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Priming Effects of Self-Reported Drinking and Religiosity

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Abstract

Research has revealed negative associations between religiosity and alcohol consumption. Given these associations, the aim of the current research was to evaluate whether the order of assessing each construct might affect subsequent reports of the other. The present research provided an experimental evaluation of response biases of self-reported religiosity and alcohol consumption based on order of assessment. Participants (N = 301 undergraduate students) completed an online survey. Based on random assignment, religiosity was assessed either before or after questions regarding recent alcohol consumption. Social desirability bias was also measured. Results revealed a priming effect such that participants who answered questions about their religiosity prior to their alcohol consumption reported fewer drinks on their peak drinking occasions, drinking less on typical occasions, and drinking less frequently, even when controlling for social desirability and for the significant negative associations between their own religiosity and drinking. In contrast, assessment order was not significantly associated with religiosity. Results indicate priming religion results in reporting lower, but potentially more accurate, levels of health risk behaviors and that these effects are not simply the result of socially desirable responding. Results are interpreted utilizing several social–cognitive theories and suggest that retrospective self-reports of drinking may be more malleable than self-descriptions of religiosity. Implications and future directions are discussed.

Keywords

religion; alcohol; priming effects

This paper considers flexibility in reports of religiosity and drinking as a function of priming. Specifically, the central aim of the current research was to evaluate whether asking individuals about their religiosity and religious behaviors would affect responses to questions about their alcohol consumption. Conversely, considering whether asking individuals about their drinking might influence their reported religiosity was also of interest.

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Religion as a Buffer Against Alcohol Use and Problems

Religiosity has consistently been identified as a protective factor against risky health behaviors, and the literature has revealed an inverse relationship between religiosity and alcohol/substance use, showing that those who report higher religiosity are less likely to engage in alcohol and other drug use (Delaney, Forcehimes, Campbell, & Smith, 2009; Geppert, Bogenschutz, & Miller, 2007; Hodge, Andereck, & Montoya, 2007; Koenig, McCullough, & Larson, 2001). Research has also shown that individuals struggling with addictive behaviors who reported higher religious support were better able to maintain substance use abstinence after treatment relative to those with lower support, and evidence suggests that the strength of support was a significant predictor of abstinence (Avants, Warburton, & Margolin, 2001; Conner, Anglin, Annon, & Longshore, 2009; Robinson, Cranford, Webb, & Brower, 2007). For example, among HIV-positive injection drug users entering a treatment program, the strength of religious support was positively associated with abstinence (Avants et al., 2001). Heroin users in consistently high religiosity groups reported greater reduction in heroin use compared to those in low religiosity groups (Conner et al., 2009). Longitudinal analyses suggested that changes in daily spiritual experiences were related to lower reports of heavy drinking among a cohort of Alcoholics Anonymous members (Robinson et al., 2007).

The majority of studies indicate that regular practice of religion increases the likelihood of abstinence and sobriety (e.g., Stewart, Koeske, & Pringle, 2008) and spirituality-based treatments (e.g., 12-step programs) have been found equally effective in comparison to other approaches (Project Match Research Group, 1997). Additionally, superior outcomes with faith-based programs have been reported on occasion (cf. Bicknese, 1999). Other research, however, indicates that religiosity does not impact alcohol consumption or relapse rates (Ramirez-Kirarte, 2001), and that religious treatment approaches are not as effective (Neff & MacMaster, 2005). Thus, while evidence generally supports religiosity as a protective factor for the development of alcohol and other drug use, treatment implications have been inconsistent. Consideration of how people perceive themselves with regard to alcohol and religion and how these perceptions interrelate may provide new insights into the relationships among alcohol-related and religious behaviors.

Theoretical Explanations for Priming Effects

There are several theoretical frameworks that may guide predictions regarding priming effects of religion on self-reported alcohol use: (a) concept activation/priming, (b) the multiple self-aspect framework, (c) heuristic processes, and (d) cognitive dissonance.

Priming may be defined as an implicit memory effect wherein exposure to a stimulus influences subsequent responses (Bargh & Chartrand, 2000; Thush et al., 2007). Priming can be accomplished by having individuals view or interact with words or pictures, increasing the accessibility and salience of the schemas related to the prime. In turn, individuals who have been primed with a construct are more likely to report attitudes and behave in ways that are consistent with the prime (e.g., Kawakami, Dovidio, & Dijksterhuis, 2003). For example, one classic study primed participants with words associated with elderly people

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such as “forgetful” and “wrinkle” and found that those primed exited the building at a slower pace than those primed with neutral stimuli (Bargh, Chen, & Burrows, 1996). This research suggests that priming activates a set of relevant constructs, further affecting cognition and behavior. Further, priming effects occur even if the participant is not aware of the priming stimulus (Bargh et al., 1996; Dehaene et al., 1998).

Priming has been used to activate concepts in a variety of domains, including some relating to alcohol and religion. Alcohol and associated stimuli can prime alcohol-related behaviors and increase the response speed to alcohol pictures, indicating an attentional bias to alcohol-related pictures (e.g., Duka & Townshend, 2004). Further, alcohol primes selectively activated alcohol expectancy-related information in long-term memory, influencing individuals’ working self-concept (e.g., sociability ratings; Hicks, Schlegel, Friedman, & McCarthy, 2009). Priming religion has led to increases in religion-relevant behaviors such as prosociality (Pichon, Saraglou, & Boccatto, 2007; Shariff & Norenzayan, 2007) and reduced cheating (Randolph-Seng & Nielsen, 2007). Religion and alcohol may be considered together if religion primes activate a representation of religion that could lead to religion-relevant changes in self-reports of behaviors in other domains (e.g., alcohol use).

Second, the multiple self-aspect framework (MSF; McConnell, 2011) offers a useful theoretical perspective for considering why priming religion might affect subsequent alcohol reports and/or vice versa. The structure of the self cannot be easily defined, but the MSF is one theoretical perspective that identifies the self-concept as being composed of multiple, contextually activated or primed selves. The MSF represents self-knowledge as a network of associated nodes that vary in accessibility, with only a small subset cognitively activated at any given time. This is similar to the notion of the “working self-concept” (Markus & Kunda, 1986). According to the MSF, the self is a collection of multiple, context-dependent self-aspects (e.g., one’s religious self-aspect), and these self-aspects are associated with personal attributes which become more accessible when that particular self-aspect is activated. This framework suggests that perceptions and actions at any given moment are managed and directed by a subset of self-knowledge. For example, mood changes have been shown to be determined by the extent to which self-relevant feedback changes the appraisals of self-aspects that are currently activated (McConnell, Rydell, & Brown, 2009). Thus, self-relevant feedback in a certain context and its ramifications are brought about by self-aspects and the way they are organized in the self-knowledge network. Self-relevant attributes are viewed as being composed of more than the base element, trait knowledge. From the perspective of this framework, individuals possess several self-aspects that are each comprised of unique attributes. Moreover, activation of one aspect of the self may account for differential recall of, or access to, a discordant aspect of the self. Thus, thoughts of drunkenness or excessive behavior may be unlikely to occur in the religious facet of the inner self. Conversely, Jesus may be an unwelcome guest to the keg party in our mind. Generally, the MSF emphasizes the importance of multiple, context-dependent self-aspects in the determination of the way individuals perceive, experience, and behave on an everyday basis (McConnell, 2011). Thus, as individuals tend to adjust their identity based on the context in which they currently find themselves, the MSF suggests that priming religion should influence subsequent reports in a way consistent with personal religious values. The MSF would suggest that individuals are multifaceted, and if one aspect of the self is primed,

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it should affect attention, memory, and the accessibility of that construct such that constructs concordant with the prime become more accessible and constructs unrelated or discordant with the prime become less accessible. Further, if the religious primes are automatically activating a personal religious belief and corresponding behavior, then this effect should be more pronounced for those who consider themselves more religious.

Third, heuristic processes provide an additional lens through which priming effects may be viewed. These processes would predict that if participants use rough heuristics in responding to the alcohol quantity or frequency measures, then when asked to recall typical drinking behavior, participants may consider a range representing their past drinking (e.g., 6–10 drinks) as an anchor, with specific responses adjusted according to context. For example, the reported number may be shifted to the lower end of the spectrum under a religious prime. The availability heuristic may also play a role if the religious prime affected the salience or ease of recalling drinking behaviors. Previous research has shown that acute alcohol consumption can influence how an individual perceives him or herself (e.g., Steele & Josephs, 1990). If, for example, participants had recently experienced an extremely intoxicated evening, or if they had spent the previous weekend at a religious retreat, it is plausible that their responses may be even further biased by recent events.

Finally, cognitive dissonance theory (CDT; Cooper & Fazio, 1984; Festinger, 1957) proposes that in the presence of two or more conflicting cognitions, individuals are driven to reduce experienced dissonance by altering existing cognitions. CDT would suggest that to the extent that religion and drinking are perceived as dissonant cognitions, if first asked about their religion and religious behaviors, individuals may try to reduce the uncomfortable feeling of dissonance by reducing their reported alcohol consumption.

Current Research

The current study evaluates whether presenting participants with religiosity and religious behavior measures prior to alcohol consumption and problems measures will affect the degree to which participants report their alcohol use and alcohol-related problems. In order to assess priming effects of religion on alcohol use, the order of assessment of each construct (religion vs. drinking) was manipulated. Social desirability bias was included as a covariate to help rule out potential findings as merely being a function of individuals responding in a manner that would be favorably viewed by others. The primary focus of the current research is the effect of priming religion on subsequent reports of alcohol consumption. The opposite priming effect was also considered in our hypotheses: that priming alcohol may affect subsequent reports of religiosity and religious behaviors.

Hypothesis 1 Self-reported religiosity will be negatively associated with drinking.

Hypothesis 2 Social desirability will be positively associated with religiosity and negatively associated with drinking.

Hypothesis 3 Priming of religiosity and religious commitment will cause lower mean levels of self-reported drinking. This effect is expected to hold even after controlling for individuals' levels of social desirability and self-reported religiosity.

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Hypothesis 4 Priming of drinking behavior will cause lower mean levels of self-reported religiosity. This effect is expected to hold even after controlling for individuals' levels of social desirability and self-reported drinking.

Method

Participants and Procedure

Participants included 301 college students (85.05% female; *M* age = 22.30, *SD* = 5.28) enrolled in undergraduate psychology classes. The sample was diverse, with 32.56% Caucasian, 29.57% Asian/Pacific Islander, 21.26% Hispanic/Latino, 16.94% Black/ African American, 1.00% Native American/American Indian, 4.98% Multiethnic, and 14.95% reporting Other. The majority of participants were Christian (67.77%); however, 10.96% reported Muslim/Islamic, 6.31% Agnostic, 5.65% Buddhist, 1.99% Atheist, 1.66% Hindu, 1.00% Jewish, and 4.65% Other.

Participants completed a web-based cross-sectional survey in exchange for extra credit. They were randomly assigned to complete measures about their religiosity and religious behaviors either before or after measures regarding their alcohol use and problems.

Measures

Alcohol use—Alcohol consumption was assessed with the Quantity/Frequency/Peak Alcohol Use Index (QF; Dimeff, Baer, Kivlahan, & Marlatt, 1999). The QF is a scale designed to identify typical drinking patterns over the previous month. This questionnaire includes an item addressing the occasion where respondents drank the most during the previous month (i.e., peak drinking), an item addressing typical weekend drinking in the previous month (i.e., typical drinking), and an item addressing typical number of drinking days per week in the previous month (i.e., drinking frequency). Peak drinking and typical drinking response options ranged from 0 to 25 + drinks. The drinking frequency response scale ranged from "I do not drink at all" to "Every day." With the exception of frequency, alcohol consumption measures were scored in terms of number of standard drinks (e.g., 12-oz. beer, 5-oz. wine). Frequency was assessed on a 12-point scale (1 = *never*; 2 = *less than once per month*; 3 = *once per month*; 4 = *two times per month*; 5 = *three times per month*; 6 = *once a week*; 7 = *twice a week*; 8 = *three times a week*; 9 = *four times a week*; 10 = *five times a week*; 11 = *six times a week*; 12 = *every day*).

Alcohol-related problems—Alcohol problems were assessed with a modified version of the Rutgers Alcohol Problems Index (RAPI; White & Labouvie, 1989). Although this measure was originally developed for adolescents 14–18 years of age, it has been used extensively in the college student drinking literature and has demonstrated good reliability and convergent validity (e.g., Borsari & Carey, 2000; Collins, Carey, & Sliwinski, 2002; Larimer et al., 2001; Marlatt et al., 1998; Neighbors, Larimer, & Lewis, 2004). The original RAPI assesses how often participants have experienced 23 alcohol-related consequences (e.g., "was told by a friend or neighbor to stop or cut down drinking") over the previous 3 months. In this study, the RAPI was modified to include two additional items (i.e., "drove

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after having two drinks" and "drove after having four drinks"). Response options for each item were on a 5-point scale (0 = *never*; 1 = *1 to 2 times*; 2 = *3 to 5 times*; 3 = *6 to 10 times*; 4 = *more than 10 times*). Scores were calculated by summing the 25 items (α = .97).

Religiosity—Two variables were used in the current research to assess religiosity. Specifically, perceptions of how religious individuals considered themselves (i.e., religiosity), and religious behaviors were measured. Religiosity was assessed by asking participants to what extent they would describe themselves as a religious person on a 7-point Likert-type scale (1 = *not at all*, 7 = *very much*). The religious behaviors construct was comprised of two items: Participants were asked how often they engage in prayer and how often they attend spiritual or religious services or meetings, which formed a composite variable referred to henceforth as "religious behaviors" (α = .81). Participants responded to these two items on a 12-point scale (1 = *never*; 2 = *less than once per month*; 3 = *once per month*; 4 = *two times per month*; 5 = *three times per month*; 6 = *once a week*; 7 = *twice a week*; 8 = *three times a week*; 9 = *four times a week*; 10 = *five times a week*; 11= *six times a week*; 12 = *every day*).

Social desirability—Social desirability bias was assessed with the 33-item Marlowe-Crowne Social Desirability Questionnaire (Crowne & Marlowe, 1960). Participants rated items as true or false of their typical attitudes and behavior. Example items are, "It is sometimes hard for me to go on with my work if I am not encouraged," "I am always careful about my manner of dress," and "No matter who I'm talking to, I'm always a good listener." Each item is scored as 1 (the socially desirable response) or 0 (the nonsocially desirable response). The final score represents the sum of the socially desirable responses from the 33 items (α = .82).

Results

Table 1 presents means and standard deviations by experimental condition. Descriptive statistics and correlations for all study variables are provided in Table 2. Table 3 is a split correlation table that reports associations by condition. Overall, identifying with religion was associated with consuming fewer drinks on typical occasions and on peak drinking occasions, and was associated with less frequent drinking. Social desirability was positively associated with religiosity and negatively associated with drinking frequency, peak drinking quantity, and alcohol-related problems.

The Effects of Priming Religion on Self-Reported Drinking

Multiple regression analyses were utilized to evaluate the effects priming religion on drinking controlling for religiosity and social desirability. Separate regression models were used to evaluate effects on each drinking outcome. Priming was dummy-coded (1 = religion measures first; 0 = alcohol measures first). Cohen's *d* was included a measure of effect size using the formula $d=2t/\sqrt{df}$ (Rosnow Rosenthal, 1991). Effect sizes of .2, .5, and .8 are typically considered small, medium, and large, respectively (Cohen, 1992). Regression results, effect sizes, and overall *F* and R^2 values are presented in Table 4.

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Results revealed significant priming effects on three of the four alcohol outcomes with effect sizes ranging from .27 to .38 (ranging from .06 to .38 with all four; *M* effect size =.26). The direction of the priming effect was consistent such that participants who answered questions about their religiosity prior to their alcohol consumption reported fewer drinks on their peak drinking occasion in the past month (*M* = 3.68 drinks in the alcohol-first condition vs. 2.72 drinks in the religion-first condition), lower typical drinking quantity (*M* = 2.03 drinks vs. 1.29 drinks), and less frequent drinking (*M* = 3.60 vs 2.94). These represent differences of 26% and 36% in peak and typical drinking respectively. Interpolating frequency scores suggested that those in the alcohol-first condition reported drinking about 1.6 times per month compared with just under 1 time per month for those in the religion-first condition. These effects were evident even after accounting for significant associations between religiosity and two of these outcomes. No priming effects emerged for alcohol problems. Social desirability was uniquely and negatively associated with alcohol problems, but not with any of the other alcohol outcomes. Finally, as can be seen in Table 3, the correlations between religion and drinking, while slightly larger on average in the religion-first condition, are in fact approximately the same magnitude in the two conditions.

Follow-up analyses were conducted to empirically test whether the observed priming effects were stronger among more religious participants. Specifically, two product terms were added to each model presented in Table 4 (i.e., a priming × religiosity term and a priming × religious behaviors term). The interaction terms for religiosity and religious behaviors were centered. Thus, two possible interactions were tested for each of the four drinking models. Of the eight tests, none were significant. Thus, we did not find any evidence that priming religion had a stronger effect among more religious participants. The current findings, then, may not be fully consistent with the MSF.

The Effects of Priming Alcohol on Self-Reported Religion

Parallel analyses using multiple regression were performed to evaluate the effects of priming alcohol on religiosity and religious behaviors controlling for drinking measures and social desirability. In these analyses, priming was dummy coded (1 = alcohol measures first; 0 = religion measures first). Regression results and overall *F* and R^2 values are presented in Table 5.

Overall, results revealed no priming effects of alcohol on either religiosity or religious behaviors. In both models, peak drinking was uniquely and negatively associated with religiosity and religious behaviors, whereas social desirability was positively associated with religiosity and religious behaviors. No other effects were significant.

Associations Between Drinking and Problems

A review of the pattern of correlations suggested that reported drinking appeared to be more consistent with alcohol problems in the religion-first condition than in the alcohol-first condition. Fisher *r* to *z* transformations and a resulting *z* test comparing the correlations showed that although the correlations of drinking frequency with alcohol problems did not differ across presentation orders, the peak drinking correlation with alcohol problems was significantly greater in the religion-first condition (*r* =.37) than in the alcohol-first condition

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(r =.15), Z = 2.04, p =.041. Similarly, the correlation of typical drinking with alcohol problems was significantly greater in the religion-first condition (r =.37) than in the alcohol-first condition (r =.14), Z = 2.04, p =.037. Thus, for two of the three drinking outcomes, reported drinking was more consistent with reported alcohol-related problem in the religion priming condition.

Discussion

Consistent with previous research (e.g., Koenig et al., 2001), the hypothesis that self-reported religiosity would be negatively associated with drinking was supported. Although results were not uniform across measures of religion and drinking outcomes, the overall pattern was consistent with previous work. The expectation that social desirability would be positively associated with religiosity and negatively associated with drinking was also supported at the bivariate level.

Additionally, support was found in three of four outcome measures for the prediction that priming religiosity and religious commitment would be associated with lower subsequent self-reported drinking. Specifically, results revealed that priming religion was associated with reports of significantly fewer peak drinks, lower drinking frequency, and lower typical amount consumed. Further, these effects were independent of social desirability and level of self-reported religiosity and religious behaviors. It is unclear why the priming effect on alcohol-related problems was not significant. While speculative, it is possible that the effect may be diluted when participants are asked to recall specific consequences of drinking (e.g., vomiting, driving after having a few drinks). These more severe behaviors may be less cognitively malleable, or less due to contextual distortion, than number of drinks consumed or frequency of drinking. The nonsignificant finding may also be a result of the fact that drinking problems in the current sample appeared to be relatively low, reducing the ability to capture variability in the outcome. Future research should replicate this procedure and determine whether the effect is a function of the psychometric properties of the instruments (e.g., multiple items) or related to the content (i.e., severity) of the items.

The final hypothesis was the priming effect in the opposite direction: that priming of drinking behavior would be associated with lower self-reported religiosity. Results did not support this hypothesis. It is theoretically interesting and meaningful that the effect for priming religion was significant, but the effect for priming alcohol was not. One potential explanation for this could be that individuals' perspectives on their religiosity are less flexible than their reported alcohol use. For example, one's stance on the extent to which they identify with a religion may not fluctuate based on current contextual factors, but the extent to which they remember drinking a specific number of drinks recently may be much more cognitively malleable. Additionally, research indicates that chronically accessible sources of information (i.e., those self-conceptions that are relatively high in personal representativeness and importance) are not as affected by contextual variables (Sedikides, 1995). If, in this sample, religion represented a chronically accessible belief system (e.g., Silberman, 2005), this would facilitate understanding why the alcohol primes did not influence self-reported religiosity.

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Our findings may be interpreted in terms of several theoretical frameworks. First, the multiple self-aspect framework (MSF) states that individuals' self-perceptions are comprised of several aspects, and the accessibility of these aspects are based on the current context. However, with its emphasis on aspects of the self, the MSF suggests that the effect of priming religion on self-reported alcohol use would be stronger for those who also report stronger religiosity. Given the absence of any significant interactions with religiosity, the present data do not support the perspective. Future research should replicate this research to confirm that the prime is activating the primed moral or social concepts of religion rather than activating religious aspects of the self.

As for concept activation, these results are consistent with on concept activation (e.g., Bargh et al., 1996), suggesting priming effects are a function of triggering the more general, concept of "religion" rather than different aspects of the self. perspective suggests that priming religion is activating a representation of religion that could lead to reporting behaviors with that representation (e.g., religious people do not drink a lot alcohol). There are no predictions that this should fluctuate extent of identification with religion or religious behaviors. current results indicated that the priming condition did not with religiosity of the individual, and other research (cf. Shariff Norenzayan, 2007) also shows that the effects of priming (e.g., increases in prosocial behavior) occur for those who are religious and nonreligious.

These findings may also be seen in light of heuristic It may be that upon considering previous alcohol use, apply heuristics that may result in a range of possible (e.g., 6–10 drinks). After being primed with religion, the that individuals finally report may come from the lower end of spectrum. If the religious prime detracted from the salience or of recalling drinking behaviors, the availability heuristic may offer some explanation for why participants reported drinking.

Finally, cognitive dissonance may also help explain the findings to the extent that religion and drinking are perceived dissonant cognitions. After being primed with religious beliefs behaviors, being presented with questions about alcohol use give an opportunity to experience dissonance. This may be especially pronounced for individuals who strongly with religious values. This potential dissonance may reduced, however, through lower reports of alcohol use and frequency.

Consistent with the concept activation, heuristic, and dissonance perspectives, the nonsignificant interactions of condition with religiosity suggest that drinking may connote cultural/moral principles. While the acceptability of drinking varies largely across religions, most at least have some proscriptions against excessive drinking and these proscriptions may also be common among nonreligious individuals. Indeed, Randolph-Seng and Nielsen (2007) reported a priming effect of religiosity on cheating behavior that did not change as a function of intrinsic religiosity. Similarly, our results map onto and support the idea that the religious primes seem to automatically activate a stereotypical representation of behaviors consistent with religious individuals rather than one's personal religious beliefs. The absence of any evidence for priming of religion having a stronger effect among more religious participants also suggests that this finding is less consistent with the MSF and

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cognitive dissonance explanations and more consistent with the concept activation and heuristic explanations.

Social desirability was included in the present research to control for participants responding in a way that would be favorably viewed by others. There is an additional explanation, however, which is that asking about religion first may result in participants being more honest. As noted, previous research has found that religious primes elicited lower rates of cheating (Randolph-Seng & Nielsen, 2007). Is it possible that the religious prime actually led participants to report more honestly (i.e., without the need to inflate their recent alcohol consumption)? If so, that could offer a further explanation for the findings reported here. The relevant data in the current research include the correlations between alcohol problems and the other drinking measures in the two orders of presentation. Related to this possibility, the drinking reports were more consistent with alcohol-related problems in the religion-first condition than in the alcohol-first condition. Thus, not only did priming religion lead to lower reported drinking, it also resulted in reports of quantities of alcohol consumed that were significantly more consistent with reports of alcohol-related problems, which may be less subject to distortion than a report of exactly how many drinks were consumed. Moreover, it is plausible that undergraduates in the alcohol-first condition exaggerated the amounts they reported drinking, thus potentially lowering the correlation between the quantity measure and a measure of drinking problems. It is possible that the religion prime suppressed mean reported levels of drinking overall, but led to a more accurate rank ordering of individuals in terms of the extent of drinking.

Implications, Limitations and Future Directions

This research has implications for the study of religion and alcohol and potentially other behaviors. A practical implication is that asking questions about religion prior to asking about behaviors that are potentially incompatible with religious values may result in underreporting of those behaviors. This would imply that it may be advisable when possible to ask questions about drinking behaviors prior to those about religion. It is also plausible that asking questions about religion first may result in more accurate reports of drinking behaviors, which would support asking these questions first. Future research including alternative measures of alcohol consumption (e.g., ecological momentary assessment) in addition to more retrospective accounts might help us more precisely define the direction of discrepancy. A practical suggestion in the mean-time might be to counterbalance presentation of the measures. It is also important to note that these results suggest social desirability, at least as assessed by traditional measures, does not account for the priming effect of religion on self-reported drinking. It is possible that the observed priming effects may represent a different type of social desirability, which may functionally overlap with the MSF, concept activation, or the heuristic processes presented here.

This study is a first step in creating or improving interventions where individuals may be repeatedly primed with religious and healthy behaviors with the goal of actually changing behavior over time. Along similar lines, it is also important to note that the priming effect presented in the current study did not actually affect participants' behavior, but rather affected their assessment and memory of their behavior. Future research may help

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disentangle how religious beliefs influence actual behavior. It is possible that specific environmental events trigger cognitive motivations among beliefs, which then affect behavioral efforts to maintain consistencies among beliefs (e.g., Bargh, 1996). An additional, potentially fruitful line of future research would examine whether the prime altered one's knowledge of their behavior or altered their interaction with the assessment instrument. This might be done in a serious of studies that empirically evaluate alternative explanations. For example, alternative priming tasks (e.g., implicit associations, lexical decision tasks, word-stem completion tasks, etc.) could help pinpoint specific cognitive mechanisms. Alternatively, further investigation of how individuals form their responses regarding past drinking might help distinguish between effects on memory versus effects on reporting. It would also be helpful to examine differences in the specific assessments used. For example, it would be interesting to compare effects of religious priming on more precise questions (e.g., "How many drinks did you have last Friday night?") with more general questions (e.g., "How many drinks do you have on a typical occasion?").

There is some overlap between the present findings and current intervention approaches that contrast individuals' values with a problematic behavior (e.g., Motivational Interviewing; Miller & Rollnick, 2002). Future research should go beyond self-reports to examine behavioral effects of priming religion. Specifically, would simply asking individuals about their religious orientation lead to a reduced amount of alcohol consumed? If so, might the effect last minutes, hours, or days? Another interesting question is whether the same effects would be found if religion were to be primed in other ways (e.g., with a religious symbol, in a church setting, specific to their particular religious denomination). Might opposite effects be found if constructs discrepant with religion (and/or concordant with drinking) were primed?

Future research would benefit from an evaluation of whether the effect of priming religion on alcohol is moderated by self-reported identification with any religion. The current sample did not include a sufficient number of nonreligious individuals to test this hypothesis (e.g., only eight individuals reported identifying with atheism), but it is theoretically interesting and may guide future research and intervention strategies. Similarly, current results with a predominantly female sample may not generalize to a predominantly male population of drinkers. Further, the current sample comprised a relatively light drinking sample compared to other undergraduate campuses. Drinking rates for this sample were comparable to others studies which have been done on this campus, which is a large diverse commuter campus and has lower drinking rates than more traditional campuses. Future research would benefit from evaluating potential differences in priming effects among heavier drinkers. Finally, although this research utilized an explicit measure of religiosity, future research using implicit measures of religiosity (e.g., Ozorak, 2005) may elicit automatic differences in the result of various primes.

Asking individuals about their religiosity and religious behaviors made subsequent responses more concordant with religious values (e.g., fewer peak drinks, lower drinking frequency, and lower typical amount consumed). While this study provides a first step examining the effect of priming religion on self-reported alcohol use, future research would benefit from considering the potential long-term effects of the findings. Despite treatment

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and intervention efforts, the societal cost of alcohol and other addictive substance use in the United States remains high, exceeding $200 million each year (Ramirez-Kirarte, 2001). Research evaluating costs associated with alcohol and other substance use emphasize the need for research to highlight protective factors that reduce or inhibit use (Hodge et al., 2007) so as to facilitate a better understanding of the factors that protect against alcohol abuse and associated problems.

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Table 1

Means and Standard Deviations by Condition

	Condition			
	Religion first		Alcohol first	
	M	*SD*	*M*	*SD*
Religiosity	4.46	1.99	4.61	1.82
Religious behaviors	6.35	2.93	6.42	2.64
Peak drinking quantity	2.72	2.37	3.68	3.55
Drinking frequency	2.94	2.48	3.60	2.68
Typical quantity	1.29	1.55	2.03	3.04
Drinking problems	3.70	9.78	4.20	10.15
Social desirability	16.37	5.78	16.29	5.99

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Table 2

Means, Standard Deviations, and Correlations Among Measures

Variable	1	2	3	4	5	6	7
1. Religiosity	—						
2. Religious behaviors	.59***	—					
3. Peak drinking quantity	−.15**	−.16**	—				
4. Frequency of drinking	−.17**	−.14**	.73***	—			
5. Typical drinking	−.13*	−.16**	.71***	.62***	—		
6. Alcohol problems	−.05	−.045	.23***	.20***	.20***	—	
7. Social desirability	.21***	.17**	−.13*	−.12*	−.10	−.12*	—
M	4.54	6.38	3.22	3.28	1.68	3.96	16.33
SD	1.90	2.78	3.07	2.61	2.47	9.96	5.88
Possible Range	1–7	1–12	0–25 +	1–12	0–25 +	0–100	0–33

Note. *N*s ranged from 287 to 301, depending on missing responses.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

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Table 3

Means, Standard Deviations, and Correlations Among Measures by Condition

Variable	1	2	3	4	5	6	7
1. Religiosity	—	.59***	−.19*	−.22**	−.14	.01	.20*
2. Religious behaviors	.59***	—	−.18*	−.15	−.14	.02	.19*
3. Peak drinking quantity	−.12	−.15	—	.72***	.68***	.15	−.14
4. Frequency of drinking	−.13	−.15	.78***	—	.62***	.19*	−.10
5. Typical drinking	−.16	−.27**	.81***	.68***	—	.14	−.10
6. Alcohol problems	−.11	−.12	.37***	.20*	.37***	—	−.12
7. Social desirability	.22**	.15	−.12	−.14	−.11	−.12	—

Note. Condition with participants receiving religious measures first below the diagonal; condition with participants receiving alcohol measures first above the diagonal.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

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Table 4

Effects of Priming Religion on Reported Drinking Controlling for Religiosity, Religious Behaviors, and Social Desirability

Criterion	Predictor	B	*t*	β	*d*
Peak drinking quantity	Prime religion vs. alcohol	−1.04	−3.20**	−.18	.38
	Religiosity	−0.20	−1.88†	−.13	.22
F(4, 282) =7.24***	Religious behaviors	−0.13	−1.85†	−.13	.22
R^2 =.09	Social desirability	−.03	−1.05	−.06	.13
Frequency of drinking	Prime religion vs. alcohol	−0.70	−2.30*	−.13	.27
	Religiosity	−0.17	−1.78†	−.13	.21
F(4, 282) = 4.26**	Religious behaviors	−0.05	−.78	−.06	.09
R^2 =.06	Social desirability	−0.04	−1.45	−.09	.17
Typical drinking	Prime religion vs. alcohol	−0.76	−2.67**	−.15	.32
	Religiosity	−0.06	−.64	−.05	.08
F(4, 282) = 4.26**	Religious behaviors	−0.12	−1.85†	−.13	.22
R^2 =.06	Social desirability	−0.03	−1.09	−.06	.13
Alcohol problems	Prime religion vs. alcohol	−0.63	−.53	−.03	.06
	Religiosity	−0.20	−.53	−.04	.06
F(4, 282) = 1.44**	Religious behaviors	−0.06	−.21	−.02	.03
R^2 =.02	Social desirability	−0.21	−1.98*	−.12	.24

† p <.10.

* p <.05.

** p <.01.

*** p <.001.

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Table 5

Effects of Priming Alcohol on Religiosity and Religious Behaviors, Controlling for Drinking and Social Desirability

Criterion	Predictor	B	*t*	β	*d*
Religiosity	Prime alcohol vs. religion	−0.28	−1.27	−.07	.15
$F(6, 280) = 4.45^{***}$	Peak drinking quantity	−0.14	-2.26^{*}	−.22	.27
$R^2 = .09$	Frequency of drinking	−0.02	−.35	−.03	.04
	Typical drinking	0.04	.63	.05	.08
	Alcohol problems	−0.00	−.15	−.01	.04
	Social desirability	0.06	3.21^{**}	.19	.38
Religious behaviors	Prime alcohol vs. religion	−0.34	−1.06	−.06	.13
$F(6, 280) = 3.69^{**}$	Peak drinking quantity	−.21	-2.22^{*}	−.22	.27
$R^2 = .07$	Frequency of drinking	.05	.60	.05	.07
	Typical drinking	−.04	−.47	−.04	.06
	Alcohol problems	.00	.04	.00	.00
	Social desirability	.07	2.64^{**}	.15	.32

$^{*}p < .05$.

$^{**}p < .01$.

$^{***}p < .001$.