Ritual wellbeing: a simplified model

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Ritual well-being: toward a social signaling model of religion and mental health

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ABSTRACT
Religion is positively correlated with subjective well-being across a variety of contexts, but convincing causal models are lacking. Some researchers have suggested that religion may boost self-control, and thus well-being, by requiring effortful rituals. This article proposes that costly signaling theory provides a vital explanatory tool for understanding these relationships. Signaling theories posit that religious adherents signal their commitment to religious collectives through difficult or anhedonic activities and rituals, creating a cost barrier for entry which protects religious communities against free riders. Because costly signaling behaviors require the inhibition of prepotent responses and intentional exposure to aversive stimuli, committed adherents build self-control over time. Subjective well-being is thus modeled as a longitudinal product of subjective investment in a religious social collective and the self-regulation abilities that emerge from signaling that investment. This emphasis on a feedback cycle driven by social signaling represents a novel contribution to investigations of religion and well-being. New longitudinal research in social investment theory and self-control lends the model conceptual credibility.

So that we may fulfill our duties toward society, we must be prepared to violate our instincts at times – to go against the grain of our natural inclinations. … And fundamentally, that is the rationale and justification for the asceticism that religions have taught in every era. —Émile Durkheim (1912/2008, p. 235)

1. Introduction
Religious affiliation appears to help protect against depression and improve subjective well-being (Balbuena, Baetz, & Bowen, 2013; Barton, Miller, Wickramaratne, Gameroff, & Weissman, 2013; Koenig, 2001; McCullough & Larson, 1999). These effects, although typically of modest size, are relatively consistent across studies and to a certain extent across cultures (Hackney & Sanders, 2003; Smith, McCullough, & Poll, 2003). However, why religious involvement should predict mental health, and whether a causal inference is warranted, are as yet unclear. In light of inconsistencies in the empirical data, researchers have offered conflicting views on the directionality and nature of the relationship (Koenig, 2009; Levin, 1994; Maselko, Hayward, Hanlon, Buka, & Meador, 2012; VanderWeele, 2013). Indeed, the identification of possible mediating variables – particularly social support – has led some experts to question the very validity of a unique religious effect on mental health (Hovey, Morales, Hurtado, & Seligman, 2014).
Despite such unresolved questions, the persistence and scope of the statistical associations between religiosity and subjective well-being call for the identification of possible explanatory mechanisms (George, Ellison, & Larson, 2002). This article proposes one such causal mechanism. In the proposed model, religion-based social support influences subjective well-being longitudinally as a consequence of religious social signaling. Social signals are behaviors or actions that communicate strategic messages—i.e., reliability, cooperativeness, or commitment. Following previous writers, I suggest that social signaling inherently produces self-regulatory benefits by requiring signal senders to inhibit emotional impulses, expend effort, and constrain behaviors (Baumeister, Bauer, & Lloyd, 2010; Lodi-Smith & Roberts, 2007; McCullough & Willoughby, 2009; Sosis & Bressler, 2003). According to the “strength model” of self-control, exercising willpower in such ways builds self-regulatory ability over time (Baumeister, Vohs, & Tice, 2007). Self-regulation skills, in turn, positively predict life satisfaction and subjective well-being (Cheung, Gillebaart, Kroese, & De Ridder, 2014; Duckworth, Weir, Tsukayama, & Kwok, 2012). Because religious communities impose more obligations and require more effortful, costly signals than other types of communities (Atran & Henrich, 2010; Baumeister et al., 2010; Sosis, 2003), such groups offer particularly robust opportunities for strengthening trait self-control. This model provides a fruitful link between the cognitive and evolutionary sciences of religion and the growing religion-health literature, while making testable predictions about the relationship between religion and mental health. For instance, liberal religious communities may offer fewer self-regulation benefits than stricter, more conservative communities that require substantial investment signaling—potentially helping explain the demographic stagnation of many liberal denominations (Iannaccone, 1994).

1.1. A rejuvenated hypothesis and a predictive model

A version of this hypothesis has been previously articulated by McCullough and Willoughby (2009), who suggested that religious communities may actively boost members’ self-control and self-regulation resources by requiring members to participate in rituals that require self-control (see also Koole, McCullough, Kuhl, & Roelofsma, 2010; Laurin, Kay, & Fitzsimons, 2012). Baumeister et al. have echoed this suggestion, arguing that “many religious practices and rituals may serve as self-control exercises” (2010, p. 78). For example, fasting for Ramadan is both a ritual obligation for Muslims and a discipline that requires self-control. It could be that many religious obligations exhibit a similar dynamic, helping practitioners build self-control over time (McCullough & Carter, 2011).

Despite the intuitive appeal of this postulate, concrete evidence in its favor has heretofore been sparse (McCullough & Willoughby, 2009). However, recent investigations into the social and religious dimensions of self-regulation (Bleidorn et al., 2013; Luchies, Finkel, & Fitzsimons, 2011; Pirutinsky, 2014) and the role of difficult or demanding religious ritual in supporting community (Atran & Henrich, 2010; Henrich, 2009; Soler, 2012; Sosis & Bressler, 2003) call for renewed attention to this hypothesis by lending it substantial empirical and conceptual support. In particular, “costly signaling” theories of religious ritual provide a rich framework for understanding the impact of religion on self-control. Growing literatures on religion and mental health, signaling theory, and social investment theory inform a model in which religious communities require their members to send ritualized signals of investment, which serve as opportunities to both demonstrate and develop self-regulatory resources. Enhanced self-control then feeds back to engender mental health benefits (Duckworth et al., 2012).

1.2. Model summary

Previous models of the causal pathways from religion to subjective well-being have tended to be linear and include relatively few mediating variables. For example, Weber and Pargament (2014) described three classes of variables that may mediate religion’s influence on mental health: religious coping, social support, and beliefs (Figure 1). This pathway cluster roughly summarizes the most
common causal hypotheses in the literature (see George et al., 2002). The social signaling model of religion and well-being instead proposes a complex interplay of feedback loops that bind individuals and religious groups into a regulative signaling system (Figure 2). The following guidelines summarize this process:

**Figure 1.** The likely mediators between religiousness and subjective well-being, as identified in Weber and Pargament (2014). This model broadly, if not exhaustively, exemplifies the mediating pathways commonly described in the religion-mental health literature.

**Figure 2.** The regulatory feedback system driven by social signaling. (1) Religious practice entails costly signaling, which (1.b) excludes those unwilling to signal. (2) More difficult, aversive, or costly behaviors are better-quality signals of commitment and (2.a) stimulate stronger social bonds, while (2.b) providing independent psychological benefits. (3) Sending such signals longitudinally develops self-control, a process (4) moderated by intrinsic commitment. (5) Conscientiousness and agreeableness develop alongside self-control, and (5.a) directly benefit subjective well-being (SWB) while (5.b) increasing sociometric status. (6) Self-control benefits well-being. (7) Social embeddedness offers opportunities to provide social support to others, which (7.a) boosts sociometric status and (7.b) benefits well-being through personality factors. (8) Higher sociometric status entails greater expectations for costly signaling, re-initiating the regulative cycle. (8.a) Conscientiousness and agreeableness predict future religiousness. (8.b) Religion may have an additional direct influence on SWB, but SWB feeds back to predict future religiousness. Boxes in gray are key nodes. Gray arrows indicate moderation.
1. **Community is not free.** Religious groups demand signals of investment, such as constraining behaviors or rituals (Sosis & Bressler, 2003).
   a. People who do not pay such entry costs are excluded, resulting in a high average level of commitment among remaining members (Iannaccone, 1994).

2. **Words are cheap, but fasting is not.** Aversive or costly rituals are more convincing signals of group commitment (Henrich, 2009). Accordingly, aversive experiences stimulate
   a. social bonding (Bastian, Jetten, & Ferris, 2014), and
   b. independent psychological benefits (Bastian, Jetten, Horsey, & Leknes, 2014).

3. **Religion is a workout.** Since convincing commitment signals draw on willpower, religious social signaling is a built-in opportunity to exercise and strengthen self-control (McCullough & Willoughby, 2009; Muraven, Baumeister, & Tice, 1999; Oaten & Cheng, 2006).

4. **Commitment begets self-control.** Intrinsic commitment moderates the influence of costly signaling on personality and self-control. Greater commitment leads to greater gains (Lodi-Smith & Roberts, 2007).

5. **Personality indexes self-control.** Conscientiousness and agreeableness are reciprocally implicated in self-control (Cumberland-Li, Eisenberg, & Reiser, 2004; Jensen-Campbell & Malcolm, 2007; Lodi-Smith & Roberts, 2007). In turn, conscientiousness and agreeableness predict
   a. subjective well-being (Hayes & Joseph, 2003; Steel, Schmidt, & Shultz, 2008), and
   b. higher sociometric (that is, local and interpersonal) social status (Cheng, Tracy, & Henrich, 2010; Jensen-Campbell & Malcolm, 2007; Liu & Ipe, 2010).


7. **High signaling means high status.** Deeper social connections provide opportunities to conspicuously provide social support to others (Brown, Nesse, Vinokur, & Smith, 2003), which in turn
   a. boosts sociometric status (Boehm, 2001; Willer, 2009), and
   b. benefits well-being, largely through personality factors (Siedlecki, Salthouse, Oishi, & Jeswani, 2014).

8. **Signaling creates loops.** Enhanced status feeds back to entail greater signaling responsibilities (Righetti & Finkenauer, 2011; Willer, 2009).
   b. Religious social signaling thus dynamically draws participants into a regulative system that serves collective (commitment signaling) and individual (self-regulative) functions reciprocally. As such, subjective well-being both predicts religiousness and is predicted by it (Maselko et al., 2012; Stark & Maier, 2008).

1.3. **A note on terms**

Researchers in religion and health use numerous constructs to measure mental health and psychological well-being. Depression inventories are one measure (e.g., Maselko, Gilman, & Buka, 2009), while self-reported satisfaction with life (cognitive appraisals) or self-reported happiness (affective appraisals) are also common (Childs, 2010). In the face of such diversity, I deploy the construct “subjective well-being” to refer collectively to the varied mental health and psychosocial functioning outcomes that religious involvement may affect. More expansive than strict psychiatric measures but more focused than diffuse constructs of happiness, subjective well-being encompasses cognitive and affective appraisals (Childs, 2010), accesses self-reports of multiple dimensions of thriving (Busseri & Sadava, 2011), and is cross-correlated with constructs of global mental health (Vaillant, 2012), while its associations with fewer psychiatric symptoms and adaptive psychological traits make it “an indicator of optimal human functioning” (Busseri & Sadava, 2011, p. 290). As the dependent variable
in the present model, subjective well-being thus summarizes and encompasses the variety of clinical and non-clinical outcome measures in the mental health-religion literature.

2. Religion and well-being

This article rests on the proposition that religion causally influences subjective well-being. That there is a correlative relationship is by now clear. Religiousness is, on average, positively associated with subjective well-being and desirable mental health indicators (Baetz, Griffin, Bowen, Koenig, & Marcoux, 2004; Bonelli & Koenig, 2013; Ellison, 1991; Green & Elliott, 2010; Hayward, Owen, Koenig, Steffens, & Payne, 2012; McCullough & Larson, 1999). Theoretical explanations for this correlation have tended to cluster loosely around one of two classes of variables: (1) the social dimensions of religion; or (2) individual religious worldview and beliefs (e.g., George et al., 2002). Crucially, evidence so far suggests that (1) is generally the more important for non-clinical populations (Berthold & Ruch, 2014; Stark & Maier, 2008). For example, social support has been found to partially or fully mediate the relationship between religious practice and reduced suicidality (Hovey et al., 2014; Rasic & Belik, 2008; Robins & Fiske, 2009); between spirituality and reduced depression (Mofidi et al., 2007; Park & Roh, 2013); between church attendance and life satisfaction (Assari, 2013); between religiosity and general mental health; (Shiah, Chang, Chiang, Lin, & Tam, 2013); and between religiousness and adjustment (Salsman, Brown, Brechting, & Carlson, 2005).

Similarly, in diverse contexts institutional religious practice predicts subjective well-being better than personal belief, nominal affiliation, or individualistic spirituality. For instance, institutional religious practice better predicts emotional well-being among African-Americans than private or subjective religiosity (Oates & Goode, 2013); predicts subjective well-being among inner-city men (Koenig & Vaillant, 2009); protects against suicidal ideation (Rushing, Corsentino, Hames, Sachs-Ericsson, & Steffens, 2013) and emotional distress (Chen, Cheal, McDonel Herr, Zubritsky, & Levkoff, 2007) among the elderly; and predicts mental health among rural, middle-aged women (King, Cummings, & Whetstone, 2005) and among Canadians (Balbuena et al., 2013). Exemplifying this pattern, Robins and Fiske (2009) found that college students involved in public religious practice suffered from less suicidality, but that this effect did not obtain for private religious practice, nor was it mediated by religious beliefs.

An important study by Greenfield and Marks (2007) elucidates such findings using social identity theory. In a large sample of Americans (N > 3000), frequent formal religious attendance predicted more self-reported positive affect, less negative affect, and greater satisfaction with life – relationships that were mediated by religious social identity. The authors concluded that strong personal identification with one’s religious community explained the relationship between institutional religious practice and subjective well-being. According to this analysis, then, formal religious practice generates group allegiance, which then redounds on subjective well-being (1–7.b) – a claim that echoes Durkheim (1912/2008). These studies suggest, then, that the social and institutional dimensions of religiosity are crucial in positively influencing mental health and subjective well-being.

2.1. Mixed effects of individual spirituality

This Durkheimian paradigm is corroborated by the generally mixed correlations between subjective well-being and individual or private spirituality. For instance, personal spiritual commitment and meaning-making predicts higher levels of hope and optimism (Ciarrocchi, Dy-Liacco, & Deneke, 2008), but “Quest” religiosity, a non-institutional, personal spirituality decoupled from traditional forms and obligations (Batson, 1976), positively predicts neuroticism (Francis, 2010; Genia, 1996; Hills, Francis, Argyle, & Jackson, 2004; Sandage, Link, & Jankowski, 2010). Similarly, personal prayer often negatively predicts health or well-being when attendance is controlled for (Leondari &
Gialamas, 2009; Nicholson, Rose, & Bobak, 2009), while Baetz et al. (2004) found that, although religious practice protected against depression, Canadian respondents who placed high personal importance on religious or spiritual values were more likely to be depressed.

### 2.2. Private spirituality may preferentially benefit those at high risk

No generalizations about religion or mental health are unequivocal. Despite the generally mixed correlations between private spirituality and mental health, personal or private spirituality may offer preferential benefits for those at high risk for mental health disorders. Miller et al. (2014) found that personal importance of religion or spirituality mediates the protective effects of increased parietal and temporal cortical thickness against depression among individuals at high familial risk. Longitudinally, personal importance of religion or spirituality predicts lower odds of depression at a 10-year follow-up, an effect strongest for subjects with a family history of depression (Miller et al., 2012). In a review, Smith et al. (2003) reported an inverse correlation between religiousness and psychiatric symptoms that was strongest for subjects undergoing life stressors. Private and individualistic forms of spirituality, then, plausibly offer unique resiliency for those facing particular psychological risks. By contrast, institutional and social religious practice may “shore up” benefits for those at lesser risk by maintaining their integration with a functioning collective. It is this normative socialization process that I suggest largely drives the religion–mental health correlation in non-clinical samples, and which the current model therefore primarily addresses.3

### 2.3. Social religion benefits well-being even in secular societies

Causal explanations for the influence of religion per se on well-being imply a universal effect. However, numerous researchers have reported that correlations between well-being and religiosity are weaker or nonexistent in less-religious societies (Lavric & Flere, 2008; Snoep, 2007; Stavrova, Fetchenhauer, & Schlösser, 2013). For instance, Gebauer, Sedikides, and Neberich (2012) found that, within Europe, religion’s psychological benefits were limited to countries with high average levels of religiosity, suggesting that happiness premiums for religiousness are largely the result of individual congruence with social expectations.

However, noting small effect sizes in Gebauer et al.’s study, Pirutinsky (2013) recently failed to replicate these findings using data from the European Social Survey. Meanwhile, other researchers have found that religious attendance in highly secular Finland protects against mental disorders among women and predicts healthy family adjustment among men (Hintikka, Koskela, Kontula, & Viinamäki, 2000), and that religious service attendance predicts self-reported health in 22 European nations (Huijts & Kraaykamp, 2011; Nicholson et al., 2009), but that private religious prayer does not (Nicholson, Rose, & Bobak, 2010). Berthold and Ruch (2014) reported that religious practice predicted life satisfaction and meaning in life among European German-speakers, but that there was no life satisfaction premium for religious affiliation alone. Even in strongly secular Great Britain, religious practice was recently found to reduce the likelihood of conduct disorders among adolescents, while weak religious affiliation positively predicted such disorders (Meltzer, Dogra, Vostanis, & Ford, 2011). Note that, again, religious practice was more relevant for well-being than private religiosity or spiritual beliefs. Communal religious practice can thus predict emotional and social functioning even in secular contexts, laying the groundwork for generalized causal explanations.

### 3. Self-control and well-being

The cornerstone of the present model is the psychological benefit of robust self-control. High trait self-control is positively correlated with psychological adjustment, including self-esteem, less
psychopathology, and adaptive emotional responses (Duckworth et al., 2012; Tangney, Baumeister, & Boone, 2004); smoother relationships, more secure attachment, and better social skills (Luchies et al., 2011; Tangney et al., 2004); less criminality and addiction (Moffitt et al., 2011); and higher levels of life satisfaction (Hofmann et al., 2014). Self-control additionally helps to reduce motivational conflict in the face of temptations and, indeed, to avoid temptations in the first place (Hofmann & Kotabe, 2012). Self-control is, ceteris paribus, an overwhelmingly positive indicator of mental health (6).

3.1. Benefits of aversive stimuli

Many behaviors that require self-control tautologically include aversive components. Paradoxically, aversive experiences can facilitate social bonding and stimulate positive emotional states (Bastian, Jetten, Hornsey, et al., 2014) (2.a, 2.b). Initiation rites cross-culturally feature negative physical experiences that stimulate intense social bonding between initiates (Turner, 1975; Van Gennep, 1961; Whitehouse, 2004). Aversive or painful religious rituals induce prosocial behavior (Xygalatas et al., 2013) and engender strong bonds (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). Bastian, Jetten, Hornsey, et al. (2014) further emphasize that induced physical pain stimulates the production of endogenous opioids (Zubieta et al., 2001), reducing the subjective intensity of social or emotional pain (Prossin et al., 2011). Thus, plausible physiological pathways run from some forms of physical discomfort to positive subjective experience. Counterintuitively, the development of self-control may therefore benefit subjective well-being in part through facilitating moderately painful or uncomfortable experiences (2.b).

3.2. Religion and self-control

A growing research program has produced compelling evidence for a positive relationship between religion and self-control. Koole et al. (2010) postulated that religion works to implicitly motivate self-regulation across a range of domains, including emotional regulation and overcoming temptations. Baumeister et al. (2010) suggested that religion “provide(s) a solution to the self-regulation dilemmas inherent in cultural life,” including resisting temptations, suppressing antisocial or selfish impulses, and motivating long-term goals. Baumeister and colleagues hypothesized several possible pathways by which religion can influence self-control, including streamlining decision-making, encouraging long-range planning, and imposing ritual requirements that demand self-control (2010). Elsewhere, McCullough, Carter, DeWall, and Corrales (2012) have argued that religion motivates the suppression of evolutionarily innate but socially undesirable impulses. These hypotheses enjoy empirical support. Weatherly and Plumm (2012) found that intrinsic religiosity reduced intertemporal discounting of future rewards, and increased the preference for larger long-term rewards. McCullough and Willoughby (2009) concluded that religiosity was associated with self-control, conscientiousness, and agreeableness. Walker, Ainette, Wills, and Mendoza (2007) found that parents’ and adolescents’ religiosity predicted less drug use among youth, a relationship mediated by increased self-control, while McCullough et al. (2012) reported that religious concept priming reduced men’s impulsivity and risk-taking tendencies.

Concept priming has featured prominently in research on religion and self-control. Fishbach, Friedman, and Kruglanski (2003) reported that priming with religious words rather than neutral words made subjects slower to identify temptation-related concepts, and Rounding, Lee, Jacobson, and Ji (2012) reported that priming with religious concepts boosted subjects’ self-control and persistence across a range of conditions. Similarly, Laurin et al. (2012) reported that religious priming predicted greater resistance to temptation, and parallel findings have been reported in Muslim contexts (Aveyard, 2014). However, Harrison and McKay (2013), in failing to replicate Rounding et al.’s (2012) findings, suggested that religious concepts may prime not self-control, but rather the desire to build a positive reputation (Harrison & McKay, 2013). Moreover, God primes may reduce subjects’
levels of active goal pursuit (Laurin et al., 2012). Religious priming therefore divergently impacts different facets of self-control, and may depend on the salience of reputation management for its primary effects (8).

4. Signaling theory and religion

Reputation management and self-control are crucial ingredients in human cooperation (Atkinson & Bourrat, 2011; Baumeister et al., 2010). The cognitive and evolutionary sciences of religion have recently produced important insights in the context of cooperation within religious groups (Atran & Norenzayan, 2004; Bulbulia & Sosis, 2011). These investigations have highlighted the social signaling functions of religion, arguing that adherents signal their commitment to religious communities by paying “entry costs” in the form of ritual obligations (Alcorta & Sosis, 2005; Atran & Henrich, 2010; Bulbulia & Sosis, 2011; Sosis & Ruffle, 2004) (1). Such claims extrapolate on strict church theory, which argues that “free riders” – people who draw on community resources but do not contribute in return – are a perennial threat to any group’s stability (Iannaccone, 1994; Kelley, 1972). To counter this threat, successful religious groups require all members to pay ritualized entry costs, which filter out free riders (Irons, 2001) (1.a).

Historically, biologists and ethologists have used signaling theories to explain the communicative functions of certain animal traits or behaviors (Maynard-Smith & Harper, 2004). For example, elk antler size honestly signals maturity, preventing young elk from strategically “lying” about their age and virility. Conspecifics can thus rely on rack size to gauge bulls’ age and strength and respond accordingly (mate, fight, defer, etc.). Signaling theory thus has a particular interest in honest, or hard-to-fake, signals (Irons, 2001). Applied to religion, then, the core claim of signaling theory is that rituals and nonverbal signals communicate religious identity more authentically than words could (Atran & Henrich, 2010; Bulbulia & Sosis, 2011). That is, ritualized, nonverbal signals convey strategic information that can be genuinely relied on (Rappaport, 1999). In eschewing automobiles, for instance, Old Order Mennonites may be said to honestly signal commitment to their religious group, because in North America the social cost of giving up driving is very high (e.g., Martina, Weiss, & Swan, 2012). Similarly, Henrich’s (2009) concept of “credibility-enhancing displays” postulates that faith community members are quicker to accept the sincerity of believers who back up their words with sacrifices, such as fasting during Ramadan or intensively studying the Torah (see also Atran & Henrich, 2010) (2).

4.1. Empirical support for signaling theory

Empirical support for signaling theory as applied to religion is substantial. In one influential study, Sosis and Bressler (2003) found that nineteenth-century American religious communes that demanded significant signals of commitment from their members – such as daily participation in strenuous ritual – significantly outlasted communes that did not require such signals. Sosis and Ruffle (2004) further established in field testing that members of religious Israeli kibbutzim were more generous in resource-sharing games than members of secular kibbutzim, and that the most generous kibbutz members were men who participated in thrice-daily communal prayer – a time-intensive social commitment (2). In non-Abrahamic contexts, Xygalatas et al. recently (2013) found that public scarification and body piercing rituals predicted increased generosity to Hindu temples among Mauritian subjects, while Soler (2012) found that Afro-Brazilian Candomblé practitioners who participated in more public rituals were more generous in resource-sharing games and contributed more to the well-being of their religious community. Indeed, recent findings suggest that religious commitment signaling, such as fasting or charitable giving, can even improve trust across religious group boundaries (Hall, Cohen, Meyer, Varley, & Brewer, 2015). Participating in public ritual thus appears to be a credible index of one’s commitment to a religious collective, and therefore of reliability (2).
Crucially, such ritual obligations are, by their very nature, often difficult, costly, and obligatory (Rappaport, 1999). They are typically not hedonically rewarding on their own merits; three hours of daily prayer is three hours of not eating or having sex (2). Religious communities are therefore “high-constraint settings” (McCullough & Willoughby, 2009). They require people to signal their acquiescence to the group’s authority by refraining from immediate rewards, postponing pleasures, controlling cravings, enduring tedium, and tamping down prepotent responses in order to successfully carry out ritual behaviors. These behaviors send high-quality, costly signals of group allegiance that require participants to exercise (and thus strengthen) self-control (Baumeister et al., 2007) (3). Since self-control is a significant predictor of general well-being (Cheung et al., 2014; Hofmann et al., 2014) (6), the individual benefits and the collective demands of the religious group form a positive feedback loop (8.b). Effortful signaling can therefore be described as a necessary condition for the long-term thriving of religious groups, while belonging to such a group is an index of self-control resources.

5. Religious mechanisms: signaling theory, personality, and well-being

The present model argues that ritualized social signaling can change cognitive habits and predispositions over time, culminating in greater self-control (3). Personality research offers a fruitful perspective for assessing these predictions, since several aspects of personality bear directly on self-control (McCullough & Willoughby, 2009). Of the commonly recognized “Big Five” major dimensions of personality (McCrae & Costa, 1987), the most relevant for social signaling are conscientiousness and agreeableness (5). Conscientiousness indexes one’s motivation to fulfill responsibilities, pursue goals, and meet social obligations, including such values as self-discipline and duty (Saroglou, 2010). Conscientiousness predicts high relationship quality (Duckworth et al., 2012; Jensen-Campbell & Malcolm, 2007) and life satisfaction (Hayes & Joseph, 2003; Steel et al., 2008) and is negatively correlated with neuroticism (Hayes & Joseph, 2003). Agreeableness indexes the willingness and desire to please others, fit in, and get along socially; one of its facets is compliance (Saroglou, 2010). Agreeableness is associated with regulating negative affect and predicts peer acceptance and friendship quality (Cumberland-Li et al., 2004; Jensen-Campbell & Malcolm, 2007). Conscientiousness and agreeableness are thus independent predictors of subjective well-being and emotional functioning (5.a), but covary significantly (Jensen-Campbell & Malcolm, 2007). Together, then, these dimensions describe a general acceptance of and motivation to uphold externally imposed social norms – precisely the personality cluster that religious groups in a costly signaling paradigm ought to select for. And indeed, religious people tend to be more conscientious and agreeable than the non-religious across cultures (Saroglou, 2010) (8.a).

5.1. Selection processes in ritual signaling

Such a selection process may help explain empirical evidence suggesting that personality factors longitudinally predict religiousness, but not necessarily the other way around (McCullough & Carter, 2011; McCullough & Willoughby, 2009; Wink et al., 2007). By making it difficult for the modestly committed or for persons with minimal self-regulation to participate in ritual, religious social signaling can function as a selection device that weeds out unsuitable group members (Cheadle & Schwadel, 2012; Sosis, 2003). In addition, people with high self-control are seen as more trustworthy by others, suggesting that indicators of self-control serve as good signals of personal reliability and enable high status accordingly (Cheng et al., 2010; Righetti & Finkenauer, 2011). Thus, individuals with poor self-control resources may be perceived as unreliable and “wash out” of religious communities (1.a).

Of course, if religion does not build self-control but only selects for it, then ritual behaviors might only indicate self-regulation, not cause it (McCullough & Willoughby, 2009). However, research findings increasingly challenge this interpretation. Most notably, Pirutinsky (2014) reported in a study of adolescent crime that increases in religiosity between two early time points predicted
self-control at a six-month follow-up. Pirutinsky also found that increased religiosity predicted longitudinal decreases in criminality, an effect that was mediated substantially by self-control (2014). Measures of religiosity were limited to affiliation and belief, but Pirutinsky’s study makes clear that religious socialization in general can longitudinally predict increased self-regulation resources. Conceptually, Pirutinsky’s findings are corroborated by those of Huuskes, Ciarrochi, and Heaven (2013), who reported that, among Catholic Australian high school students, initial religiosity predicted agreeableness and anti-predicted psychoticism at follow-up, while the reverse longitudinal relationship was not significant. Similarly, Halama and Lačná (2011) found that Slovakian religious converts were rated by peers as having become more conscientious and agreeable after their conversions. Third-party ratings of converts’ conscientiousness and agreeableness were not moderated by raters’ own religiosity. Halama and Lačná are thus likely correct to state that post-conversion personality traits may be “shaped by religious norms and demands” (2011, p. 766).

However, as indicated above, personality traits can and do also longitudinally predict religiosity (Heaven & Ciarrochi, 2007). In real-world contexts, then, selection and socialization effects almost certainly coexist and feed back on one another (8.d). Longitudinal evidence for the bidirectionality of socialization versus selection effects in religion is offered, for example, in Cheadle and Schwade (2012), who found that religious high schoolers both self-selected for friendship groups with similar religious profiles and mutually influenced one another’s levels of religious practice and affiliative identity over time. In real-world settings, religious selection effects on self-control thus could easily operate in tandem with the active inculcation of self-control resources through religious practices.

5.2. Social investment theory and social signaling

Further bolstering the case for the practical efficacy of social roles, research in social investment theory has produced compelling evidence that social inputs and role expectations beyond religion can change personality longitudinally (Bleidorn et al., 2013; Lodi-Smith & Roberts, 2007; Pirutinsky, 2014; Specht, Egloff, & Schmukle, 2013). As previously discussed by McCullough and Willoughby (2009), transitions into new, demanding life roles, such as “parent” or “employee,” are known to precede subsequent positive changes in conscientiousness, agreeableness, and emotional stability in longitudinal studies (Lodi-Smith & Roberts, 2007). Specht et al. (2013) concluded that setting out on one’s career predicts longitudinal increases in conscientiousness, while having children predicts increases in agreeableness. Importantly, both careers and children entail increased responsibilities and constraints on behavioral autonomy.

Supporting these conclusions, Bleidorn et al. (2013) reviewed more than 60 studies and determined that, across societies, earlier imposition of adult role obligations predicts earlier increases in conscientiousness and agreeableness. Adult roles, then, appear not only to demand the self-regulation resources necessary to meet their demands, but in some cases to actually foster them (5). Bleidorn et al.’s results dovetail with those of Seeley and Gardner (2003), who found that “chronic other-oriented” subjects exhibited less self-control depletion in a laboratory task than more individualistic subjects. Noting the extensive social obligations found in collectivist cultures, Seeley and Gardner cited the strength model of self-control (Baumeister et al., 2007) to suggest that “chronic socially motivated exertion of self-control” builds self-regulation skills over time (Seeley & Gardner, 2003). This self-regulation ability, once developed, generalizes beyond any one domain (Muraven et al., 1999). Accepting adult responsibilities then reflects socially motivated self-control and the onset of “other-oriented” thinking, inasmuch as people strive to fulfill their adult roles (worker, teacher, parent, etc.) in response to social pressures incumbent on them.

Importantly, in real-world settings, fulfilling social obligations frequently involves a dimension of social support known as provided social support, or providing for others’ needs or offering aid (Brown et al., 2003; Siedlecki et al., 2014) (7). Interestingly, of the commonly identified dimensions of social support – including perceived social support, social embeddedness, and enacted (received)
social support – provided social support has been cited as the best predictor of subjective well-being (Siedlecki et al., 2014; Thomas, 2010). This relationship echoes the observation by Baumeister, Vohs, Aaker, and Garbinsky (2013) that people gain more meaning in life from giving and generative activities than from hedonic pursuits. Crucial aspects of social support may therefore benefit subjective well-being through the positive psychological effects of prosocial behavior (7.b).

Moreover, there may also be an important status premium for provided social support. Generosity and prosocial acts are the most valued determinants of leadership across cultures (Boehm, 2001) (7.a). In everyday contexts, the provider of help often occupies a de facto higher-status role than the person being helped, such as when adults provide for children or pastors advise their parishioners. High sociometric status (interpersonal social status) benefits subjective well-being even more than socioeconomic status (Anderson, Kraus, Galinsky, & Keltner, 2012). Thus, as individuals move into life roles that entail provision for others, the meeting of other-oriented obligations entailed in high sociometric status may lead to increased well-being (7.b). Indeed, empirical research has demonstrated a feedback relationship between conspicuous contributions to others’ welfare, increased social status, and further expectations of greater contributions (Willer, 2009) (8). Such effects may help explain why the benefits of provided social support for subjective well-being are partly mediated by conscientiousness, which indexes responsibility and is associated with peer acceptance and high social status (Jensen-Campbell & Malcolm, 2007; Siedlecki et al., 2014) (7.b).

Importantly, internal attitudes can moderate how external social obligations influence individual personalities over time. Lodi-Smith and Roberts (2007) found that conscientiousness and agreeableness were positively predicted by emotional investment in social roles: the more subjectively committed people were to life roles (i.e., worker, parent, religious adherent, volunteer), the more actively those identities influenced the development of conscientiousness and emotional stability over time (4). In light of such findings, we can hypothesize that, although religiosity in general may only weakly predict longitudinal changes in personality factors relevant to self-control (McCullough & Willoughby, 2009), profound involvement in or high status within a religious community – for example, serving as a deacon – should stimulate greater gains in self-control (and therefore conscientiousness and agreeableness) longitudinally (4). Greater self-control, in turn, predicts higher subjective well-being (Cheung et al., 2014; De Ridder, de Boer, Lugtig, Bakker, & van Hooft, 2011) (6). Such personality shifts would be substantially mediated by individuals’ subjective identification with their roles. In short, merely claiming to be religious may have little effect on one’s personality, but leading a prayer group every week may have a large one. In light of signaling theory, future research should therefore take pains to distinguish between different levels of formal commitment to a religious community.

6. Potential criticisms

The present model, while offering conceptual breadth and useful predictions, also invites a number of potential critiques. First, it could be that the social signaling model relies excessively on the social and ritual facets of religion, to the exclusion of its personal and individual aspects. Indeed, the evidence that institutional religious practice has greater influence on mental health than private spirituality is strong (Greenfield & Marks, 2007; McCullough & Larson, 1999), but not univocal. In Ellison’s (1991) landmark study, religious existential certainty alone predicted well-being. More recently, Ellison and Flannelly (2009) found that receiving spiritual guidance from religion reduced the odds of major depression, but religious attendance and social support did not. Similarly, Miller et al. (2012) found that the subjective importance of religion reduced the odds of major depression over a 10-year follow-up period, but religious attendance had no effect. Deriving a sense of meaning from religion has also been found to predict psychological well-being among older African-Americans, another high-risk group for depression (Krause, 2003), while Flannelly, Koenig, Ellison, Galek, and Krause (2006) found that belief in life after death, but not service attendance, predicted fewer psychiatric symptoms.
This list, while incomplete, amply demonstrates that religion’s influence on mental well-being cannot be wholly reduced to social factors. In particular, there is evidence that personal spirituality may be more beneficial among people at high risk for psychological disorders (Arévalo, Prado, & Amaro, 2008; Barton et al., 2013; Krause, 2003; Miller et al., 2012; Smith et al., 2003). The proposed model will therefore not account for all variance in subjective well-being predicted by religious factors. However, far from constituting a weakness of the model, this vulnerability to limitations in scope indicates appropriate responsiveness to empirical constraints. A fruitful line of future research will be to rigorously parse the different effects of social support, ritual practice, and belief on mental health across populations. Meanwhile, given the highly social nature of much religious behavior (Durkheim, 1912/2008; Stark & Maier, 2008), the social signaling model contributes significant explanatory and predictive insights where the need for causal understanding is sharpest.

A further criticism is that the model is too sanguine regarding religious constraints on personal autonomy. Signaling demands made by religious communities can become oppressive, and communities that too greatly restrict individual freedoms can be injurious to members (Vess, Arndt, Cox, Routledge, & Goldenberg, 2009). Some costly signals themselves may indeed be potentially dangerous, such as forgoing medical treatment for religious reasons (Iannaccone, 1994; Vess et al., 2009). Community members who are burdened with too many social or role obligations may also suffer emotionally or become “burned out” – a problem that often disproportionately affects women (Kawachi & Berkman, 2001). In response to this critique, it is important to note that Sosis’s (2003) discussion of religious signaling already predicts that oppressive costs should render a religious group unstable. This prediction implies that most extant religious communities – those which have survived the winnowing of time – probably offer greater benefits on average than the costs they impose, despite the side effect of overburdening specific individuals. However, at a broader level, this critique identifies what could be accurately termed a moral ambiguity inherent in religious signaling systems. Religious mechanisms may inculcate self-control and mental health for central members while overburdening peripheral actors and excluding outsiders. Thus, their facilitation of psychological well-being implies not necessarily moral laudability, but only regulatory effectiveness.

An additional critique might be that, in the cognitive and evolutionary sciences of religion, formal signaling models specify that signals are more costly for nonbelievers than for believers (Atran & Henrich, 2010; Sosis, 2003). Thus, commitment-signaling rituals may not require as much willpower from those who truly believe. However, previous research has conclusively demonstrated that partaking in religious rituals draws even on believers’ self-control and personal resources. Ramadan fasting has been found to reduce perceptual acuity among the faithful (Ali & Amir, 1989) and to alter patterns of REM sleep (Bahammam, Nashwan, Hammad, Sharif, & Pandi-Perumal, 2013; see also McCullough & Carter, 2011; McCullough & Willoughby, 2009). Fasters in Indiana reported that they conducted religious fasts in part to demonstrate self-control (Tamney, 1986). Looking back in history, ancient Christian monks recognized that spiritual discipline could deplete willpower (Crislip, 2005). Religious believers do, then, experience spiritual practices as drawing on self-control, and thus may strengthen self-regulation ability through religious practice (3). Indeed, social investment theory predicts that committed believers may gain more in self-control than the less committed (Alessandri et al., 2014; Bleidorn et al., 2013; Seeley & Gardner, 2003) (4).

Finally, evidence that religiousness longitudinally predicts self-control or relevant personality traits remains mixed, despite recent advances (McCullough & Willoughby, 2009; Pirutinsky, 2014; Wink et al., 2007). Until recently, the evidence has equally supported the reverse claim: that self-control predicts religiousness over time (McCullough & Carter, 2011; McCullough & Willoughby, 2009). However, accumulating evidence indicates that the transition to high-responsibility roles longitudinally predicts gains in conscientiousness and agreeableness (Bleidorn et al., 2013; Specht et al., 2013); and that religiosity predicts longitudinal shifts in personality or self-control (Halama & Lačná, 2011; Heaven & Ciarrochi, 2007; Pirutinsky, 2014). In examining why the evidence has not always been clearer that religion causally increases self-control, we must remember that not
all religious communities are identical, nor are all religious individuals motivated by the same level of intrinsic commitment (Iannaccone, 1994; Wildman & Garner, 2009). Adherents of conservative or demanding religions may show greater self-control gains than members of more liberal, less demanding denominations, and sincere converts may gain more self-control over time than nominal adherents. The well-known correlation between political conservatism and conscientiousness offers tentative conceptual support for this hypothesis (Carney, Jost, Gosling, & Potter, 2008). Previous research might thus have conflated different levels of religious commitment and varying sorts of religious communities. Identifying and clarifying these distinctions will be necessary for future evaluation of the influence of religious practice on the development of self-control. Meanwhile, there are increasingly strong a priori and empirical reasons to expect that religion can and does longitudinally influence personality variables relevant to self-regulation (3, 5).

7. Discussion

Why does religion predict subjective well-being? Signaling theories have gained prominence in the anthropological, cognitive, and evolutionary studies of religion over the past two decades as an explanation for the popularity of strict religious denominations and the demographic decline of more liberal ones (Iannaccone, 1994; Irons, 2001). Following “club-goods” models, signaling theories posit that successful religious groups are strict in calling for honest signals of their members’ investment, often in the form of effortful rituals such as fasting (Atran & Henrich, 2010; Sosis & Alcorta, 2003) (1–2). The social signaling model of religion and well-being postulates that participation in such ritualized signals of commitment supports and catalyzes individual self-regulation (3). Fasting through a long August afternoon or getting out of bed for church on a cold morning are not hedonically rewarding on their own merits; they require some willingness and ability to counter the drive for immediate gratification (Baumeister et al., 2010). Exercising this willpower in service of costly social signaling strengthens self-control over time (Baumeister et al., 2007; Muraven et al., 1999), invoking William James’s admonishment to “keep the faculty of effort alive … by a little gratuitous exercise each day” (James, 1890/1950, p. 126). In short, this model implies that members outsource self-regulation to the religious collective. The process is modeled as a dynamic feedback loop in which costly rituals play individual (self-regulative) and collective (strategic social signaling) roles reciprocally (8.b). For the individual, this development of self-control culminates in higher long-term subjective well-being.

7.1. Extending the social signaling model beyond religion

Despite this article’s emphasis on religion, it should be clear that self-regulative commitment signaling extends beyond the religious domain. Nonbelievers get up at night (against their bodies’ protestations) to feed their babies. Staunch secularists babysit for relatives when they would rather not. People constantly withhold rewards from themselves when embedded in a web of community, simply because their social obligations demand it (Durkheim, 1912/2008). Indeed, I submit that social support nearly always entails costly signaling, whether in religious contexts or not. Any well-functioning social group will tend to reward and reinforce behavior that signals investment in the collective, from showing up for team practice to hosting barbecues – behaviors motivated in part by adaptive reputational concerns (Harrison & McKay, 2013; Sosis, 2005). Group members who fail to display such signals will be gradually marginalized, drifting over time to the group’s periphery – even as the more energetic signalers migrate toward the center (1–8). Accordingly, social support is nearly impossible to disentangle from the willpower-demanding, self-regulating demands of mandatory costly signaling, since “expending limited resources for the sake of self-control is the price people pay to gain acceptance in society” (Baumeister et al., 2010, p. 78). This merely holds doubly true for collectivistic societies, which call for pervasive “other-oriented” thinking (Seeley &
and define people according to social roles (Hofer, Busch, Chasiotis, Kärtner, & Campos, 2008, p. 3).

Religion’s effects on well-being, then, may reduce in many cases to social support (e.g., Hovey et al., 2014), but the relationship between social support and well-being may in turn be more complex than previously acknowledged (Lakey & Orehek, 2011). Indeed, at least one study (Schuurmans-Stekhoven, 2013) has found that the connection between spirituality and social support itself reduces to conscientiousness and agreeableness – precisely the personality traits entailed in a religious signaling system (5). Religion may also strengthen believers’ implicit drive to maintain a prosocial reputation, motivating effortful signaling of social commitment (Harrison & McKay, 2013). Beyond the narrow realm of religion, then, social support in general may influence subjective well-being to a substantial degree through social signaling processes. People become valued members in social groups through demonstrating their self-control and commitment in tangible, costly actions that are clearly interpretable by fellow group members. It is likely that religious groups intensify and leverage this dynamic. Thus, as previously suggested by McCullough and Willoughby (2009), the correlation between religion and mental well-being should be partly mediated by self-control. However, in contrast to their expectations, self-control may not explain significantly more of the religious variance in well-being than that accounted for by social support, coping, and similar factors (George, Larson, Koenig, & McCullough, 2000). In fact, self-control may itself partially explain the relationship between social support and well-being, since self-control is tautologically implicated in good social functioning, and thus in reliable social support (Baumeister et al., 2010; Bland, 2008; Siedlecki et al., 2014). Indeed, it has been suggested that executive self-control may have evolved in humans largely to serve social purposes (Barkley, 2011).

7.2. Concluding notes

The social signaling model of religion and well-being articulates a fundamental role for social processes in the construction and maintenance of well-being (1–8.B). Exercising discipline for the sake of ritual or social obligations indicates acquiescence to religious authority, demonstrates personal commitment to the collective, and indexes the simple ability to muster self-control. Overcoming appetitive temptations can thus “provide opportunities for the believer to attest to the authenticity of his or her faith” (Bland, 2008, p. 8). In this way, signaling theory strengthens the theoretical, conceptual, and empirical grounding for heretofore tentative claims that religion can actively build self-regulation resources, particularly in tandem with social investment theory and growing evidence from personality psychology (Bleidorn et al., 2013; Huuskes et al., 2013; McCullough & Willoughby, 2009). It also offers useful, testable predictions regarding which communities will offer greater self-regulatory benefits to their members – for example, conservative, high-demand communities probably impose more signaling requirements on their members than liberal counterparts, and may preferentially inculcate self-control accordingly (Wildman & Garner, 2009). Demographic, survey, and experimental data could corroborate or contradict this prediction. Although previous researchers have suggested that religious and ritual requirements may build self-control over the long term (Baumeister et al., 2010; McCullough & Willoughby, 2009), and others have pointed out clear relationships between religious signaling and mental health (Alcorta, 2011; Bulbulia, 2006), the current model is the first to explicitly articulate a pathway by which incrementally strengthened self-control is the crucial mediator between religious costly signaling and enhanced subjective well-being. Finally, in offering signaling theory as an explanatory heuristic for religion-health researchers, this article provides a valuable liaison between the religion-and-health field and the cognitive and evolutionary science of religion – a cross-fertilization that stands to substantially benefit both fields, and promises to enrich our growing understanding of the complicated relationship between religion, health, and well-being.
Notes

1. Recent research (e.g., Hagger et al., 2015) has questioned some conceptual foundations of the “strength model” of self-control. Such findings bear crucially on psychological models of self-regulation, but not on the question of whether trait self-control can be longitudinally influenced by social commitments or signaling obligations. See the author’s response to commentators (section 8.1).

2. Throughout this article, these steps will be referenced where appropriate with bold, italicized numbers in parentheses: (5), (7.a), etc.

3. See below (section 6) for discussion of the implications of such constraints.

4. But probably not sufficient; see Wildman and Sosis (2011) for empirical evidence in favor of Weber’s (1947) postulate that religious groups also require charismatic leadership to prosper in most contexts.

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**COMMENTARIES**

**Religion, social signaling, and health: a psychoneuroimmunological approach**

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Over the past several decades a growing body of epidemiological, sociological, and medical research has demonstrated a largely positive correlation between religion and health (Alcorta, 2010; Koenig, 2015; McCullough, 2001). This relationship persists even when potential confounds such as health selectivity factors and social support are controlled (Hummer, Rogers, Narn, & Ellison, 1999; Koenig, 2001). Various causal models have been proposed to explain the religion/health relationship. The “self-control” model discussed in the current work offers important insights into possible proximate mechanisms linking religion and health. As a comprehensive explanatory model, however, it is incapable of answering two fundamental questions: (1) why is religion a more effective mechanism for enhancing self-control than secular institutions, such as school or the local gym? and (2) why is it specifically religious attendance rather than commitment or belief that demonstrates the most robust and consistent correlations with health measures across three decades of research (e.g., Levin & Vanderingpool, 1987; McCullough, 2001; Murphy, Ciarrocchi, Piedmont, Cheston, & Peyrot, 2000; Schnittker, 2001; Strawbridge, Shema, Cohen, & Kaplan, 2001)?

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The social signaling model of religion proposed by Wood seeks to address both of these questions. Wood argues that religion, in contrast to most secular institutions, imposes numerous aversive or costly requirements on adherents that serve as reliable signals of commitment to the group. The non-utilitarian nature of these “costly signals” renders them particularly effective mechanisms for enhancing individual self-control since they provide neither immediate gratification nor personal benefit. These same requirements ensure “honest” social signaling since only true adherents both know and regularly practice them. Religious attendance is required to learn these signals and further “boosts sociometric status” through a series of social feedback loops. Wood maintains that engaging in costly religious practices simultaneously signals commitment to fellow adherents, strengthens self-control, and enhances social standing, all of which contribute to better health.

Wood’s proposal addresses the two major deficits of the self-control model of the religion/health relationship. The major contribution of his proposal, however, is the paradigm shift it entails. In contrast to the cognitive approach of the self-control hypothesis and many current theories of religion, the social signaling model introduces a behavioral approach to the religion/health relationship. It seeks to identify defining behaviors of religion and to examine the psychoneuroendocrinological sequelae of these behaviors and their impacts on health. Most significantly, this approach situates religion within a broader evolutionary framework that encompasses both human and non-human species, thereby promoting both experimental and comparative research.

When religion is viewed from a cross-species, behavioral perspective, the centrality of ritual to religion becomes apparent. Although few researchers can agree on a definition of religion, all can agree that ritual is at its core (Rappaport, 1999). The formality, pattern, repetition, and stereotypy that define ritual’s form promote associational learning (Rowe, 1999) and differentiate it from “normal” secular behaviors across human and non-human species alike. This structure is evident in the ritualized displays of baboons and bowerbirds, and is abundantly apparent in shamanic healing rituals and Roman Catholic Mass. Religious ritual retains the shared structure of non-human ritual, but expands and amplifies it through music, chanting, language, dance, cultural artifacts, and even pain.

A growing body of research demonstrates that these elements of religious ritual have direct effects on neurophysiological, endocrinological, and immunological systems (Chanda & Levitin, 2013; Fancourt, Ockelford, & Belai, 2013; Halpern, Udry, & Campbell, 1994; Koenig, 2015; Kreutz, Quiroga, & Bongard, 2012). Studies of ritualized behaviors across a wide variety of non-human species clearly demonstrate psychoneuroendocrinological effects. Biologist Russell Fernald’s studies of cichlid fish (Haplochromis burtoni) from Lake Tanganyika in Africa dramatically illustrate ritual’s ability to impact physiology (Fernald & Maruska, 2012). Agonistic displays between cichlid males induce major changes in the hormones, external appearance, brain neuron sizes, and even the gene expression of winners and losers. Aggressive and brilliantly colored black, yellow, blue, and red males almost instantly morph into much less aggressive drab brown “satellite” fish when ousted from their territories by rivals. If the “satellite” later acquires a new territory, his color, hormones, hypothalamic neuron sizes, and gene expression again change. Similar neuroendocrine changes in both senders and receivers have been documented across numerous species. In songbirds, ritualized vocalizations vary with seasonally fluctuating hormone levels and impact female oxytocin levels and sexual receptivity (Ball, 1999). In non-human primates, ritualized dominance and submission behaviors alter participants’ cortisol, dopamine, and testosterone levels (Sapolsky, 1999).

Religion is the ultimate human ritual experience. Rappaport’s (1999) observation that religious ritual requires performance insures that participants directly experience the somatic affects induced by the elements of ritual, “run(ning) the process through the body theater” (Damasio, 1994, p. 156). Music – abstracted auditory ritual – is a core feature of every religion known. Recent empirical work demonstrates myriad impacts of music on human autonomic function, on neurotransmitter systems including dopamine, norepinephrine, opioids, and oxytocin, and on hemispheric processing (Chanda & Levitin, 2013; Levitin, 2008). Music can elicit emotions, induce entrainment and empathy,
increase social cooperation, enhance immunological response, and alter psychoneuroendocrinological processes (Chanda & Levitin, 2013; Fancourt et al., 2013; Kreutz et al., 2012; Levitin, 2008).

Other elements of religious ritual alter human neurophysiological functions as well. The emotional and social stimuli that predominate in religious ritual engage unconscious subcortical structures involved in memory, trust, and valuation (Adolphs, 2002; Alcorta & Sosis, 2005; Dolan, 2000). The ability of religious ritual to engage these emotional and social functions of the brain renders it a highly effective tool for defining social relations and weighting subconscious, emotionally charged beliefs and values that subsequently shape individual choices and behaviors (Adolphs, 2002; Adolphs, Tranelet, & Damasio, 1998; Cardinal, Parkinson, Hall, & Everitt, 2002; Dehaene & Changeux, 2000; Dolan, 2000; Morris, Ohman, & Dolan, 1998). The creation of these emotionally weighted cognitive models defines and clarifies social judgments and relationships, thereby optimizing social decision making and reducing cognitive dissonance and social anxiety (Alcorta & Sosis, 2005). Not only do these social algorithms foster enhanced group communication and cooperation; they also reduce activation of the body’s hypothalamic-pituitary-adrenal (HPA) axis that is activated by ambiguity, anxiety, and conflict.

The social signaling model of religion proposed by Wood illuminates a growing body of psychoneuroendocrinology research that offers important insights into proximate mechanisms involved in the religion/health relationship. This approach situates religion within a broader evolutionary framework of ritual behavior that holds great promise for fruitful future research.

References

Religious group identity and costly signaling

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In their 2009 Psychological Bulletin review, McCullough and Willoughby proposed that the relation between religion and well-being is mediated, at least partly, by increased self-control. The target article by Connor Wood picks up where McCullough and Willoughby left off and provides a much needed update on empirical support for the idea that self-control mediates the religion–well-being link. Wood’s article also extends their theoretical framework by identifying effortful religious rituals as one mechanism by which religion increases self-control. That is, drawing on signaling theory and emerging research on religious costly signals, Wood argues that rituals that communicate a genuine commitment to one’s religious group require, demonstrate, and ultimately strengthen self-control. In turn, heightened self-control contributes to well-being through increased social support, increased within-group standing (i.e., sociometric status), and additional opportunities to strengthen self-control. Wood’s model thus sheds light on a component of religion—one that is inherently social and rooted in group identity—that received less attention in the earlier review. In short, McCullough and Willoughby’s discussion of group aspects of religion centered on how religious communities, as “moralistic audiences,” facilitate the inward focus needed to compare one’s behavior to a desired end-state (i.e., a goal) vis-à-vis cybernetic theories of self-regulation (e.g., Carver & Scheier, 1998). In writing this commentary, we hope to highlight directions for future research that we believe will further clarify Wood’s model in key ways.

Differences in group dynamics across religious groups

One especially informative avenue for future research involves a more systematic investigation of how the relations among costly signaling, self-control, well-being, and the model’s intermediary variables (e.g., social support, personality correlates of self-control) vary across religious identities. For example, religious groups may vary in how strongly members typically identify with the group, the

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hierarchical structure within the group, group norms surrounding social support, the degree of inclusiveness versus exclusiveness of the group, and entitativity (or group cohesion). To our knowledge, there is surprisingly little research on how the strength of religious identification or the degree of entitativity varies across religious groups. Compared to Protestants and Catholics, however, Buddhists, Muslims, Hindus, and Jews are perceived (by a US sample) as being higher in entitativity (Toosi & Ambady, 2011). It seems likely that a bidirectional relation exists between religious group entitativity and the extent to which visible and authentic signs of group commitment are required. In indirect support, religious communes with a higher number of costly requirements on members persist longer over time than those that do not (Sosis & Bressler, 2003).

A related aspect of religious group identity – the degree to which group membership is viewed as an essential, immutable trait (see Toosi & Ambady, 2011) – may also predict differences in costly signaling. Religious group identities that are perceived as relatively immutable (versus malleable) may require less costly signaling because less needs to be done to demonstrate commitment to the group or, alternatively, may require more signaling because of a stronger sense of collectivism among group members (Cohen, Hall, Koenig, & Meador, 2005; Cohen & Hill, 2007). The benefit of cross-religion investigations of the pathways between religious costly signaling, self-control, and well-being is underscored by the finding that religious participation, measured via service attendance, is a stronger predictor of self-reported happiness in some religions than others (Stark & Maier, 2008).

**Differences in religious costly signals**

Valuable insights may also be gained from research examining the impact of different forms of religious costly signaling on self-control and well-being. Religious costly signals differ in how much self-control they require, how effective they are at communicating one’s commitment to the group, and in other ways such as how permanent or irrevocable the behavior is and the degree of behavioral repetition (see Henrich, 2009, for a discussion of the related idea of credibility-enhancing displays). A fascinating question is how religious rituals that require a high degree of self-control but that are performed on a limited number of occasions (e.g., scarification) might relate differently to the model’s mediating variables compared to rituals that require less self-control at a single point in time but involve a high degree of behavioral repetition (e.g., praying multiple times throughout the day). To most people, scarification would be a more aversive experience than daily prayer, yet rituals that involve repetition over the course of years might result in greater gains in trait self-control. Another question is how the anticipated utility of a costly signal for communicating commitment to the group influences the perceived aversiveness of an experience and resulting gains in self-control.

In our own research, we have found that individuals who engage in religious costly signaling are seen as more trustworthy – regardless of whether they belong to one’s own or another religious group – and that this holds across different forms of religious costly signaling (i.e., donating to religious charities and adhering to religious-based dietary restrictions) (Hall, Cohen, Meyer, Varley, & Brewer, 2015). We are trying to better understand the mechanisms underlying this effect and hope that our work in this area can contribute to a more nuanced understanding of the intermediary pathways in Wood’s model.

**Concluding thoughts**

To clarify, we do not mean to suggest that Wood’s model is constrained to only certain religious groups or specific forms of religious costly signaling. His review is impressively comprehensive, with support for components of the model coming from research on a range of religious groups and populations, across a range of geographic regions and cultural contexts. What we propose is that the utility of the model will only increase with cross-religious research that is informed by the vast literatures on group identity and group processes and new developments in the emerging literature on religious costly signaling.
Costly signaling theory is not the only pathway to self-control

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The positive relationship between religious involvement and mental health has been explained by the cognitive, social, and behavioral effects of religious involvement (Koenig, 2012). Connor Wood proposes that costly signaling theory (CST) grounded on social investment theory and self-control may help us understand these mechanisms better. No doubt true in some respects, the theory sounds a bit harsh and mechanistic to me. Church attendance, fasting and prayer is not very pleasurable for many persons, and for them, require great self-discipline. For the devout believer, however, these activities often provide a sense of fulfillment and deep satisfaction, sometimes both in the short and long term. Some individuals who undergo religious conversion, for example, experience great joy and euphoria almost immediately (James, 1902), and while this emotional experience may taper off in intensity over time, the experience can endure and be revived during both private and communal religious activities.

Admittedly, there may be a period of initial anhedonia and delayed pleasure as one acquires the habit of praying, meditating, fasting, or attending religious services. As the habit is established, however, joys and pleasures result from the activity (and may or may not be driven by social relationships). This ability to delay gratification until a habit develops, as the author acknowledges, is almost certainly affected by personality. Personality is heavily influenced by genetic as well as developmental predispositions (Livesley, Jang, & Vernon, 2003), and there is even evidence that tendencies toward religious or spiritual experience may be affected by genetic factors (Dew & Koenig, 2014; Koenig et al., 2015). So, then, is it the chicken or the egg?

Wood acknowledges that one pathway from religion to mental health involves belief or cognition. While an individual’s beliefs/cognitions may be influenced or reinforced by social signaling, I don’t think this is the whole story. Some individuals, particularly those who are more introverted, might attend religious services or social functions not for social reasons at all but rather because they are committed to a religious faith that requires it (Hebrews 10:24–25). Having a personal relationship

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with or attachment to God, as the basis for that religious faith, may also play a role (Ellison, Bradshaw, Kuyel, & Marcum, 2011). I am referring to views of God as an all-powerful, fair and just, loving and compassionate creator who cares about his/her creation and responds to prayer. Much peace, joy and pleasure might be derived from such a Divine relationship, whether imaginary or real. Since religious doctrines indicate that “sin” could interfere with this relationship, individuals may seek to avoid sinning (i.e., control selfish desires and urges) in order to maintain and deepen this Divine connection. Such a mechanism could act largely independent of a desire for inclusion in or support by a religious social group.

Monks and mystics in monotheistic traditions have written about the development of the Divine relationship, claiming that it begins with the belief that God really and truly exists (Winter, 1971). Accompanying that belief is often the belief that God has made certain promises documented in the Holy Scriptures of the person’s faith tradition through Divine revelation. Believing in these promises, the individual develops faith and has hope, which leads to a desire to please God and to conform the “will” to the Divine will. This, in turn, results in a sense of peace, pleasure, and fulfillment, which is at least partly due to accepting circumstances (circumstances that may be interpreted as being God’s will). Cognitive processes of this kind often arise at the time of religious conversion. While such beliefs may have their origins in doctrines derived by social groups, they may develop and persist independent of involvement in a religious community.

In the end, though, among all indicators of religiosity, frequency of religious attendance is the most powerful predictor of mental health outcomes. There are reasons, however, for that (Koenig, King, & Carson, 2012). One is that the desire and ability to attend religious services depends in part on being in good mental and physical health. Depressed people tend to socially withdraw and not engage in religious services. Chronic disabling physical illness may likewise prevent religious attendance. These dynamics promote an inverse relationship between attendance and mental or physical health, biasing the association in one direction. In contrast, stress and depression often cause individuals to turn to prayer, scripture reading for guidance, and other private religious activities to cope, thus creating a positive relationship between this type of religious involvement and mental distress, biasing the association in the other direction.

In order to test my hypothesis that intrinsic religious commitment (IR) (absent of any indicators of social religious activity) might account for the relationship between religious attendance and a variety of psychosocial states, I analyzed for fun a small dataset from a study of 251 stressed female family caregivers (unpublished data). Controlling for age, race, and education, frequency of religious attendance was related to every single outcome (fewer depressive symptoms, lower caregiver burden, less perceived stress, and greater satisfaction with social support). Although controlling for IR did not account for the significant relationships with mental health outcomes, it completely explained the relationship between attendance and greater satisfaction with social support.

Religious attendance does not always predict outcomes. Wood refers to a study at Columbia University (Miller et al., 2014) that reported significantly less cortical brain thinning in those indicating that religion/spirituality was very important. Not mentioned, though, was that frequency of religious attendance was not associated with thicker cortices in that study. Given that there are well over 3000 quantitative studies on the relationship between religion and health (three-quarters focusing on mental health outcomes), it is easy to cite studies that support one hypothesis or another.

While CST definitely has merit, I do not think that it “largely drives the religion–mental health correlation in non-clinical samples.” CST is an important model that together with cognitive processes centered more on the individual (and perhaps on the Divine) may help to explain the very complex relationship between a person’s faith and their mental health.

References
Religious rituals as tools for adaptive self-regulation

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All known human societies have rituals – activities that are singled out and endowed with special meaning and significance. Many rituals are enacted within modern secular institutions, during such events as committee meetings, award ceremonies, and sports matches. Nevertheless, the most diverse and elaborate rituals can be found among religious groups, whose members have long cultivated ritualistic practices like prayer (Bremner, Koole, & Bushman, 2011), meditation (Cahn & Polich, 2006), fasting (Sabate, 2004), ceremonial cleansing (Zhong & Liljenquist, 2006), pilgrimages (Coleman & Elsner, 1995), religious holidays (Fiese & Tomcho, 2001), and even ritual sex (Goldenberg, Pyszczynski, Greenberg, & Solomon, 2000).

Why are the lives of countless people pervaded by religious rituals? The answer, according to Wood in the target article, lies in the social and psychological advantages that religious rituals bestow on their practitioners. From Wood’s perspective, religious rituals can be seen as psychological exercises that strengthen people’s capacity for self-control. Moreover, religious rituals may enhance people’s social standing, by providing public displays of willpower and commitment to the group.

Wood’s provocative analysis of religious rituals highlights the behavioral side of religion. This theoretical focus is highly welcome, given that modern psychology of religion has often restricted itself to the contents of people’s religious beliefs. This restrictiveness has hindered progress, because the psychological meaning of religious beliefs cannot be understood without considering religious behavior. For instance, people may subscribe to a religious worldview even when they rarely act upon them. Conversely, people may enact religious rituals even when they have not embraced a religious worldview, such as self-avowed atheists who unexpectedly find themselves praying during moments of crisis. In short, people’s religious beliefs may or may not correspond with their religious
behavior. It is therefore vital to extend the scientific analysis of religion to religious behavior, for instance as it is enacted during religious rituals.

Wood’s general idea that religious rituals facilitate self-regulation is consistent with our prior theorizing in this area (Koole, McCullough, Kuhl, & Roelofsm, 2010). Relative to our work, however, Wood places more emphasis on the effortful aspects of self-regulation. Wood’s emphasis fits with traditional views of self-regulation as a wholly conscious and effortful process that is continually at war with people’s more automatic inclinations. Nevertheless, we believe that a broader view of self-regulation is warranted, in light of growing evidence that adaptive self-regulation is based on the coordinated interplay between effortful and automatic processes (Kuhl, Quirin, & Koole, 2015). For instance, a recent meta-analysis showed that, compared with their less self-controlled counterparts, people with better self-control are more adept at forming habits that are aligned with their consciously held goals and objectives (de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). Consequently, if religious rituals indeed improve self-regulation, then we may expect religious rituals to recruit both explicit (effortful) and implicit (more automatic) processes.

One implicit route whereby religious rituals may facilitate self-regulation is by priming contents that are consistent with people’s religious values (Shariff, Willard, Andersen, & Norenzayan, 2016). In prayer, for instance, Christian believers typically activate mental representations of God that are similar to mental representations of other people (Epley, Converse, Delbosc, Monteleone, & Cacioppo, 2009; Kapogiannis et al., 2009; Schjoedt, Stødkilde-Jørgensen, Geertz, & Roepstorff, 2009). Once activated, thoughts about God may therefore carry over to people’s perceptions of their fellow mortals. Because Christian conceptions of God are typically positive, praying to God may prime more positive social perceptions. To test this presumed sequence, we experimentally manipulated whether a group of Dutch Christians prayed for or thought about a person in need, after which they judged a series of target persons (Meijer, Bushman, & Koole, 2015). As expected, prayer led to more positive perceptions of the target persons, especially among participants who viewed God in positive terms. Similar priming processes may explain why prayer and meditation can promote benevolence in interpersonal relationships (Bremner et al., 2011; Fincham, Lambert, & Beach, 2010; Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008).

Beyond priming, religious rituals may help people to align their implicit and explicit responses, a process that is integral to effective self-regulation (Baumann, Kaschel, & Kuhl, 2005). All major religious traditions have emphasized the value of inner peace (Kuhl et al., 2015). At least some religious rituals may hence be directed towards resolving people’s inner conflicts. An example may be mindfulness meditation, a traditionally Buddhist practice in which people focus their attention on present feelings, thoughts, and bodily sensations in an open, accepting, and non-judgmental manner (Segal, Williams, & Teasdale, 2002). Because mindfulness may make people more inclined to regard their implicit responses as valid (Koole, Govorun, Cheng, & Gallucci, 2009), conflicts between implicit and explicit responses may be more actively confronted and resolved during states of mindfulness (Teper, Segal, & Inzlicht, 2013).

In line with these ideas, mindfulness has been found to promote greater coherence between explicit and implicit responses (Crescentini & Capurso, 2015). For instance, Remmers, Topolinski, and Koole (in press) observed that participants who had completed a brief mindfulness exercise displayed a stronger correlation between implicit and explicit mood than participants who had completed a control exercise. Mindfulness practices may thus promote emotional coherence between implicit and explicit systems (see Evers et al., 2014, for a discussion of emotional coherence). It would be worth examining if these findings extend to other religious rituals besides prayer. For instance, fasting may heighten interoceptive awareness (Herbert et al., 2012), a mental state that may increase the alignment of implicit and explicit responses (Thrash, Elliot, & Schultheiss, 2007). Furthermore, religious rituals may help people to discover greater meaning and purpose in life, which also rely on coherence formation (Heintzelman, Trent, & King, 2013).

In sum, we concur with Wood that religious rituals may have important benefits for self-regulation. However, the pathways whereby religious rituals may yield self-regulatory benefits
may be more diverse than Wood suggests. Religious rituals may facilitate not only effortful self-control among their practitioners, but also implicit forms of self-regulation, and improve the alignment between explicit and implicit processes. Through these multiple routes, religious rituals may function as tools for adaptive self-regulation.

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Mutualistic cooperation – why religion is common but saints are rare

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Wood’s article usefully links costly signaling theory applied to the evolution of religion to theories of how executive control and social support influence wellness. The article is excellent so far as it goes, and I hope we see more articles that strive to develop new understandings of religion by exploring the intersection of ultimate and proximate causation. Unfortunately, Wood’s article also represents the current state of evolution of religion literature that implicitly assumes the majority of religious cooperation is altruistic and mediated by costly signals.

Evolutionary biologists long made a similar error of presuming that most animal cooperation was altruistic–meaning the cooperators sacrificed some immediate fitness benefit for a delayed fitness reward. In contrast, mutualistic cooperation yields immediate rewards for all participants. Most animal cooperation that was at first considered altruistic is now thought to be mutualistic (Clutton-Brock, 2009). For example, sharing of blood meals by vampire bats, coalitions among lower-ranking baboons, and cooperative hunting among chimpanzees were all at first thought to be altruistic modes of cooperation maintained by reciprocity or kin selection. We now know that, on average, cooperators benefit directly and immediately from all these interactions and they show no tit-for-tat bias as in reciprocity, nor do they show kin bias as predicted by kin selection (Gilby, Eberly, & Wrangham, 2008; Langergraber, Mitani, & Vigilant, 2007).

I propose much of the link between religion, wellness, and cooperation may be similarly mutualistic rather than altruistic. The unfortunate focus on altruism appears motivated by altruistic cooperation problems being admittedly interesting and difficult to explain evolutionarily (Bulbulia, 2012), rather than by empirical evidence that altruism is the most common mode of religiously mediated cooperation. Here are some concrete examples of how religious signals might relate to mutualisms that benefit wellness and Darwinian fitness:

1. The marriage partnership is clearly a mutualism where each party benefits their reproductive success. Religiosity and denomination appear to covary with parenting style at least in some settings (Vermeer, 2014). Thus, marrying a coreligionist and/or person of similar religiosity may produce greater agreement for the couple on difficult parenting decisions like how to discipline children. Some parents use only positive reinforcement while others use negative techniques like “time out” for toddlers or “grounding” for teenagers. Perhaps one of these approaches confers somewhat higher fitness, but the lowest fitness probably occurs when parents employ different techniques. This creates confusion for children, conflict among parents, and likely reduced wellness from family discord. Such problems conform to a mutualistic payoff matrix in which cooperators are better off if they play the same strategy among two or more alternatives.
2. In situations when rational conversation fails, religion may provide an important symbolic language to navigate out of madness and despair. Consider the cross-culturally common practice of exorcism. Religion may provide the possessed and exorcist a common symbolic language through which to communicate (the diagonal cells in Figure 1). Assuming that exorcism provides some relief to the possessed, then religion has clearly increased the wellness of the possessed individual. The exorcist also has benefited because they are usually compensated directly for their services. A similar argument could be constructed for the spiritual counsel pastors provide to families of the deceased.

In these examples, religion plays a signaling role to coordinate mutualistic cooperation, but these signals need not be costly. They need only entail that the religious signals are somewhat correlated with the mutually beneficial behavior that is signified. The required correlations of religious signals with behaviors could arise as a simple product of each person’s necessarily limited social learning experiences. This is an extension of my recognition signal hypothesis that I too originally developed within the context of altruistic cooperation (Matthews, 2012). Recognition signals can be equally useful for mutualism.

As with altruism, Wood similarly presumes costly signaling is pervasive in religious practice. This arises partly from fundamental misunderstandings of what qualifies as a costly signal, which I believe are not particular to Wood but symptomatic of the evolution of religion field. For signal honesty to be maintained by costliness, the signal must involve a direct loss of Darwinian fitness, and this loss only later compensated by cooperators receiving benefits (Maynard Smith & Harper, 2003; Zahavi, 1975; Zuk, 1992). Getting up at night to feed your own infants is not a fitness cost as Wood claims. Fasting may require self-control, but it is unclear if the minor fasts imposed by most religions are in themselves a net fitness cost or benefit (Brandhorst, Choi, & Wei, 2015). The psychological effort involved, in itself, is not germane to the cost in costly signaling theory. I do not doubt the reality of Wood’s hypothesized mechanisms linking religion to wellness through costly signals and self-control, but I question that they are the main causal pathway from religion to wellness when so many non-costly signals and mutualistic benefits likely exist, unstudied by evolution of religion researchers.

In cases where costly signaling theory is logically sound, it exhibits nuanced empirical support as an explanation for religion. For example, Sosis and Bressler (2003) applied costly signaling theory in a sound way and found that costly signals functioned for religious and not secular communes. They, quite logically, concluded that religion must function through some unmeasured factor that interacted with costly signals. Economic games experiments on religious Kibbutzim found that daily synagogue attendance correlated with altruistic cooperation, but less devout forms of practice like weekly or holiday attendance had no effect (Sosis & Ruffle, 2003). These studies support that costly signaling plays an important role in religion, but also suggest it is not an all-encompassing explanatory framework. Costly signaling might be a sufficient explanation if the moderate religious practices of the majority are simply watered-down evolutionary byproducts of the truly devout. I suspect, however, that much religion of the un-saintly majority is not such a byproduct, but rather is about recognition signaling to achieve mutualistic and not altruistic cooperation.

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*Figure 1.* Payoff matrix for mutualistic cooperation games.
The primacy of social support

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In his target article, Wood links together distinct fields and disparate studies of religion to create a synthetic model of religion and well-being. I see much merit in Wood’s formulation, and I suspect that the chains of association he maps out are largely right. What I suggest is a shift in emphasis, with greater weight placed on the relationship between religion and social support.

Wood frames his inquiry around the consistent finding that religious involvement correlates with better mental health, seeking to trace out the causal links that result in this association. Consequently, though Wood offers a complex system of factors, outcomes, and feedbacks, subjective well-being is given particular emphasis and attention. Certainly, subjective well-being is an important measure of individual status, and by linking the work on self-control and subjective well-being with the larger literature on religion, Wood does us all a service. Still, while well-being is indeed an outcome of religious practice, I would suggest that it is not what drives religion. Wood has described a system, but he has not pointed to the mechanism(s) that fuel it.

As an anthropologist who works with people concerned first and foremost with meeting the basic necessities of life, I see more fundamental outcomes as the most salient (and certainly as the most relevant to an economic or evolutionary framework). Namely, what Wood notes as an important mediator in this process – social support – is what I see as the crucial outcome of religious practice. While Wood does discuss social support, he focuses on how it may directly and indirectly build subjective well-being. But, as Wood recognizes, social support does much more than this. The support of others (especially of kin) can help a person raise a family (Sear & Mace, 2008), advance in a career (Lin, 1999), navigate the aftermath of a natural disaster (Kaniasty & Norris, 1995), and even live

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longer (Holt-Lunstad, Smith, & Bradley Layton, 2010). I follow the work of many sociologists in seeing social support as productive for the individual, garnering social capital that can be mobilized in the generation of other resources (Bourdieu, 1986; Coleman, 1988; Lin, 2001). Religion’s ability to foster bonds between devotees (and the structural consequences of that affiliation) has the potential to be the driving mechanism of the religious signaling system that Wood describes, creating feedbacks that can account for the universal and sustained salience of religion today.

I suggest a recalibration of Wood’s model, with a focus on social support, rather than subjective well-being. A few observations and alterations to Wood’s system result from such an adjustment.

1. “Subtle signals” matter too

It is not only costly acts that can strengthen bonds and build social support. While emphasis is often placed on aversive experiences, other sorts of rituals can also foster trust and social cohesion (Whitehouse & Lanman, 2014). Indeed, in my own work in South India, I have found that worshipping regularly at a temple or church corresponds to a comparable, if not even greater, likelihood of both receiving and providing support than undertaking costly, dramatic ritual acts such as firewalking (Power, 2015). This more “subtle signal” of religious devotion may seem less costly, but it cumulatively becomes a substantial investment of time and energy (and self-control), giving a consistent, honest demonstration of commitment. While dramatic, aversive rituals may help someone demonstrate the depth of their devotion, they are often also accompanied by the suspicion that the performer is more interested in the gaze and regard of the onlooking crowd than in the gaze of the divine (undermining some of the “credibility” that such acts convey (Henrich, 2009)). “Subtle signals” have neither the audience nor the accompanying skepticism, making them particularly useful when choosing with whom to form supportive partnerships. The eye-catching spectacle of costly, aversive ritual acts has led many (myself included) to focus on the dramatic to the exclusion of the subtle; we should remember to attend to the full suite of religious signals.

2. Self-control also helps interpersonal relationships

Self-control may indeed be important to the religious signaling system, but for reasons that Wood downplays: self-control involves the capacity to delay immediate gratification for longer-term benefits; this ability to overcome the immediate temptation to act selfishly should help individuals establish stronger, more reciprocal relationships with others (Baumeister, Vohs, & Tice, 2007; Luchies, Finkel, & Fitzsimons, 2011; Tangney, Baumeister, & Boone, 2004). As Wood reports, there is substantial evidence that religion can bring about such control (Baumeister, Bauer, & Lloyd, 2010; Geyer & Baumeister, 2005; McCullough & Willoughby, 2009; Rounding, Lee, Jacobson, & Ji, 2012; Shariff & Norenzayan, 2007), motivated in large part by a concern for maintaining a good reputation (Harrison & McKay, 2013; Johnson & Bering, 2006). Again, I do not deny that self-control will also increase subjective well-being, as Wood suggests; I instead want to emphasize that it also, and more importantly, influences the nature of people’s relationships with others.

3. Whence the religious community?

Absent from Wood’s reckoning are the social structural consequences of the system: the fostering of a cohesive, cooperative religious community. Despite drawing on signaling theory in his explanation and talking of its generation of feedback loops, Wood leaves out the largest loop of all; the collective effect of religious signals (and the trust and self-control it engenders) is the creation and maintenance of the religious group itself (Atran & Henrich, 2010; Bulbulia & Sosis, 2011; Henrich, 2009; Irons, 2001; Sosis, 2003; Sosis & Bressler, 2003). Too often, this crucial step in the religious signaling system is overlooked and the “congregation” is presumed. For Wood, the existence of the religious
Community is taken as a given at Step 1. He is not alone in this; whole fields (for example the economics of religion (e.g., Iannaccone, 1994)) often presume the pre-existence of the religious community. The process by which the religious group emerges must be part of Wood’s model, and I suggest that the feedback between religious practice and social relations is the crucial mechanism by which this is achieved.

Wood set himself the task of tracing out the pathways from religious practice to subjective well-being. Here, I have suggested that the task should center instead on elucidating the feedbacks between religious practice and social support. These two tasks are eminently compatible, and clearly both subjective well-being and social support are important components of the complex system that we call religion.

Note

1. This may partially be due to the focus of much research on subjects who are not only “WEIRD” (Henrich, Heine, & Norenzayan, 2010) but also members of Abrahamic religious denominations.

References


Are we, like sheep, going astray: is costly signaling (or any other mechanism) necessary to explain the belief-as-benefit effect?

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Does religiosity genuinely promote well-being? Bi-variate associations seemingly support a small ($r^2 < .05$) belief-as-benefit effect (BABE; Sawatzky, Ratner, & Chiu, 2005). Ironically then, religious faith may be thoroughly self-serving.

In his target article, Wood, uncritically accepting the BABE, augments costly signaling theory (CST; see Purzycki & Sosis, 2009; Spence, 1973) to assert that religious rituals – interacting with prosociality – enhance self-control, social support, and thereby well-being. However, since the BABE is predominantly a North American finding (often sponsored by vested interests), religiosity’s incremental and causal contribution to such outcomes remains as yet unestablished (Galen, 2012; Schuurmans-Stekhoven, 2010, 2011, 2013a, 2013b, 2013c).

A by-product view (Pinker, 2006), wherein religiosity results from (rather than causes) a coalescence of pre-existing positive affectivity (Saroglou, Buxant, & Tilquin, 2008), acquiescence (Bouchard, 2009), prosociality (Henningsgaard & Arnau, 2008), desire for belonging (Burris, Batson, Altstaedten, & Stephens, 1994), and schizotypal/magical thinking (Claridge, 2010; Unterrainer, Huber, Sorgo, Collicutt, & Fink, 2011), completely accords with both the available evidence and CST.

Spurious associations, monotonously trumpeted, remain specious

Opinions regarding religiosity’s key feature(s) differ. Consequently, numerous religiosity/spirituality measures – that literally con-fuse separate dimensions into a single mélange of positivity, affiliation, prosociality, and supernatural-related belief/practice (SB/P) – exist (Kapuscinski & Master, 2010). Given that SB/P, despite counter-assertions (Myers, 2012; Underwood, 2008; Wood, 2013), remains (1) the only unique diagnostic feature of religiosity (Koenig, 2008; Lindeman, Blomqvist, & Takada, 2012; McCullough & Willoughby, 2009; Schuurmans-Stekhoven, 2013a, 2014) and (2) empirically distinct from sociability, virtue, hope, etc in factor analyses (Isaacowitz, Vaillant, & Seligman, 2003), the con-fused measures lack validity. Since believers’ and skeptics’ prosociality and functionality are more alike than different (Diener & Seligman, 2002; Schuurmans-Stekhoven, 2011, 2013c),
effects found utilizing con-fused psychometrics are unintelligible and those found using less con-fused measures are much weaker – though reputational concerns (Gervais & Norenzayan, 2012; Sedikides & Gebauer, 2010) probably distort even these. So-called objective measures (e.g., service attendance) remain problematic because pre-existing health and sociability correlate with both attendance and well-being.

Damningly, the BABE is rarely sustained in multivariate models (Adler & Fagley, 2005; Schuurmans-Stekhoven, 2011, 2013a). Additionally, the bivariate BABE conceals underlying interactions – SB/P moderates the associations among well-being subscales (Schuurmans-Stekhoven, 2010) and is related to positive affectivity among schizotypals only (Schuurmans-Stekhoven, 2013b). Despite these pitfalls, path models employing mediators merely re-flective of the aforementioned psychometric confounds abound. Unsurprisingly then, mediator effects are statistically confi- rmed and almost invariably swamp (commonly twice or more) the effect of religiosity. In sum, neither religiosity nor spirituality is necessary to describe well-being (see Figure 1).

Nevertheless, Wood’s obfuscated hypothesis attempts to salvage religiosity’s relevance by trotting out unconvincing findings. Past studies typically utilize cross-sectional data, restricted samples, and exclude rival explanations of the mediator. The latter is no esoteric triviality. For example, Schuurmans-Stekhoven (2013c) – contra 7.b – establishes that heritable traits linked to social affiliation nullify faith’s apparent association with social support. Moreover, SB/P actually appears to be detrimental to well-being when hope, loving kindness, and self-control effects are modeled directly (Schuurmans-Stekhoven, 2011).1 The weak correlation between SB/P and self-control reported in this latter study could suggest a distal BABE (as pathway 1-2-3 hypothesizes) but unfortunately vanishes when hope and age are added as rival predictors of self-control ($\beta_{\text{spirituality}} = -0.03, p = .48$).

Similarly, nearly all the cited evidence that agreeableness and conscientiousness facilitate well-being (path 5.a) omits extraversion and neuroticism as alternative explanations. Indeed, Steel, Schmidt, and Schultz’s (2008, Table 8) meta-analysis reveals agreeableness and conscientiousness are commonly non-significant well-being predictors and, when significant, explain just a sliver of total variance. Furthermore, social desirability and self-enhancement positively correlate with religiosity (Eriksson & Funcke, 2014; Sedikides & Gebauer, 2010), well-being (Fastame, Hitchcott, & Penna, 2015), agreeableness, and conscientiousness (He et al., 2015). Since research volunteers

![Figure 1: SB&P as a by-product of prosocial, schizotypal, and positive affectivity traits](image-url)
typically display above average social desirability and agreeableness, estimated relationships (even via experimentation) are probably unrepresentative.

**Might the costly signal socialization hypothesis be problematic?**

Wood’s hypothesis appears at cross-purposes; religious rituals that both signal loyalty and enhance practitioners’ prosociality/self-control must lower the fidelity of the loyalty information conveyed (because signaling in itself offers benefits). To the extent that rituals both signal loyalty and improve self-regulation, they are “mixed”; such personal benefits lower the signals’ net cost. Additionally, since costly signals deter imposters from accessing collectively provided resources, from the CST perspective, the faithful are not especially altruistic; they are *ultra-rational* and have a self-serving incentive to exclude others (to maintain their share of the fixed social pool).\(^2\) Exactly how this reconciles with the experimental evidence that spirituality/religiosity reduces selfishness and enhances cooperation is left unexplained.

If ritual is a social means of signaling prosociality/self-control, what initiated this innovation? Signaling loyalty with resource donations creates community-wide benefits that are already obvious/costly. Conversely, SB/P-related rituals add little to the social pot and solely aim to manipulate impressions (Dawkins & Krebs, 1978). Such “peacocking” is profoundly boastful/egoistic. This alone diminishes the fidelity with which rituals could convey information about one’s altruism and prosociality. These “mixed signals” will also tend to confuse onlookers who might reasonably ponder whether a propensity for such ostentation reveals

1. an *obsessive tendency* (the antithesis of self-control), and/or
2. a *confession* of substandard prosociality/self-control (i.e., are merely self-improvement exercises to redress one’s current shortcomings).

Signals are credible precisely because of their *cost and correspondence with pre-existing* desirable attributes (cf. section 3.2). To the extent that displays offer self-improvement, they become porous filters – practice can make *anyone* perfect.

Moreover, as Wood admits, not all religions/rituals will facilitate self-control or prosociality (section 6) and those that supposedly do are not the only socialization means available (section 7.1). Hence, the augmented CST model is neither a *general* nor a *unique* BABE explanation. Moreover, none of the evidence offered convincingly demonstrates that a ritualistic propensity or proficiency bolsters either self-control or prosociality.

**Summary**

Viewing religiosity as a psycho-behavioral *marker* of a cluster of *pre*-dispositions arguably responds more parsimoniously with past findings and CST. Those interested in accurately identifying the BABE are encouraged to eschew *con-fused* measures and utilize more precise SB/P constructs as predictors. Once the myriad of measurement, methodological, and sample biases are fully considered, the BABE – and hence Wood’s complicated explanation – seems much ado about nothing.

**Notes**

1. This more robust multivariate result actually implies a *belief-as-cost-effect* – a finding that more logically concurs with the CST of religion.
2. Seen in this way, CST may explain why free-thinkers are typically killed by religious zealots and not the other way around. Those who remain tempted by the religion-as-prosocial perspective might, in addition to reading Galen’s (2012) critique, like to fully consider the rich history of religiously ordained acts of questionable morality. We are truly spoiled for choice. For example, human sacrifice was a religious practice...
seen in ancient Rome, Greece, Egypt, Mongolia, China, Tibet, India, Africa, and the Americas. Reflecting on the morality of the acts of Abraham (Genesis 22) and Jeptah (Judges 11:30–31) against their own family members, and the religious requirements to stone to death homosexuals (Leviticus) to appease God is also informative. That (1) few German clerics opposed the Nazi regime (which itself arguably contained religious-like ritualistic elements, for example having its own marriage ceremony), (2) the current Australian Royal Commission has revealed widespread child sexual abuse by clerics, and (3) genital mutilation is an ongoing quasi-religious ritual inflicted upon children in many cultures, suggests that religious-related abuse is not “a thing of the distant past.” Irrefutably, institutionally sanctioned belief in supernatural agents has inspired the infliction of suffering on the self, in-group, and more often out-group members. Historically then, most religions and their rituals have had antithetical associations with notions of virtue, prosociality, and self-restraint. Although many wish to assert that a particular religion (typically their own) is the one true cause of virtue, goodness, and well-being, such proclamations are not just patently illogical, they are also deeply offensive to everyone else. Consistent with CST, such boastful claims segregate “us” from “them” and religiosity does seem to predict a proclivity to utilize such means of self-enhancement (Eriksson & Funcke, 2014). Taking this more comprehensive view of the signaling process does seem to undermine any credible argument that ritual unambiguously enhances or even signals virtue and prosociality (see Hall, Matz, & Wood, 2010).

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Ritual well-being: a simplified model

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Wood presents a comprehensive overview of the relationship between religion, religious ritual, and subjective well-being. We agree that the process of refining and understanding how these findings are connected is a worthwhile goal (see Willard & Norenzayan, 2013). At the same time, the current
model has limitations that impact the clarity and insight their theory can provide. In particular, we believe this model would benefit from incorporating the existing body of theoretical work examining the evolution of humans and human cultural groups. We propose that the relationship between ritual and wellbeing is part of a set of processes that have evolved through the benefits of living in groups. Our aim is to suggest ways to incorporate evolutionary insights into the model in order to increase clarity.

Separating proximate and ultimate causes provides insight into the function of behavior at different levels of analysis (Mayr, 1961; but see Laland, Sterelny, Odling-Smee, Hoppitt, & Uller, 2011). Proximate explanations are explanations of immediate cause and effect. For example, people are willing to engage in the costly actions required for group membership to avoid the pain of ostracism. The immediate cause – avoidance of pain – explains the effect – the willingness to engage in costly ritual behavior (Henrich, 2009; Sosis, 2000, 2004). Ultimate explanations describe how something came to exist. We feel psychological pain from ostracism because our survival as individuals is contingent upon our ability to live in groups (Buss, 1990; Kerr & Levine, 2008; Kurzban & Neuberg, 2005). This pain motivates us to be successful group members, as does the subjective wellbeing we feel from social support. Being a cooperative and successful group member increases our chances of reproduction and thus of passing these traits on to the next generation.

The psychological consequences of ostracism and benefits of social support can ultimately be explained by our evolved capacity for group living (Figure 1). This ultimate model is not at odds with the claims of the target article, but it does allow us to simplify how we think about the more proximate causal connections by linking them to an ultimate explanation. Social status and reputation are part of the proximate expression of this ultimate causal model; they represent an assessment of how good we are at being group members and thus impact how good or bad we feel. A poor reputation or low status has negative effects on our subjective wellbeing, whereas a good reputation or high status improves our subjective wellbeing (Anderson, Kraus, Galinsky, & Keltner, 2012; Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013). Ostracism is an outcome of a poor reputation, which leads to poor subjective wellbeing, and is therefore encapsulated in the relationship between status and wellbeing.

Subjective wellbeing itself is much broader than just social status and has many potential causal pathways (Diener, 1984; Diener, Suh, Lucas, & Smith, 1999). The target article’s model suggests one of the causal pathways between religion and wellbeing is costly signals of group membership. These signals increase self-control, which makes us happier (Cheung, Gillebaart, & Kroese, 2014). We agree that the practice of rituals might improve self-control, as should any normative behavior that involves self-control, but why does self-control make us happier? Research across primate species suggests that self-control evolved in relation to social complexity (Amici, Aureli, & Call, 2008; but see MacLean et al., 2014). In humans, the relationship between self-control and subjective wellbeing is mediated by the avoidance of conflict (Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2013). Both of these pieces

Figure 1. Ultimate model.
of evidence suggest that this relationship is related to how well we function in groups. Personality traits too are shaped by our interaction with the norms of our cultural group that reward and punish acceptable and unacceptable behavior (see Schmitt, Allik, McCrae, & Benet-Martinez, 2007).

Ritual behavior – as well as other signals and cues such as norm following, accent, and dress – allow others to assess our status as a group member. If you do not talk, dress, and act in the same way as others in your group, then you are not a group member (Moya, 2013; Moya & Boyd, 2015). Rituals and norm following further help establish our reputation as good or bad group members (Chudek & Henrich, 2011; Watson-Jones & Legare, in press; Watson-Jones, Legare, Whitehouse, & Clegg, 2014; Watson-Jones, Whitehouse, & Legare, in press). These are the social rules that group members are expected to follow.

The path to subjective wellbeing that is unique to social religious practice (rituals) in the target model is via costly behaviors and aversive experiences, because of the increased benefit of aversive experiences on group bonding and self-control. Though religious rituals can be costly and aversive, many are low cost and not especially unpleasant (Henrich, 2009; Whitehouse, 2004). The Kavadi is extremely costly and aversive (see Xygalatas, 2012; Xygalatas et al., 2013), but the average Sunday church service is neither. Considering the benefits to subjective wellbeing, attending church is probably a positive experience for most people (see Ellison, 1991; Ellison, Gay, & Glass, 1989). Since most of the literature that relates religion to subjective wellbeing is based on Christianity, which does not contain many aversive rituals, aversive experiences seem unnecessary to the model.

What we are left with is the proximate model illustrated in Figure 2.

Where is religion in this model? Religions are social groups (Norenzayan et al., 2015; Sosis, 2000; Sosis & Alcorta, 2003). They are either so embedded in a broader cultural context that they cannot be separated (such as in most traditional societies), or they form new sorts of cultural groups (such as in Christianity). Since ritual is in no way unique to religion, if religious belief or practice has any unique contribution to subjective wellbeing, it is unlikely to follow through pathways that reinforce group identities. Rather, it will be caused by factors that are more unique to religion, such as additional coping mechanisms offered by religion or through some unique effect of specific supernatural beliefs. With this, we suggest the model presented by Weber and Pargament (2014) is a more plausible candidate for the unique impact of religion on wellbeing than the model presented in the target article.

References

Ritual and the logic of self-regulation: response to commentators

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1. Introduction

I would like to thank the commentators for their useful critiques and suggestions. There is a great deal of ground to cover in a short space, so I will plunge immediately into what I consider the main issues at stake, namely: (1) whether religion is actually costly; (2) whether formal demands of costly signaling theory are met; (3) whether religion is collectivistic; (4) whether the religion–mental health relationship is genuine; (5) what is unique to religion in the present model; (6) how social support and religion are related; and (7) whether self-control is primarily effortful or automatic. I will follow these discussions with a general model of self-regulation and social signaling that demonstrates isomorphism between religious and secular signaling regimes, and conclude with suggestions for future research.

2. Is religion in fact costly?

Matthews, Koenig, and Willard and Legare each call into question the relevance of costly signaling to real-world religion. Koenig, for instance, objects that, rather than imposing costs, religious attendance and such activities as fasting “often provide a sense of fulfillment and deep satisfaction.” On the basis of such claims, these commentators contest the applicability of the social signaling model of religion and mental health. This critique emerges from a basic misunderstanding of the predictions and implications of costly signaling theory in religion. Strict church theory – the conceptual foundation for the application of costly signaling theory to religion – assumes from the outset that religion provides intrinsic rewards (Iannaccone, 1994). Formally at issue in costly signaling theory is only whether religious participation imposes marginal costs that are greater for less committed members than for the more committed. The answer to this question is yes. The simple opportunity cost of adhering to religious obligations is the clearest example: for the less committed Mormon believer, forgoing caffeine presents a steeper opportunity cost than for the truly committed, because the salience of the temptation to indulge is greater when the believer has not yet foreclosed secular options. Other costs are clearly apparent in most religious practices. Eastern Orthodox Christian attendees are obliged to stand for entire services, or as much as they can. This requirement is neither physically comfortable nor easy even for long-term, committed members, as evidenced by the fact that even young healthy attendees often stretch, shift feet, and periodically retire to the benches. However, the summed marginal cost is clearly lower for the committed. If you do not want to be there standing for two hours is intolerable. If you are excited about attending, the subjective cost is significantly less, even if the metabolic cost is identical.

The example of Eastern Orthodoxy raises a more important basic proposition that Koenig and Willard and Legare fail to acknowledge: religious communities that choose not to be expensive tend to fail. This is a well-established empirical finding (Iannaccone, 1994; Sosis & Bressler, 2003). Thus, these commentators may be correct to claim that many contemporary American religious communities are not particularly costly – but these churches are dying, exactly as costly

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signaling theory predicts. Eastern Orthodoxy in the United States faces its own demographic challenges, but it is not outright collapsing as the typically lax United Church of Christ or the Episcopal Church are (ASARB, 2012). If Koenig and Willard and Legare were to restrict their observations about the costliness of religious commitment to those groups that are thriving or holding steady – such as, to pick further examples, the Amish or Orthodox Judaism – previous data suggest that they would find a significantly higher level of costs on a variety of metrics (Iannaccone, 1994; Irons, 2001). Without including this basic demographic fact in their critiques of costly signaling theory, these three commentators leave themselves without a good point of contact with the existing debate.

Matthews, meanwhile, contests the necessity of costly signaling to achieve stabilized religious prosociality in general on theoretical grounds. This critique is, I think, more fruitful, because it offers a welcome point of contact with evolutionary biology. However, it is ultimately mistaken as a challenge to the present model. Matthews (2012) is correct that an appreciable proportion of religious behavior and signaling is linked to mutualistic cooperative intent (“recognition signaling”). Methodist churches, for instance, want to attract Methodist congregants and Methodist believers want to attend Methodist churches; there is no strategic conflict or motive for deceit in signaling Methodist affiliation. Honest signaling (the cross and flame displayed on the church grounds) is stable at equilibrium without strategic cost. However, in dismissing the importance of altruistic models of cooperation for religion, Matthews appears to assert implicitly that free-rider problems are not a major concern for human cooperation. This is difficult to accept. If free-riding were not a problem for religious communities, the positive correlation between imposed costs and reliability of attendance across denominations would scarcely be so remarkably robust (Iannaccone, 1994), nor would mainline Protestant denominations be atrophying as rapidly as they are (ASARB, 2012). Religious communities clearly suffer when too many members attempt to receive benefits (such as spiritual support, aesthetically appealing services with a well-trained choir, or social networks) without contributing reciprocally. Matthews acknowledges that costly signaling is a stable solution to this problem where it exists, but seems to imply that it is not as ubiquitous as theorists have suggested. Yet an inductive inference from the data appears to undermine Matthew’s claim.

In sum, strategic conflicts between community and individual interests are a fundamental feature of religious life, and indeed of any community. The correct observation that many aspects of social and religious cooperation are mutualistic is in no way a contradiction of this assertion, since – as Matthews points out – mutualistic and altruistic scenarios are not incompatible. This is why religious commitment costs are real, and why they empirically and reliably predict congregation success (measured in longevity and intensiveness of congregants’ participation). This is also why – as Power correctly observes – “subtle signals” such as standing for hours in weekly services are eminently serviceable as investment barriers or costly signs of group commitment. Long-term attendance “becomes a substantial investment of time and energy” with a more favorable marginal cost/benefit ratio for those who are more motivated. Any argument against costly signaling per se must fully account for these facts.

3. Are the technical requirements of costly signaling theory met?

Matthews and Schuurmans-Stekhoven both claim that costly signals that provide incidental benefits cannot, ipso facto, be stabilized for honesty, since they offer an intrinsic motive. This is an interesting argument, but ultimately incorrect. Consider the classic example of gazelle stotting (Zahavi & Zahavi, 1999). Stotting is an immediate cost because it expends energy that could otherwise be used running from lions; its benefit is that it warns lions away. According to Matthews and Schuurmans-Stekhoven, if there is any other incidental benefit to stotting, it cannot count as a costly signal; yet Physiologically, no one denies that vigorous exercise at minimum builds or maintains muscle even as it draws down metabolic energy, because that is how muscle tissue works – use produces benefits. Stotting is exercise, and gazelles who stot benefit at least in that minimal sense accordingly.
The analogy to social signaling and self-control is obvious. As long as the criterion of differential marginal costs is met, a signal therefore need not be detrimental to be strategically costly, nor are strategic costs incompatible with incidental benefits – including those that spring from the very efficacy costs of sending the signal.

In a related vein, Matthews argues that costs must be appraised in the strict currency of fitness in order for costly signaling to count as such. While again offering useful contact with the signaling literature in evolutionary biology, this claim would come as news to economists who pioneered the study of costly signaling in human contexts (e.g., Spence, 1973). More importantly, it also contradicts Zahavi and Zahavi, the progenitors of costly signaling theory in biology, who explicitly argue for a contingent “logical relationship between the signal and the message it conveys” – whether that message is strictly about fitness or another, more complex social quality (1999, p. xiv). Indeed, even critics of religious costly signaling theory concur that, when dealing with intentional agents (such as humans), signaling costs can take the form of “perceived utility costs” such as opportunity cost or energy input (Murray & Moore, 2009). In short, costly signaling theory stipulates only that the marginal cost/benefit ratio be more favorable for signalers with a higher level of the desired quality in a non-mutualistic scenario. In animals that quality might be viability, fertility, or likelihood of escaping a predator; in such cases strict fitness handicaps would be logically appropriate. But in religious communities the referent quality is generally modeled as commitment or intensity of belief. It thus follows that costs paid in the currencies of opportunity, utility, metabolic draw, or effortful self-control can unproblematically function as stabilized investment signals.

4. Is religion really “eminently social?”

Koenig seems to advocate for an individualistic conception of religiousness, specifically as a dyadic relationship between the believer and God. On this basis, Koenig questions the necessity for social influences in producing religious self-regulation. Phenomenologically speaking, this asocial model may reflect some experiences of religiosity, but the implied claim that social factors are less relevant for religion than internal commitments simply does not stand in the face of accumulated anthropological, sociological, and psychological data. For instance, Koenig’s remarkable implication that Abrahamic mysticism is largely pleasant and solitary, characterized by “peace, pleasure, and fulfillment,” flatly contradicts available textual evidence. From St. John of the Cross’s “dark night of the soul” to the notorious discipline of Greek desert fathers, the monastic mystical path has rarely if ever been described historically as easy. Nor, despite its etymology (μοναχός = “alone”), has Abrahamic monasticism ever been truly solitary. The Benedictine rule – the fount of the Western Christian monastic tradition – was explicitly communal from its very inception, while even the hermetic desert monks of Evagrius of Pontus’s milieu were under the strict authority of a thick network of elders, mentors, and even sometimes bishops (Goehring, 1999). The picture Koenig paints of a direct personal relationship between believer and God, essentially unmediated by extrinsic social influences, is thus ahistorical and ecologically invalid. Even the most solitary believers of any era receive concepts, ideas, practices, and – most importantly – expectations and norms from an extended historical and dialogic community underpinned by various levels of authority. Religion does not happen in a vacuum.

5. Is religion’s influence on mental health spurious?

Schuurmans-Stekhoven objects to the imputation of a causal connection between religion and mental health on two basic grounds. First, as elsewhere (Schuurmans-Stekhoven, 2013), he argues that the correlation decomposes upon mediation analysis. Thus, for instance, “hope,” “loving-kindness,” and “self-control” eliminate the positive variance between religion and well-being. This is true statistically, yet without sufficient attention paid to the appropriateness of levels of analysis, it is possible using mediation analyses to eliminate the causal connection between virtually anything and anything else. The argument that therefore “religion” itself offers no mental health benefits could be akin to
claiming – to pick an illustration – that a vegetable has no genuine health benefits *in itself* because its effects on health statistically disappear when vitamins A and B2, folic acid, and fiber are all controlled for. But in such cases, the explanatory mandate is only deferred. Why is it that variables such as hope and self-control are so conflated with religion? This is the interesting question, and Schuurmans-Stekhoven waves it away. Meanwhile, he ignores the studies cited in the target article demonstrating that religious practice can and does predict health outcomes even in secular nations (e.g., Berthold & Ruch, 2014), and that religion indeed has *longitudinal* effects on personality and health. These findings seriously challenge his assertions that religiousness is mostly epiphenomenal on trait individual differences, and that religion–health connections are artifacts of cultural congruence. Indeed, he simply reiterates the charge that religion’s effects on health are limited to North American samples without acknowledging the contrary evidence enumerated in Section 2.3 – that is, an entire subsection devoted to contesting just this claim. I may be ultimately wrong, but if Schuurmans-Stekhoven wishes to have a productive debate on the matter, he is obliged to at least acknowledge the contrary data, if only to show how and why they are refuted.

Second, in Schuurmans-Stekhoven’s view, religion manifests many clearly negative effects, and thus should not be considered prosocial. He unfortunately appears here to be embroiled in a normative argument. His long endnote 2 makes clear that his objection is not merely to the potential adaptive effects of religious practice, but to the association of religion with objective ethical virtues. However, instead of prescriptively applying liberal Western standards of universal morality to all cultures, we ought to take a flexibly descriptive emic approach that assumes that “moral thinking is for social doing” (Haidt & Kesebir, 2010, p. 798). From such a standpoint, “prosociality” entails help for ingroup members, often at the price of dismissal of or antagonism toward outgroups – that is, it is *parochial altruism* (McKay & Whitehouse, 2015). Groups that discriminate against outsiders often enjoy survival advantages (e.g., Turchin, 2006). What enables practices to thrive and spread, then, is a variety of extremely complex selection pressures which are, at heart – as I indicated in Section 6 of the target article – *objectively amoral*. Thus, religious participation may provide regulatory benefits for the human organism; indeed, that this occurs simply should no longer be up for serious debate (Koole, McCullough, Kuhl, & Roelofsma, 2010). But these regulatory benefits are likely tied intimately to parochial ingroup functioning, which tautologically implies outgroup discrimination. For normative moralizing, this is a serious catch-22, and it should be recognized as such by those who wish to make both pro- and anti-religion normative claims.

6. Focus on ritual: what is religious about the social signaling model of religion and mental health?

Questions of religion’s ultimate essence are notoriously fraught (Asad, 1993; Smith, 1982). Thus it is surprising that Schuurmans-Stekhoven and Willard and Legare object that my model does not *essentially* get at “unique” aspects of religion, which they take to be supernatural beliefs. It ought to be clear that I am explicitly describing what Purzycki and Sosis have called a “religious system” that “consists of complex interrelations between necessary components” but which offers no single adamantine core (2010, p. 38). From this standpoint, I am explicitly claiming that the dynamics of religious systems and other social processes are essentially commensurable, with the caveat that – as Alcorta points out – religious communities impose more demands and evoke significantly greater emotional response and commitment. Thus, the dynamics of social investment signaling and its feedback effects on mental regulation are roughly isomorphic across secular and religious groups. Beliefs in God, gods, bodhisattvas, spirits, or angels ratchet up the emotional intensity involved, and contribute significant intrinsic motivations to participate in religious life. But they do not introduce anything uniquely different into the equation *as far as the regulative effects of signaling are concerned*. In this sense, as in so many others, to understand something crucial about religion is to learn about *homo sapiens* at large. As Koole, Meijer, and Remmers point out in their commentary, the
cognitivist insistence that religion be boiled down to propositional beliefs about supernatural agents is thus unhelpful and ecologically misleading.

For this reason, Alcorta’s emphasis on ritual as a point of evolutionary contact between religion, humans, and other animals is well taken. A renewed focus on behavior and human ethology would help the cognitive and evolutionary sciences of religion better incorporate the continuities between human ritual and animal ritualizing (Bell, 1992) and to situate human religion firmly in an evolutionary framework that not only is fruitful for theoretic insights and predictions, but is in fact necessary for grounding the study of religion in the dominant paradigm of the life sciences. Moreover, as Alcorta points out, it is in this evolutionary paradigm that purely cognitivist or individualistic models of religion most clearly reveal their insufficiency. This is not to say that propositional beliefs are irrelevant for religion; indeed, I have taken great pains not to claim that religious practice and ritual explain all religious effects on mental health. What a ritual-centered framework instead enables is a forthright acknowledgment that, as Seligman, Weller, Puett, and Simon (2008), Rappaport (1999) and others have shown, ritual is the process by which humans generate commitment to non-empirical, subjunctive social constructs. Thus, there is nearly always a non-empirical, unverifiable component to human ritual, whether that component is a supernatural agent or something else – a fact that renders strict dichotomies between “religion” and “non-religion” functionally void. Slipping a wedding ring on a bride’s finger references the sacrality of marriage, which of course is an unverifiable ideal that is all too often refuted in actual fact. The American Pledge of Allegiance references the mental construct of a free, beneficent, and indivisible Republic – a work of imagination, no more empirically verifiable than the gods and spirits of folk religions.

Hence, rather than assuming that there is some intrinsic essence to “religion” that distinguishes it from secular groups, a ritual-focused framework enjoins a continuum model in which (1) ritual behaviors combined with (2) extra-empirical propositions produce (3) groups characterized by (4) dynamical feedback that both (5) regulates individuals and (6) conscripts them into its own self-perpetuation. This continuum extends from the most informal fraternities to the 2000-year-old edifice of the Roman church, with greater intensity and more emphasis on subjunctive, extra-empirical concepts in the regions of the continuum conventionally labeled as “religious,” but no discrete break anywhere along the line where “religion” is marked off from everything else. For our purposes, the key point is that, across the entire continuum, social signaling obligations and investment motives interact to stabilize group investment and feed back to regulate individuals. Any model of religion and health that does not take as its starting foundation such a feedback structure must be considered incomplete.

7. What is the relationship between religion, well-being, and social support?

Power makes a useful point with her argument for increased focus on social support as an outcome variable. I clearly agree with her that religious practice facilitates the creation and maintenance of social support. Moreover, social support clearly generates numerous concrete benefits, from access to material resources to informal medical advice to career contacts. Notice, however, that each of these benefits ultimately accrues to the individual. Thus, social support is no more obvious as a choice for the final output of a religion-signaling nexus model than is individual subjective well-being; since we are dealing with a dynamic feedback system, it is very difficult to argue that nature forces us to use any particular component as the initial or the final step along the chain. In the case of the social signaling model, I set out to explain not why religion predicts social support, but why social support predicts subjective well-being in religious contexts, since in my judgment social support is often used as a “black box” to mediate away religion’s effects on well-being without adding explanatory substance (Hovey, Morales, Hurtado, & Seligman, 2014). Therefore my objective in the social signaling model is to show that the pathway by which social support impacts subjective well-being is partly mediated by the costly obligations that are a necessary component of obtaining and retaining robust social ties. That is, it is functionally impossible to extricate social support
from self-control and self-regulation, since these factors are fundamentally implied by one another in ecologically valid models of *homo sapiens* sociality. For this reason I wholeheartedly concur with Power’s argument that it is “feedback between religious practice and social relations” that produces the religious community in the first place – the existence of which is indeed taken as an *a priori* assumption in my model, but should be the target of its own modeling efforts in future investigations.

8. Is self-regulation primarily explicit and effortful, or implicit and automatic?

Koole, Meijer, and Remmers are correct to advocate for a more complex conception of self-control than that offered in the present model. It is likely that self-control issuing from religious practice leverages both implicit and explicit efforts, and future research should attempt to parse the effects of these distinct pathways on religion and mental health. For instance, for new converts to Islam getting up for early-morning prayers may require brute force of will. But continued investment in a social or religious collective over time may slowly facilitate a reconfiguration of lifestyle settings and routines that makes such efforts intrinsically less difficult – for instance, avoiding late-night socializing (e.g., Galla & Duckworth, 2015). Eventually one may face less brute temptation to stay in bed – a negative, avoidant motive – and experience instead a positive or approach-oriented motive to realize the desired goal (praying faithfully). But, as William James (1890) eloquently pointed out, many habits and routines always require a certain force of will. Many of us do not really ever want to mow our lawns. We do it anyway. For many it becomes a habit, so the brute effort is minimal; but it is not the case that there is no explicit effort involved, as I believe Koole, Meijer, and Remmers would agree.

Religious signaling, then, probably involves the long-term inculcation of habits that streamline self-control decisions, but certainly also demands brute tamping down of some prepotent responses for the sake of external social goals. One learns first to resist slouching in temple, but this incipient ability to resist minor temptations may be the first step toward eventually constructing uniquely Jewish life routines that render such conscious efforts redundant. While the ratio between these two functions of self-control probably varies over the course of involvement in a religious community, the need for effortful self-regulation never fully recedes. Indeed, the mandate for effortful religious signaling may provide a kind of backstop that catches people when other patterns of behavior become dysregulated or disrupted by externalities, such as job loss or the death of a spouse. In the face of such life disruptions, myriad well-established habits that facilitate implicit self-control are no longer available. If the victim still retains obligations to continue signaling commitment to a religious community, the self-control cycle may be prevented from falling back to zero across all domains, in turn facilitating the eventual reconstruction of new patterns of implicit self-regulation in relation to the newly perturbed context.

8.1. Is the “muscle model” of self-control invalid?

A related topic, not raised in any of the commentaries but of topical importance for the social signaling model, is the conceptual viability of the “strength model” or “muscle model” of self-control, in which self-control is conceptualized as a limited, general cognitive resource (Baumeister, Vohs, & Tice, 2007). For instance, a recent meta-analysis found substantial evidence of publication bias in the literature on the “depletion effect,” in which exerting self-control in one task decreases self-control performance on a subsequent task (the “two-task paradigm”) (Carter & McCullough, 2014). More pointedly, a large, preregistered replication study recently found null effects using this two-task paradigm (Hagger et al., 2015). These and similar studies (e.g., Lurquin et al., 2016) suggest that self-control may not be a cognitive “resource” susceptible to generic depletion in the way that Baumeister, Vohs, and Tice (2007) have described.
These findings raise important questions about replicability in psychology and the viability of cognitive resource models generally, but they do not impinge on the social signaling model of self-control. If we mean self-control to refer to the abilities to delay gratification, substitute distal rewards for short-term ones, and adaptively inhibit prepotent responses, personality traits relevant to self-control are known to change under the influence of culture (Bleidorn et al., 2013), regardless whether self-control is conceptualized as a transiently depletable resource. Self-control skills measured in one domain can predict outcomes in unrelated domains (Nederkoorn, Houben, Hofmann, Roefs, & Jansen, 2010), and social factors can influence or impede the development of such skills (Burt, Simons, & Simons, 2006).

For instance, response inhibition is one of the three basic executive cognitive functions (EFs), along with task switching and working memory (Fleming, Heintzelman, & Bartholow, 2015). Response inhibition, which enables one “to overrule impulsive or habitual reactions to approach stimuli” (Nederkoorn et al., 2010) is clearly transferrable across domains. Nash et al. (2013) found that stronger electrophysiological markers of response inhibition during a Go/No-Go task predicted subsequent self-control in a qualitatively different social context, while Sahdra et al. (2011) found that meditation training was correlated with future improvements in socio-emotional functioning, and that this effect was mediated by longitudinal improvements in basic response inhibition. Response inhibition is, then, domain-general, but not static. Inhibitory self-control has been found to predict longitudinal changes in criminality and deviant behavior among children, even as increases in authoritative (not authoritarian) parenting predict longitudinal increases in self-control (Burt et al., 2006). And, as surveyed in the target article, increased adolescent religiosity predicts subsequent increases in self-control and decreases in criminal behavior (Pirutinsky, 2014). In sum, self-control is an empirically valid (although possibly underdetermined) concept that predicts objective life outcomes and is influenced by social factors, particularly social constraints. This constellation of facts matches the predictions and dynamic structure of the social signaling model, and changes to or abandonment of the specific resource model of self-control do not alter this correspondence. Self-control can indeed be “strengthened” over time, regardless whether this occurs through the exercise of a putative cognitive “muscle” or – for example – through the incremental, motivated reformulation of cost-benefit computations regarding long-term versus short-term rewards (e.g., Kurzban, Duckworth, Kable, & Myers, 2013).


As I have argued above, the dynamics of investment signaling in religion are different from those in secular contexts only in magnitude, not in absolute kind. Each of our various social roles and affiliations imposes its own ritualized expectations for investment signaling. Contra Matthews and Schuurmans-Stekhoven, the fact that many of these signals carry their own practical benefits either for signaler or signal receiver (the community) is no barrier to their simultaneous ritual function. Neither is perceived triviality or lack of extreme cost. As members of society, we do countless things out of social obligation that are not particularly effortful in the moment – such as shaving and dressing decently for work – but which in fact require a non-negligible investment of time and energy. One of the most crucial signs of mental illness is an incipient failure of these routines of self-maintenance, which confirms that they do in fact require energy – since depression (for instance) is characterized by withdrawal from energy-drawing activities (Gilbert, Allan, Brough, Melley, & Miles, 2002). Therefore, such routines can be stabilized as investment signals.

Consider the stereotype that men often stop shaving when external social obligations are removed: when unemployment strikes, when wives are away, etc. This suggests that shaving is not strictly a self-maintenance behavior, but is also a ritual whose purpose is to signal obeisance to relevant relationships and their attendant obligations. A purely practical self-maintenance behavior would be less contingent on social contexts. Thus, a social signal can be described as a behavior or action that refers beyond itself to some relevant social datum. This component is strategic, not
merely practical; it conveys socially valuable information about the signaler’s commitment to the various relationships and obligations to which the signal is semiotically tied by convention. Shaving each morning thus signals investment in and abidance by the social norms of reciprocal relationships in the middle class, for instance.

Many aspects of apparently basic and practical self-maintenance among *homo sapiens* therefore serve strategic signaling purposes, and this is particularly true for culturally contingent self-maintenance expectations that have no strict survival value. Eating regularly cannot be a reliable signal of investment in a normative order, but lawn-mowing can be. Such behaviors can be analytically decomposed into practical and strategic components. If an American homeowner stops mowing his lawn, neighbors become irritated not only for immediate practical reasons—the ragged lawn seems ugly according to North American conventions—but also because the homeowner’s non-conformity awakens in neighbors an unsettled anticipation of looming defection on other, more substantive cooperative arrangements.

This perspective sheds explanatory light on why many apparently arbitrary social and self-maintenance rituals seem to carry such disproportional moral weight, despite being objectively unrelated to practical questions of harm. It also helps explain, for instance, the tragic fact of the moral judgment against poverty; a recently unemployed person who stops shaving and temporarily gives up mowing his lawn can become the target of moral judgment on the part of others who perceive him as a defector on the basis of his signaling failures. Finally, it facilitates a forthright acknowledgment that self-regulation is not entirely sourced in the individual, but can be seriously disrupted by externalities. Indeed, I am suggesting here that self-regulation consists in the participation in a dynamically stabilized regime of social investment signaling, and that without the external obligations imposed by membership in such a regime, self-regulation fails. However, individuals may fail to achieve membership in such a regime for a variety of arbitrary reasons. Social regimes may reject individuals out of racial or other prejudice. Individuals themselves may reject regimes out of moral judgment (as when, for instance, anti-war protesters reject the conventional norms of American bourgeois suburbia—including the ideal of green, pristine lawns). In either case, self-regulation failure follows unless the individual identifies and joins an alternative group with its own rigorous signaling demands.

With these observations, we are able to successfully parse the practical dynamics of social signaling and self-regulation from the questions of ethically approving of the groups, religious or otherwise, that impose those regulative requirements. A person may be successfully regulated by obligations to an evil group; another person, rejecting membership in that group, may suffer tremendously. This is not just. It is nature. Thus we cannot and must not use emotional thriving as a proxy for moral standing. Social signaling is one of the primary mechanisms by which human self-regulation is achieved, but morally this process is utterly neutral.

### 10. Conclusion: additional implications

Several final points should be made about the social signaling model. First, the importance of aversive ritual behaviors is overstated in the target article, which has produced confusion. Aversive rituals are indeed crucial components of many non-Abrahamic religions—a fact my commentators would do well to take into account given that my aim is a general explanatory model of religion and mental health. However, my highlighting of aversiveness has distracted from the more important formal point that a variety of costs, which may be comparatively subtle, can be stabilized as costly signals of investment. Future investigations should focus on the self-control efforts required to participate in subtle ("doctrinal") religious ritual, or take pains to parse such efforts from the more acute self-control required by many more intense or aversive ("imagistic") rituals (Whitehouse, 2004).

Second, I wish to highlight again that the present model is not intended as an exhaustive account of the relation between religion and mental health. Despite my emphasis on the continuum nature of the category “religion” above, Koenig and Willard and Legare are quite correct to point out that supernatural beliefs may have their own unique influence on subjective well-being (Ellison, 1991).
In response, I think the conversation would benefit from acknowledgment that self-regulation is no synonym of psychological thriving. The signaling nexus and its stabilizing force on subjective well-being may be a kind of necessary middle ground – not sufficient to pull the most psychologically at-risk from the depths, or to launch believers to the heights of joy. At these extremes, personal spirituality and other mechanisms may become more salient. In other words, signaling is a mechanism by which religious participation engenders basic minimum psychological stability – which is not synonymous with or fully sufficient for psychological thriving. Indeed, as Koenig reminds us, some positive psychological states may be orthogonal to stability-producing functions of investment signaling. The present model is thus not in competition with the hypothesis that personal supernatural beliefs provide direct psychological comfort. However, without the stabilization that participation in a signaling regime inculcates, other aspects of psychosocial functioning are obviously deeply impinged. Social signaling ought therefore to be thought of as a stable platform onto which individuals outsource basic, vital functions of self-regulation and self-stabilization. Participation in the effortful rituals that maintain the dynamic integrity of and motivate allegiance to imaginal social worlds – whether religious, civic, or otherwise – is a basic engine of psychosocial stability, even if psychological thriving itself contains unnamed other dimensions. Such careful parsing of the distinct functions of different aspects of religiosity for self-regulation and other aspects of subjective well-being is vital if future investigations are to make the empirical progress that we so acutely need.

References


