No relevant studies, however, have directly examined whether religious cognitions are primed by, or prime, perceptions of light versus dark. As shown in the horizontal lines of Figure 1, we posited bidirectional associations of this type and designed two experiments to examine them. If people recruit perceptual metaphor when thinking about religious concepts, then we should be able to show that the activation of religious thoughts (i.e., thoughts related to God and the divine: Shariff, Willard, Andersen, & Norenzayan, 2016) biases subsequent perceptions in a light-ward direction. Study 4 used procedures borrowed from Meier, Robinson, Crawford, and Ahlvers (2007) to examine this possibility. In addition, though, the manipulation of cues to brightness should activate religious thoughts (Landau et al., 2010). Study 5 investigates this possibility within a person-perception paradigm (Meier, Scholer, & Fincher-Kiefer, 2004). In this experiment, we hypothesized that models wearing light-colored shirts would seem more religious or faithful than models wearing dark-colored shirts. Together, Studies 4 and 5 were designed to make a case for the bidirectional nature of the relevant associations.

Our central interest was individual differences, though. Although experimental work on CMT has progressed, personality-related research is scant (Meier, Schnall, Schwarz, & Bargh, 2012). This is unfortunate because people differ from each other substantially and any general theory of the human mind should be capable of contacting such differences (Posner & Rothbart, 2007). We therefore sought to show how CMT can be extended such that it is capable of making robust predictions concerning individual differences in religious belief. The model builds on CMT by proposing that the mind harbors deep and strong associations between its abstract concepts (e.g., power) and metaphor-consistent mappings (e.g., size). In the present case, there

are deep and strong associations between religious concepts (e.g., God, heaven) and perceptual representations of lightness or brightness (Chiou & Cheng, 2013). These associations have an embodied basis, for example in links between lightness and cleanliness (Yu, 2015), but they are reinforced by cultural media (Forceville & Renckens, 2013). In either case, people should implicitly associate religious concepts with lightness rather than darkness.

Now, consider what happens when the self or self-concept is added to this associative network (Greenwald et al., 2012). If religious concepts are light rather than dark, then religious people should develop favorable associations to perceptual lightness, particularly over time (Simon & Holyoak, 2002). Equally so, preferences for light rather than dark should pressure the cognitive system to favor concepts associated with perceptual lightness, including religiosity (Greenwald et al., 2002). These dynamics are depicted in the top panel of Figure 1, which uses the notation of balance theory (Heider, 1958) as interpreted through the balanced identity design (Cvencek, Greenwald, & Meltzoff, 2012). The self's associations will be balanced if the person both (a) favors light to dark (represented by a + sign) and (b) is religious (also represented by a + sign), given that (c) religious concepts are light rather than dark. By contrast, preferences for darkness would be inconsistent with strong religious beliefs and this configuration would be avoided by the cognitive system (Gawronski, 2012; Greenwald et al., 2002). There is evidence that mental associations work this way (Cvencek et al., 2012). For example, linking an object to the self leads the self to develop more favorable attitudes toward the object and these dynamics can be understood in balance-related terms (Gawronski, Bodenhausen, & Becker, 2007).

Another balanced configuration is also achievable, as shown in the bottom panel of Figure 1. If religious concepts are light rather than dark, then non-religious people should favor perceptual lightness to a lesser degree than religious people and might actually favor darkness.

Equally so, a strong preference for darkness should lead people to dis-identify with the religious domain, in effect distancing the self from religious concepts. In other words, the self's associations can be balanced if the person both (a) disfavors lightness (represented by a – sign) and (b) dis-identifies with the religious domain (also represented by a – sign), given that (c) religious concepts are light rather than dark. Evidence for distancing dynamics of this type has also been found, particularly in the stereotyping literature. For example, girls and women distance themselves from pursuits like math and science in part because these subjects are stereotypically associated with males rather than females (Cvencek et al., 2012; Nosek, Banaji, & Greenwald, 2002). Indeed, there are very strong relationships between gender identity and the types of occupations that people tend to aspire to (Lippa, 2001) and preferences of this type can be understood in balance-related terms (Cvencek et al., 2012; Gawronski, 2012).

According to our balanced version of CMT, then, preferences for light or dark are likely to have religious significance. Preferences for light over dark are consistent with stronger religious beliefs (top panel of Figure 1) whereas preferences for dark over light are consistent with weaker religious beliefs (bottom panel of Figure 1). If so, we should be able to infer how religious people are by asking them whether they prefer light or dark as perceptual symbols. In total, five studies examine this novel perspective on religious cognition.

Overview of Studies

Studies 1-3 examine our individual difference predictions. Balance dynamics (Greenwald et al., 2002) should favor some degree of correlation between preferences for light (over dark) and religious beliefs (see Figure 1). This idea was examined in Studies 1, 2a, and 2b, and then in a different way in Study 3. Studies 4-5 focused, instead, on normative predictions. Figure 1 posits a bidirectional metaphoric association between the intangible concept of God and the more

tangible concept of lightness. Pursuing such ideas, Study 4 hypothesized that priming thoughts of God would shift perceptual responses in a light-ward direction and Study 5 hypothesized that people wearing light, relative to dark, clothing would seem more religious. Altogether, the studies were designed to provide support for a balance-related (Heider, 1958) extension of CMT (Lakoff & Johnson, 1999) capable of making individual difference predictions.

Across the studies, we also examined issues of scope and generality in several ways. The metaphor-related processes that we focused on should function similarly among men and women (Fetterman, Bair, Werth, Landkammer, & Robinson, 2016). To examine whether this was the case in the present studies, we performed secondary analyses in which biological sex was a potential moderator. Although our samples were somewhat homogeneous in terms of race, we were able to combine Studies 2a and 2b to examine possible differences along these lines. As assessed, light and dark consist of perceptual concepts rather than skin color and the associations focused on should function similarly across different racial groups (Adams & Osgood, 1973). Finally, Study 3 sought to contribute to discriminant validity by showing that preferences for light, and biases to see light, predict religious beliefs after controlling for several personality traits.

Study 1

People can have idiosyncratic responses to colored images (Palmer, Schloss, & Sammartino, 2012). Study 1 therefore administered a simpler measure that asked people whether they prefer “light” or “dark” as words/concepts. Light-preferring individuals were expected to score higher in religiosity than dark-preferring individuals.

Method

Sample Size Considerations and Data Management

We wanted adequate (.80) power to detect medium effect sizes. We determined that sample sizes of 95 would give us this degree of power and therefore sought sample sizes at least this large or a little bit larger. Such considerations led us to run each study for a fixed period of time, one that had produced sample sizes of the desired type in previous research in the lab. No participants were dropped, no conditions were excluded (nor were there any between-subjects manipulations), and no interim data analysis occurred. What follows therefore represents a complete account of the findings. Such comments apply to Study 1 and also to the other studies reported in the paper.

General Procedures

Participants for all studies were undergraduates seeking credit for their North Dakota State University (NDSU) psychology classes. They first signed up for a generally described “personality” or “social judgment” study using SONA participant registration software. They then reported to the laboratory in groups of 6 or fewer. After informed consent, participants were assigned to individual rooms, each equipped with its own personal computer. Instructions for each task or measure (see below) were presented on computer.

Participants and Measures

The Study 1 sample consisted of 152 undergraduates (68% female; 92% Caucasian; M age = 19.06). They first completed a simple, face-valid measure of preferences for light or dark. Specifically, they were asked “which do you prefer?”, a question that was presented toward the top left of the computer screen. Roughly 2 inches below the question were the options “light” or “dark”, which were presented very closely to each other in a vertical arrangement, with one (light) immediately above the other (dark). Participants indicated their preference by clicking the box adjacent to the preferred concept. The dichotomous nature of the item was important as it

forced participants to make a choice among the metaphorically bipolar options (Robinson & Fetterman, 2014). Additionally, the use of word stimuli focused attention on concepts rather than more complicated color patches or pictures (Adams & Osgood, 1973), toward which people can have less predictable reactions (Palmer et al., 2012). The dark/light item was embedded among other preference questions (e.g., “books” versus “movies”) in order to disguise the purpose of the assessment.

Individual differences in religiosity were assessed later in the session in a different Medialab program. We used two transparent, religion-unspecified questions (Bishop, 1999). First, participants were asked: “to what extent do you believe in God?” They made a rating along a 6-point continuum (1 = “not at all”; 6 = “fully and completely”: $M = 4.91$; $SD = 1.91$). Second, we asked about beliefs in an afterlife (“to what extent do you believe in an afterlife?”) using the same 6-point scale ($M = 4.96$; $SD = 1.04$).

Results

The average participant was more religious than not. Similarly, the average participant favored “light” (67.76%) to “dark” (32.24%). Of greater relevance, two between-subjects ANOVAs revealed that religiosity (the continuous dependent measures) varied by light/dark preferences, the dichotomous predictor. Specifically, the light-preferring group believed in God to a greater extent than the dark-preferring group, $F(1, 150) = 13.60$, $p < .001$, $\eta_p^2 = .08$. Similarly, light-preferring people believed in an afterlife to a greater extent than dark-preferring people, $F(1, 150) = 8.49$, $p = .003$, $\eta_p^2 = .05$. Means for these ANOVAs are reported in Table 1.

As a robustness check, we reran the primary analyses with participant sex as an additional between-subjects factor. In the belief in God analysis, there was a dark-light main effect, $F(1, 148) = 16.20$, $p < .001$, $\eta_p^2 = .10$, that was not modified by participant sex (i.e., there

was no preference group by participant sex interaction), $F(1, 148) = 2.60, p = .109, \eta_p^2 = .02$.

Similarly, in the belief in afterlife analysis, there was a dark-light main effect, $F(1, 148) = 9.44, p = .003, \eta_p^2 = .06$, that was not modified by participant sex, $F(1, 148) = 0.96, p = .329, \eta_p^2 = .01$.

Preferences for light over dark therefore predicted religiosity among both men and women.

Discussion and Study 2

If God is light (Weightman, 1996), then preferences for light may typically occur in the context of higher relative to lower levels of religiosity (see Figure 1). Study 1 provided support for these ideas in the context of beliefs in God and in an afterlife. Given the novel nature of the predictions and findings, however, we deemed it important to replicate them. We therefore conducted two independent replications, both of which added a nearness to God or proximity scale to the belief-based outcomes thus far examined.

Method

Participants

Study 2a recruited a new sample of 133 undergraduates (54% female; 91% Caucasian; M age = 19.09) and Study 2b recruited another new sample of 135 (54% female; 88% Caucasian; M age = 19.36).

Measures

Participants received the dark/light preference probe of Study 1. As in Study 1, a majority of responders preferred light over dark (Study 2a: 79.70%; Study 2b: 77.94%). Religious beliefs were assessed later in the relevant sessions, in a different Medialab program. Participants in both replication samples completed the belief in God (Study 2a: $M = 4.93; SD = 1.50$; Study 2b: $M = 4.77; SD = 1.59$) and afterlife (Study 2a: $M = 5.05; SD = 1.38$; Study 2b: $M = 4.90; SD = 1.42$) questions of Study 1. Participants in both replication samples also completed the Nearness to

God Scale (Gorsuch & Smith, 1983), which pairs 6 statements (e.g., “God is constantly with us”) with a 4-point extent-of-agreement scale ($M = 3.21$; $SD = 0.84$; $\alpha = .93$). High scores occur among Christians (Lupfer, Brock, & DePaola, 1992) or theists (Toburen & Meier, 2010) who believe that God is personally involved in their lives (Gorsuch & Smith, 1983).

Results

Primary hypotheses were examined in a series of ANOVAs with preference group (dark versus light) as the dichotomous predictor variable and religious beliefs as the continuous dependent measures or outcomes. In Study 2a, people who preferred light to dark believed in God to a greater extent, $F(1, 131) = 8.93$, $p = .003$, $\eta_p^2 = .06$, believed in an afterlife to a greater extent, $F(1, 131) = 6.84$, $p = .010$, $\eta_p^2 = .05$, and perceived themselves to have a closer relationship with God, as reflected in Nearness to God scores, $F(1, 131) = 9.81$, $p = .002$, $\eta_p^2 = .07$. These relationships were replicated in Study 2b, in that light-preferring people had stronger beliefs in God, $F(1, 133) = 8.00$, $p = .005$, $\eta_p^2 = .06$, stronger beliefs in an afterlife, $F(1, 133) = 11.20$, $p = .001$, $\eta_p^2 = .08$, and a closer perceived relationship with God, $F(1, 133) = 8.29$, $p = .005$, $\eta_p^2 = .06$. Means and standard deviations for these analyses are reported in Table 1.

As in Study 1, we then performed robustness checks by adding participant sex as an additional between-subjects predictor. There were 6 of these 2 (preference group) x 2 (participant sex) ANOVAs, one for each dependent measure in each replication sample. As shown in Table 2, there were no hints of interactions in these ANOVAs. Accordingly, preferences for light over dark predicted religiosity equally well among men and women in Study 2.

Turning to a different issue, the samples were not very diverse. Nonetheless, given that participants in Studies 2a and 2b completed the same dependent measures, we could combine the samples to examine some initial questions about race and ethnicity. For these analyses, we

contrasted Caucasian ($n = 241$) versus non-Caucasian ($n = 29$) groups, both with respect to their dark-light preferences and with respect to the manner in which they functioned. The percentage of participants who preferred light as a perceptual symbol was identical in the Caucasian (78.75%) and non-Caucasian (79.31%) groups, as confirmed by a chi-square test, $\chi^2 = 0.00$, $p = .944$. Furthermore, there were no preference group (dark versus light) by race interactions within 2 x 2 ANOVAs that included both predictors and this was true for the belief in God, $F < 1$, $p = .430$, $\eta_p^2 = .00$, afterlife, $F < 1$, $p = .899$, $\eta_p^2 = .00$, and closeness to God, $F < 1$, $p = .788$, $\eta_p^2 = .00$, measures. Thus, people do not seem to interpret light versus dark in terms of skin color (Adams & Osgood, 1973) and the metaphoric processes of interest appear to work similarly across racial groups.¹

Discussion

In three independent samples, we have shown that people who prefer light to dark have stronger religious beliefs. They believe in God to a greater extent (Bishop, 1999), believe in the afterlife to a greater extent, and think that God is personally involved in their lives (Gorsuch & Smith, 1983). These findings support our balanced version of conceptual metaphor theory and indicate that simple questions about perceptual preference have broader attitudinal implications.

Study 3

Having established the basic relationship that we sought to establish, we turned to some additional questions. In the first two studies, light-dark preferences were assessed with a single item. Accordingly, we do not know how consistent light-dark preferences are across multiple items. To address this question, we created a new multi-item measure that will lend itself to regression-based predictions.

The balance dynamics that guided our hypotheses work through attitudes or preferences (Gawronski et al., 2007; Pelham, Carvallo, & Jones, 2005). Nonetheless, light is a powerful perceptual symbol for the divine (Eliade, 1996; Weightman, 1996). Given that this is true, people who are perceptually accessible (Bruner, 1957; Higgins, 1996) for light may be predisposed to believe in God as well, as suggested by the horizontal lines of Figure 1. Color preferences tend to be independent of perceptions, however (Palmer et al., 2012), and we therefore expected the two light-related predictors to be uncorrelated.

A final goal of Study 3 was to provide evidence for discriminant validity. Individual differences are often assessed in terms of personality traits (John & Srivastava, 1999) and personality traits tend to be modest predictors of religious belief (Piedmont, 1999). It therefore seemed useful to control for several personality traits, in a supplementary analysis, as a way of showing that our metaphor-related predictors capture distinct sources of variance. Toward this end, Study 3 assessed three traits of the Big 5 – extraversion, agreeableness, and neuroticism – that have been implicated in religious beliefs in previous research (Saroglou, 2002).

Method

Participants

Study 3 included 140 (44% female; 91% Caucasian; *M* age = 19.35) participants.

Measures

Light/Dark Preferences. To examine the reliability of individual differences in light/dark preferences, we built on the single item of the first two studies. In a series of 5 preference questions, participants were asked whether they preferred “light or dark” (original item), “white or black”, “day or night”, “lighter or darker”, and a “lighter room or darker room”. In each case, we scored the darker option as 1 and the lighter option as 2 before averaging across items. As

with the single item, there was a normative trend to prefer light ($M = 1.65$; $SD = 0.32$), but there were reliable individual differences on either side of this normative trend ($\alpha = .70$), with minimal skew (.35), consistent with a continuous distribution.

Light/Dark Perceptions. In addition to working through preferences, religious beliefs could operate at the level of perceptual categories (Bruner, 1957). Specifically, religiosity may covary positively with a tendency to categorize stimuli as light rather than dark. To investigate this possibility, we created a measure that asked people to indicate whether 2 inch by 2 inch squares presented on the computer screen were “more light” or “more dark”. The stimuli were fairly ambiguous (i.e., gray), but varied from 40% black/60% white to 60% black/40% white, with the 5% steps in between also included. There were thus 5 stimuli that were presented twice each (in a randomized order), for a total of 10 trials.

Dark (light) responses were scored as 1 (2). These responses varied as a function of stimulus, $F(4, 522) = 162.21$, $p < .001$, $\eta_p^2 = .54$, as would be expected (e.g., at 40% black, the mean was 1.84; at 60% black, it was 1.10). However, there were also reliable individual differences in tendencies to perceive stimuli as lighter or darker ($M = 1.44$; $SD = 0.21$; $\alpha = .68$; skew = .29).

Religiosity. Religiosity was assessed by the three outcomes of Study 2, with the minor note that we added 4 items to the Nearness to God Scale (Gorsuch & Smith, 1983) to amplify the everyday implications of these religious beliefs. The 4 new items correlated highly with the original 6 items and we therefore averaged across all 10 items ($M = 3.11$; $SD = 0.93$; $\alpha = .97$).² Of note, the religiosity measures were presented before the metaphor-related measures, and in a separate program, to guard against order effects of a metaphor-to-religion type.

Personality. As a secondary aim, we sought to show that predictor/outcome relationships could not be explained in terms of personality traits. Toward this end, we assessed the affect-related (Robinson, 2007a) personality traits of extraversion, agreeableness, and neuroticism, which have some relevance to people's religious beliefs (Saroglou, 2002). These traits were assessed using Goldberg's (1999) well-validated IPIP scales, which use a 1-5 response scale (extraversion: $M = 3.25$; $SD = 0.68$; $\alpha = .83$; agreeableness: $M = 3.92$; $SD = 0.60$; $\alpha = .80$; neuroticism: $M = 3.25$; $SD = 0.68$; $\alpha = .80$). Given that implicit and explicit measures of personality are often fairly independent (Robinson & Wilkowski, 2015), the metaphor-related predictors will likely continue to predict religiosity when controlling for personality traits.

Results

Color perceptions do not bear any direct relationship to color preferences (Palmer & Schloss, 2010). Similarly, the preference and perceptual response measures of Study 4 did not predict each other, $r = .02$, $p = .82$. Nonetheless, both measures are likely to have value, with perceptual responses tracking a more cognitive form of accessibility and color preferences tracking a more affective form (Robinson, Liu, & Bair, 2015).

These ideas were supported in simple regressions. Specifically, preferences for light were positively predictive of the belief in God, $t(136) = 2.51$, $p = .010$, $\beta = .18$, afterlife, $t(136) = 2.10$, $p = .038$, $\beta = .18$, and nearness to God, $t(136) = 2.65$, $p = .009$, $\beta = .21$, outcomes. Similarly, perceptions of light were positively predictive of the belief in God, $t(136) = 2.50$, $p = .013$, $\beta = .21$, afterlife, $t(136) = 2.45$, $p = .016$, $\beta = .21$, and nearness to God, $t(136) = 2.64$, $p = .009$, $\beta = .22$, outcomes. Both sorts of predictors mattered for religiosity, then.

Further, given that the preference and accessibility predictors were uncorrelated, it seemed likely that both would predict variance in religiosity when simultaneously controlled in

multiple regressions. This proved to be the case. First, both preferences for light, $t(135) = 2.52$, $p = .013$, $\beta = .21$, and biases to see light, $t(135) = 2.52$, $p = .013$, $\beta = .21$, predicted belief in God in the first multiple regression. Similarly, both the preference, $t(135) = 2.10$, $p = .038$, $\beta = .17$, and accessibility, $t(135) = 2.45$, $p = .016$, $\beta = .20$, measures predicted beliefs in an afterlife. Finally, both the preference, $t(135) = 2.67$, $p = .008$, $\beta = .22$, and accessibility, $t(135) = 2.66$, $p = .009$, $\beta = .22$, measures predicted perceptions of nearness to God.

We next turned to some secondary analyses. To examine possible interactions by gender, we scored participant sex as -1 (men) or +1 (women), created sex by metaphor-related predictor interaction terms, and then performed a series of 6 multiple regressions to test for potential interactions (Aiken & West, 1991). As shown in Table 3, none of the interactions were significant. Hence, the metaphor-related predictors functioned similarly across genders.

In a final series of analyses, we examined predictor/outcome relationships after controlling for the personality traits of extraversion, agreeableness, and neuroticism, which have predicted religious outcomes, to some degree, in previous research (Saroglou, 2002). We used multiple regression procedures to perform these analyses. As shown in Table 4, the metaphor-related predictors continued to predict religiosity when controlling for the personality traits that were assessed. These results provide some evidence in support of discriminant validity.

Discussion

Study 3 built on and extended the findings of Studies 1-2. Metaphors for dark versus light are systematically related to metaphors for black versus white and similar perceptual attributes (Yu, 2015). Accordingly, we expected and found that light-preferring individuals also preferred white to black, day to night, and lighter to darker ambient lighting. Thus, there are systematic individual differences in dark-light preferences that are apparent across multiple items.

Our individual difference framework emphasizes preferences rather than perceptions. Nonetheless, we also entertained the possibility that people would vary in whether they were perceptually accessible for dark versus light and that these differences in accessibility would be consequential (Bruner, 1957; Higgins, 1996). Although the light-related accessibility and preference measures were not correlated with each other (Palmer et al., 2012), both predicted individual differences in religiosity. We therefore encourage further work on perception-based measures of lightness, and present a relevant extension in Study 4.

Study 4

Light-dark imagery is frequent in religious language (Weightman, 1996), but language is not sufficient for establishing that the relevant associations are automatic or conceptual (Gibbs, 2011). In Studies 4 and 5, we turned to questions of this type. As shown in the horizontal lines of Figure 1, we think that there is a normative link or association between representations of God and more perceptual representations of lightness. This link is also posited to be bidirectional in nature. That is, thinking about God should prime perceptions of lightness, but perceptions of lightness should also prime semantic content related to God. Study 4 focuses on the first possibility and Study 5 focuses on the second and we expected priming influences in both directions (Lee & Schwarz, 2012). Please note that predictions for these two studies are normative rather than based on an individual differences framework. Studies 4 and 5 differ from Studies 1-3 in this respect.

Method

Participants

A new sample of 104 (50% female; 84% Caucasian; *M* age = 19.50) NDSU students received course credit.

Priming Task

We sought to determine whether the activation of religious thoughts would shift perceptions in a light-ward direction. To evaluate this possibility, we created a version of a continuous priming task (McRae & Boisvert, 1997) that actually required people to alternate between two different tasks. The first task was a word categorization task designed to activate religious, versus non-religious, cognitions (Shariff et al., 2016). The second task was a perceptual task probing relative perceptions of lightness versus darkness (Meier et al., 2007). The two tasks were interleaved with each other – word, perception, word, perception, etc. Through the use of these procedures, we could examine what happened to perceptions as a function of whether the preceding category had been religious or not (Meier et al., 2007; Wilkowski & Robinson, 2007).

Hence, participants were told that we were interested in their abilities to alternate between two very different tasks. In the first, they should categorize words as indicative of a belief in God (“believer”, “faithful”, & “holy”) or not (“agnostic”, “atheist”, & “secular”), with concreteness and word length fairly well-matched across categories. The o and p keys of the keyboard were used for this word categorization task, with key assignment (e.g., o = God; p = not) counterbalanced across participants. The second task involved indicating whether a centrally presented square (1 inch by 1 inch) was “lighter” or “darker”. The q and w keys of the keyboard were used for these perceptual responses, with key assignment (e.g., q = darker; w = lighter) also counterbalanced across participants. Word stimuli were randomly assigned to trials but the perceptual stimulus was always the same gray (45% black) color. In the latter case, though, we led participants to believe that there were two stimuli rather than one, with one lighter in coloration than the other (Meier et al., 2007). Stimuli remained on the screen until a response

was made, with response labels provided. Each response, though, terminated the current stimulus and this was followed by a 200 ms blank screen before the next stimulus was presented.

Results

We chose words that we thought would be unambiguous members of their categories. This was generally the case in that the average accuracy rate for the word categorization task was 89.60% (M categorization time = 973 ms; M time to make a perceptual judgment = 473 ms; accuracy was not relevant to the perception task because the stimulus was always the same). To ensure that the relevant categories had been primed, though, we deleted the perceptual judgments that followed incorrect word classifications (Ratcliff, 1993). Then, to examine the possibility of priming, we calculated the percentage of lighter (0 = darker; 1 = lighter) perceptions following religious primes and also the percentage of lighter perceptions following non-religious primes. These percentages differed from each other, as revealed in a repeated-measures ANOVA, $F(1, 103) = 29.08, p < .001, \eta_p^2 = .22$. As shown in the top panel of Figure 2, religious primes shifted perceptual responses in a light-favoring direction, relative to non-religious primes, which shifted perceptual responses in a dark-favoring direction by comparison.³ This hypothesized priming effect did not interact with sex in a follow-up ANOVA in which sex was added as an additional between-subjects factor, $F < 1, p = .920, \eta_p^2 = .00$.

Discussion and Study 5

Metaphors can be viewed in terms of concept/percept pairings that are stored in memory (Lakoff & Johnson, 1999). If this is the case, one element of the pair (e.g., the concept) should be capable of priming the other element of the pair (e.g., the percept), potentially in a bidirectional manner (Lee & Schwarz, 2012). Study 4 provided support for one direction of influence, namely from religious thoughts (conception) to perceptions of lightness. It is equally if not more

important to show, however, that cues to lightness influence religious thoughts or judgments. In the absence of such evidence, the metaphoric processes that we have explored might follow from religious cognitions but not guide them. Accordingly, the purpose of Study 5 was to show that people make religious inferences on the basis of cues to lightness or darkness, a possibility that we could examine within a social judgment paradigm (Meier et al., 2014) that manipulated shirt color (dark versus light) in an incidental manner.

Method

Participants

The sample consisted of 97 (46% female; 86% Caucasian; M age = 19.61) undergraduates.

Priming-Judgment Task

Stimuli. A number of online retailers picture the same model, in the same simple pose, wearing different colors of the same shirt (typically, a t-shirt). We obtained 32 racially diverse picture pairs of this type, with 16 males and 16 females wearing a white shirt (one picture) and then the same shirt in a black color (second picture). Paired pictures were identical except for shirt color. For presentation purposes, targets were assigned to two alternative sets – Group A (8 male models & 8 female models) or Group B (another set of 8 male models & 8 female models). A computer program presented Group A in white shirts and Group B in black shirts or vice versa. Thus, there were 32 trials involving unique models, 16 with white shirts and 16 with black shirts. Stimuli were randomly ordered and presented at center screen.

Ratings. Participants were told that we were interested in their ability to make inferences about people on the basis of first impressions (Slepian, Bogart, & Ambady, 2014). In specific terms, they were asked to rate the extent to which each pictured individual likely “believes in

God” along a 1 (not at all) to 7 (completely) scale. We stated that people can often make inferences of this type accurately and we encouraged participants to do their best.

Results

Conceptual metaphors may have powerful, largely unexplored, influences on social cognition and judgment. Consistent with this point, the incidental feature of shirt color influenced people’s judgments of religiosity, as established in a repeated-measures ANOVA, $F(1, 96) = 14.95, p < .001, \eta_p^2 = .13$. In more particular terms, the bottom panel of Figure 2 shows that white-shirted targets were seen to believe in God to a greater extent than black-shirted targets, despite the equivalence of the models involved.⁴ This effect did not interact with participant sex in a second ANOVA, $F(1, 95) = 1.74, p = .191, \eta_p^2 = .02$, and it did not interact with target sex in a third, $F(1, 96) = 1.30, p = .263, \eta_p^2 = .01$.

In Study 2, we presented initial evidence for the idea that dark-light metaphor may function independently of racial considerations. Study 5 provided another opportunity for examining this idea, specifically in the context of the racial characteristics of targets. Of the 32 clothing models that were used, 22 were Caucasian and 10 were non-Caucasian. We therefore performed a 2 x 2 repeated-measures ANOVA in which we treated both shirt color and target race as predictors of religiosity inferences. A main effect for target race, $F(1, 96) = 8.81, p = .004, \eta_p^2 = .08$, was opposite in direction to the main effect for shirt color, $F(1, 96) = 15.98, p < .001, \eta_p^2 = .14$, in that Caucasians were seen to be less religious ($M = 4.66$) than non-Caucasians ($M = 4.81$). Furthermore, there was no hint of a target race by shirt color interaction, $F < 1, p = .494, \eta_p^2 = .00$, confirming the independence of these predictors. In total, then, the metaphor-related processes of Study 5 do not appear to involve inferences related to race.⁵

Discussion

Studies 4 and 5 focused on normative predictions. If light/God associations are stored in memory (Lakoff & Johnson, 1999), then evidence for this point should be apparent in priming paradigms (Crawford, 2009). Study 4 found that representations of God primed perceptions of lightness and Study 5 found that perceptions of lightness primed representations of God, in the latter case as manifest in social judgments (Meier et al., 2014). We therefore conclude that light/God mappings are conceptual rather than merely linguistic (Gibbs, 2011).

General Discussion

The use of conceptual metaphors should be prevalent in the religious domain because many of the key concepts of this area (such as God or the afterlife) are either abstract or intangible to the senses (Lakoff & Johnson, 1999). Consistent with this idea, scholars have found a great deal of symbolism and metaphor in religious ceremonies (Weightman, 1996) as well as religious texts such as the Bible (Jäkel, 2002) and Koran (El-Sharif, 2012). In both of the latter texts, believers are likened to travelers, who must traverse a long, straight, and narrow path in order to find salvation. Fortunately, though, the path seems to be well-lighted, at least for believers, and progress along the path seems to be ensured to the extent that God's dictates are consistently followed. Other metaphors also abound, such as those related to family, occupations, animals, and verticality (DesCamp & Sweetser, 2005; El-Sharif, 2012; Jäkel, 2002).

Light-dark metaphors make particular sense. We are diurnal creatures who use light to navigate our environments, and we are vulnerable in the dark (Kövecses, 2005). The perceptual dimension of light versus dark is therefore co-opted to represent multiple concepts that figure prominently in religion, such as insight, purity, salvation, and morality (Meier & Robinson, 2005; Yu, 2015). That is, although "God is light" is probably a case of symbolism, this symbolism is extended through the mechanism of conceptual metaphor (Lakoff & Johnson,

1999) to refer to a wider class of religious concepts such as religious insights (e.g., “to see the light”), pathways (e.g., “God lights the way”), and faithfulness (e.g., “inner light”). These mappings also make sense in other ways: Light is energy, just as God is. Light facilitates growth, just as God does. Light permits us to see things clearly, just as God does, etc.

There are major limitations to textual analyses, though (Crawford, 2009). Thus, a primary purpose of the present studies was to show that light-dark metaphors are active in religious cognition, and in multiple ways. Study 4 showed that the representation of religious concepts activated perceptions of lightness and Study 5 showed that lighter-colored clothing led to inferences of greater religiosity. Together, these studies establish the bidirectional mappings that seem to be characteristic of ingrained conceptual metaphors (Lee & Schwarz, 2012). Our primary interest was in advancing CMT, however, and we offered a balance-related version of CMT that was capable of making individual difference predictions. Strong metaphoric mappings should create pressures to either favor (top panel of Figure 1) or disfavor (bottom panel of Figure 1) both components of a metaphoric mapping. In the present case, that is, people who favor perceptual lightness should possess greater religious sentiment and belief than people who disfavor perceptual lightness. Studies 1-3 supported these novel, theory-extending predictions.

Please note that our priming-related predictions were reliant on only one mechanism – conceptual metaphor – whereas our individual difference predictions were reliant on two – conceptual metaphor and balance dynamics. Such considerations suggest that the experimental results that we reported should have a larger effect size than the correlational results that we reported. Effect sizes corresponded to these expectations. Studies 4 and 5, which examined spreading activation processes per se, had effect sizes that were large (Cohen, 1988). Studies 1 and 2, which contrasted light and dark preferences in a group-based manner, had effect sizes that

were medium. And Study 3, which sought to create a more continuous measure of preferences for light, had effect sizes that were small-to-medium (Cohen, 1988). The preference measure of Studies 1-2, relative to that of Study 3, can therefore be favored for reasons of both parsimony and effect size. Beyond this point, though, we acknowledge that our preference measures predicted religious beliefs to a moderate rather than strong degree. This makes sense because religious beliefs are multi-determined rather than the product of any one set of factors (Gervais, 2013). In the discussion below, we will briefly touch on some of these factors.

We should also acknowledge that our samples tended to be somewhat homogeneous and this limitation could be revisited in future studies. Nonetheless, we did provide some evidence for process-invariance. In all studies, we tested for the possibility of interactions by gender and never found them. Thus, the processes that we focused on function similarly among men and women. Our ability to examine racial and ethnic differences was more limited but we did provide some relevant evidence. Preferences for light over dark do not seem to be stronger among Caucasians relative to people of other races (Study 3) and cues to light versus dark function similarly as a function of target race as well (Study 5). Our metaphor-related processes, then, should not be equated with skin color and may operate similarly across racial groups (Adams & Osgood, 1973). Our samples consisted of younger rather than older adults and we can only speculate concerning age. Even so, age does not seem to be a major moderator of metaphor-related effects (Landau et al., 2010) and any subtle differences could actually result in larger effect sizes for older adults, specifically due to increased socialization and therefore greater familiarity with the relevant class of metaphors (Kövecses, 2005).

The possibility of cultural differences is also worth examining. Arnheim (1969) thinks that associations to light and dark have remained fairly constant across cultures and historical

periods. Consistent with the former possibility, Adams and Osgood (1973) found that people from 23 different cultures had similar associations to the perceptual concepts of light and dark. Also, a comparative analysis of different religions suggests a great deal of convergence concerning the implications of light and dark symbolism (Eliade, 1996). Even so, there are intriguing cultural subtleties in the manner in which metaphors are used. For example, Yu (2003) reports that head and heart metaphors function somewhat similarly in the United States and in China, but that the Chinese heart is given a much greater scope of influence. Similarly, Gilead, Gal, Polak, and Cholow (2015) state that sweetness-related metaphors function similarly in the United States and in Israel, but that sweetness connotes inauthenticity (as in “saccharine”) to a greater extent in Israel. To the extent that cultural subtleties with respect to light and dark connotations could be identified, they would be worth pursuing.

Turning to a different issue, our sense is that the metaphor-related processes that we highlighted are fairly unique. Still, it is worth speculating on the possible interface between conceptual metaphor and some of the other factors that have been highlighted in the psychology of religion literature. There is considerable interest in religious priming and what sorts of processes it entails (Shariff et al., 2016). Our results, and particularly those of Study 4, suggest that religious primes are likely to activate metaphor-related associations (e.g., lightness, cleanliness, high verticality), among other sources of knowledge. In turn, some of these metaphoric dimensions could be responsible for religious priming effects, given that both cleanliness and lightness have been linked to moral behavior (Zhong & House, 2014). Further, metaphor has an imaginative scope to it and a tendency toward metaphoric thinking could relate to some predictors of religiosity such as magical ideation or intuitive thinking (Shenhav, Rand, & Greene, 2012). Finally, it is plausible that dark-preferring people are lower in empathetic

concern, which is a predictor of religiosity (Jack, Friedman, Boyatzis, & Taylor, 2016). The present studies lay the groundwork for possible extensions along these lines.

In conclusion, preferences for light or dark may seem like minor aesthetic judgments. They are not, however, as light and dark are integral to our moral metaphors (Yu, 2015) and the manner in which God is conceptualized (Weightman, 1996). Preferring light to dark is therefore partly a matter of faith. The present results document relations of this type while also showing how an essentially normative theory (Lakoff & Johnson, 1999) can be transformed into one capable of making individual difference predictions.

Declaration of Conflicting Interests

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Footnotes

¹For exploratory purposes, Study 2b also asked participants to categorize their religious beliefs. The choices were “Agnostic” (3%), “Atheist” (3%), “Buddhist” (2.2%), “Christian” (83.1%), “Muslim/Islamic” (0.7%), “Hindu” (0.7%), “Jewish” (0%), “Unknown” (5.9%), and “Other” (0.7%). This measure is exploratory because – as expected (Meier, Fetterman, Robinson, & Lappas, 2015) – agnostic and atheist percentages were low. We therefore grouped participants according to whether they professed a religious affiliation or, alternatively, identified themselves as atheist/agnostic, with the “unknown” responses dropped. Among atheists/agnostics, the percentage of light-preferring people was 25%. Among believers, by contrast, the percentage of light-preferring people was 82%. These percentages were different from each other, $\chi^2 = 14.73$, $p < .001$, meaning that a preference for light seems to covary with having a religious affiliation. This finding, though, must be considered supplementary rather than primary given the infrequency with which participants identified as atheist or agnostic.

²The four added items were “God watches over us”, “You can see God’s work in everyday life”, “God is definitely part of my life”, and “I can talk to God through my prayers”.

³Predictions for Study 4 were normative rather than based on individual differences. Even so, it may be interesting to examine possible modulatory influences due to religiosity. As part of the Study 4 protocol, participants were asked about their beliefs in God and in the afterlife, using the same questions administered in Study 1, and these two questions were averaged ($M = 4.76$; $SD = 1.44$; $\alpha = .83$). We then re-ran the main analysis with religiosity as a standardized covariate (Robinson, 2007b). The main effect for prime type (religious versus not) remained highly significant, $F(1, 101) = 29.90$, $p < .001$, $\eta_p^2 = .23$. Although the main effect for religiosity was not significant, $F(1, 101) = 1.47$, $p = .228$, $\eta_p^2 = .01$, there was some hint of a prime type by

religiosity interaction, $F(1, 101) = 3.10, p = .081, \eta_p^2 = .03$. Estimated means for the marginal interaction revealed that the priming effect for religious concepts was present at both low ($-1 SD$; non-religious prime = 32.67%; religious prime = 50.13%) and high ($+1 SD$; non-religious prime = 29.42%; religious prime = 63.49%) levels of religiosity, but was somewhat stronger in the latter case. This makes sense in that more religious people may have more exposure to God-is-light symbolism and its extension to metaphor (Eliade, 1996).

⁴Predictions for Study 5 were normative. Regardless, it might be interesting to examine possible modulatory influences due to religiosity, assessed in a manner identical to Study 4 ($M = 4.67; SD = 1.52; \alpha = .95$). A standardized version of this variable was added to the primary analysis, using a General Linear Model framework (Robinson, 2007b). The main effect for shirt color remained highly significant, $F(1, 95) = 15.44, p < .001, \eta_p^2 = .14$. In addition, there were lesser influences due to a religiosity main effect, $F(1, 95) = 7.28, p = .008, \eta_p^2 = .07$, and a shirt color by religiosity interaction, $F(1, 95) = 4.13, p = .045, \eta_p^2 = .04$. Estimated means for the interaction revealed that the shirt type effect was in the same direction for individuals low ($-1 SD$; black shirt = 4.25; white shirt = 4.74) and high ($+1 SD$; black shirt = 4.85; white shirt = 5.01) in religiosity, but was more pronounced among less religious people. The interaction may have occurred because religious people assumed relatively high levels of religiosity among all targets.

⁵In another ANOVA, we added participant race (Caucasian versus non-Caucasian) as another factor, in addition to shirt color and target race. All effects involving participant race were not significant, $F_s < 1, p_s > .45, \eta_p^2_s < .02$. Thus, shirt color affected non-Caucasian and Caucasian participants similarly and these processes were independent of target characteristics.

Table 1

Religiosity Means (Standard Deviations) as a Function of Preferences for Dark versus Light, Studies 1 and 2

Study	Religiosity Measure	Dark Group	Light Group	<i>M</i> Difference
1	Belief in God	4.29 (1.70)	5.20 (1.29)	+0.91
	Belief in Afterlife	4.49 (1.62)	5.18 (1.20)	+0.69
2a	Belief in God	4.19 (1.96)	5.12 (1.29)	+0.93
	Belief in Afterlife	4.44 (1.74)	5.21 (1.24)	+0.77
	Nearness to God	2.78 (1.03)	3.32 (0.74)	+0.54
2b	Belief in God	4.07 (1.86)	4.97 (1.45)	+0.90
	Belief in Afterlife	4.17 (1.72)	5.11 (1.25)	+0.94
	Nearness to God	2.65 (0.93)	3.14 (0.78)	+0.49

Note: Values can vary from 1-6 for the belief measures and from 1-4 for Nearness to God scores.

Table 2

Participant Sex by Preference Group Interactions in Study 2

Study	Measure	Interaction		
		<i>F</i> -value	<i>p</i> -value	η_p^2
2a	Belief in God	0.01	.924	.00
	Belief in Afterlife	0.45	.512	.00
	Nearness to God	0.14	.993	.00
2b	Belief in God	0.23	.632	.00
	Belief in Afterlife	0.34	.564	.00
	Nearness to God	0.30	.586	.00

Note: Listed are the *F*, *p*, and η_p^2 values for the interaction term within the 2 (preference group) x 2 (participant sex) ANOVAs of Study 2.

Table 3

Interactions by Participant Sex, Study 3

Predictor	Outcome	Interaction		β
		<i>t</i> -value	<i>p</i> -value	
Light Preferences	Belief in God	-0.30	.761	-.03
	Belief in Afterlife	0.10	.923	.01
	Nearness to God	0.02	.989	.00
Light Accessibility	Belief in God	0.40	.687	.03
	Belief in Afterlife	-0.79	.434	-.07
	Nearness to God	0.16	.859	.01

Note: Listed are the *t*, *p*, and β values for the predictor by participant sex interaction term from the 6 gender-related multiple regressions performed in Study 3.

Table 4

Predictor/Outcome Relationships After Controlling for Extraversion, Agreeableness, and Neuroticism, Study 3

Predictor	Outcome	Predictor			Overall
		<i>t</i>	<i>p</i>	β	Model
Light Preferences					
	Belief in God	2.41	.022	.20	$F = 3.07, p = .019, \eta_p^2 = .08$
	Belief in Afterlife	2.09	.039	.18	$F = 1.41, p = .232, \eta_p^2 = .04$
	Nearness to God	2.59	.010	.22	$F = 3.10, p = .018, \eta_p^2 = .09$
Light Accessibility					
	Belief in God	2.25	.029	.19	$F = 2.87, p = .025, \eta_p^2 = .08$
	Belief in Afterlife	2.34	.018	.20	$F = 1.70, p = .153, \eta_p^2 = .05$
	Nearness to God	2.28	.019	.20	$F = 2.70, p = .033, \eta_p^2 = .08$

Note: Listed are the *t*, *p*, and β values for the predictor variables (light preferences or light accessibility) after controlling for extraversion, agreeableness, and neuroticism in a series of 6 multiple regressions. We also list statistics for the overall model that considers all 4 predictors simultaneously.

Figure 1

Balance Dynamics Supporting Greater (Top) and Lesser (Bottom) Religiosity

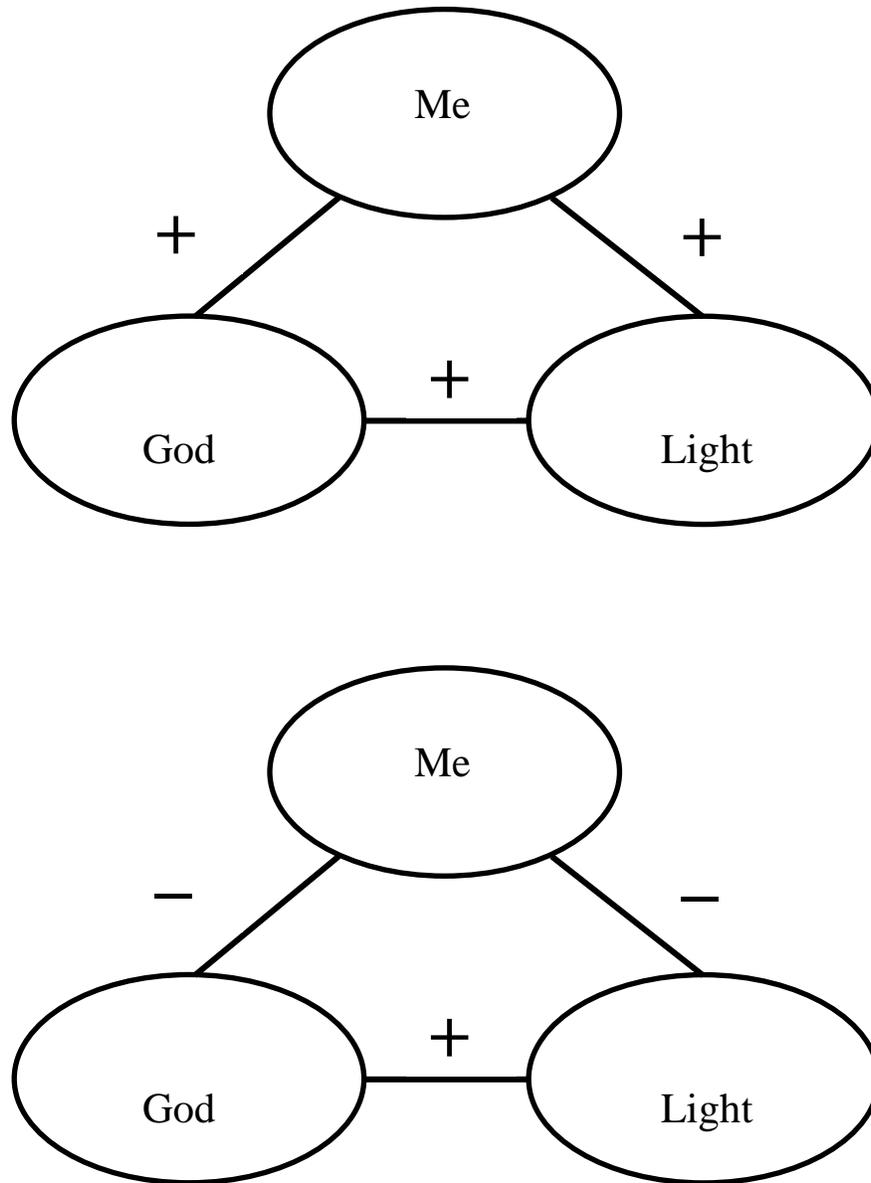


Figure 2

Top Panel: Percentage of Light Perceptions as a function of Prime Type, Study 4; Bottom Panel: Religiosity Ratings as a function of Shirt Color, Study 5

