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What I Hate, That Do I: Religion as a Cultural Tool for Cognitive Control

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by

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Abstract

The present paper is an introduction to religion and self-control. Many theories of religion assume that religion is a cultural system that adjusts the behaviour of its adherents towards behaviour that benefits the group. An important proximate perspective on this is the workings of individuals' self-control, that is, of how people suppress conflicting impulses in the service of long-term goals and social standards. Researchers have recently started to explore religion explicitly through this lens, and have suggested that religion is a cultural tool that systematically improves the self-control of its adherents. I review correlational and experimental evidence on the effects of religion on self-control measures, along with current psychological theories of self-control. Despite heterogeneity in the concept of 'religion', the available evidence gives modest support to a general relationship between religion and self-control: Survey evidence across religions finds that religiosity predicts adherence to group-goals that require self-restraint, correlational studies show positive associations between religiosity and measures of self-control ability, and experimental evidence finds religious priming to improve performance on self-control tasks in the lab. Some researchers have interpreted the findings using the 'strength' model of self-control, but current discussions in cognitive psychology suggest that purely motivational accounts give a more plausible picture of the workings of self-control. I integrate three motivational models and show how they account for current findings on religion and self-control. These integrated models provide an explanatory framework for how differences in beliefs and values make individuals perceive the costs and benefits of religious commitment differently, leading to differences in self-control. Based on the models of self-control reviewed and the current state of empirical evidence, I conclude by giving recommendations for future research.

1. Religion and Self-Control: Introduction

For that which I do I allow not: for what I would, that do I not;

but what I hate, that do I. (Romans 7:15)

From reminders at a Friday prayer of what Allah has prohibited, to churchgoers praying for strength to become better people, religion seems intimately related with social and individual control. Hence, the idea that religion exists to control people's behaviour is one of the oldest hypotheses in the study of religion (cf. McCullough & Willoughby 2009). On a social level, Durkheim suggested that religion functions to unite people into a single moral community (Durkheim 2001). On a more individual level, Malinowski thought religious behaviours help people handle situations with uncertain outcomes, allowing them to alleviate anxiety and gain a sense of control through the use of magic rituals (Sørensen 2015; Malinowski 1935).

For a long time, however, social scientists merely assumed these hypotheses to be true, including that religion causes people to behave themselves, thereby maintaining the moral order of society (Stark & Bainbridge 2013). What they lacked was large-scale evidence of the relationship between concrete, measurable aspects of religion and actual behaviour, as well as plausible cognitive models founded in systematic psychological research. Thus, it came as a shock to social theory when Hirschi & Stark reported in 1969 that they were unable to find any correlation between measures of religiousness and delinquency among Californian high school students (Hirschi & Stark, 1969; later research has found consistent correlations, cf. Stark & Bainbridge 2013). In recent decades, large strides have been made in the study of religion on mapping the actual relationships between religion and behaviour, clarifying how cultural systems of belief and practices relative to supernatural agents matter. We now have systematic bodies of knowledge of the effects of religious beliefs and practices on both social (from community

lifespan to delinquency rates, Regnerus 2003; Sosis & Bressler 2003) and individual levels (from charity donations to honesty, Randolph-Seng & Nielsen 2007; Reitsma et al. 2006).

The present paper is an introduction to, and discussion of, the relationship between religion and individuals' self-control. This relationship has recently been suggested to be foundational to many behavioural effects of religious beliefs and practices (McCullough & Willoughby 2009). Self-control refers to people's ability to override impulses, desires, and habitual responses in favour of other responses that align better with their long-term goals, moral beliefs, or social standards (Hagger et al. 2010; Duckworth & Steinberg 2015). For example, people may suppress an immediate impulse for chocolate in order to stick to their dietary plan. As some scholars have pointed out, acting morally is normally contingent on self-control (Baumeister & Exline 2000). That is, morally relevant situations tend to be situations in which people must suppress immediate impulses in order to act in line with group norms and standards, e.g. when suppressing anger and desire to aggress against another person. Therefore, the idea that religion bolsters moral communities implies that religion improves people's ability to resolve conflicts between responses in favour of the interests of their group. Moreover, scholars have long observed that religious beliefs and practices often involve behaviours with little obvious justifications, or that even run directly counter to people's impulses. For example, Catholic priests may pledge to live their life in sexual abstinence and some Hindu devotees participate in painful rituals where they are pierced with needles and skewers (Fischer & Xygalatas 2014). Such behaviours similarly require people to suppress immediate impulses and regulate their behaviour according to a higher goal. In addition, religious texts explicitly address struggles of self-control in the face of temptation, from St Paul's writings on the struggle between his wish to follow God's law and the sin at work within him (Rom.7:15-25) to the Quran's assertion that

“[he] who feared to stand before his Lord and restrained his soul from lust, Lo! the Garden will be his home” (Quran 79:40-41).

Only in recent decades, however, has research into how religious beliefs and practices relate to measures of individual self-control picked up pace (cf. McCullough & Willoughby, 2009). And only in very recent years has such research begun to apply experimental methods to weigh in on questions of causality (e.g. Friese et al. 2014; Rounding et al. 2012). Based on this work, researchers have suggested that religious beliefs and practices improve people’s ability to exercise self-control, and that religion appears designed to this end (McCullough & Carter 2011).

On the psychology side, much effort has gone into studying what self-control is in the first place, and what its boundary conditions are. For two decades, the dominant model of self-control in psychology has been the ‘strength’ or ‘limited resource’ model developed by Roy Baumeister and his colleagues (Baumeister et al. 1998). According to this model, all acts of executive control – from suppressing emotional responses to making conscious choices – is based on some physical resource in the brain that can be depleted over time. Self-control is, according to this model, similar to a muscle in that it gets ‘depleted’ with sustained use and has a refraction period before people can again act optimally. In recent years, however, theoretical arguments and empirical evidence have mounted that this model is inaccurate. A number of competing models based purely on motivational accounts of self-control reinterpret the psychological findings in ways that seems a better fit to the data than the strength model (Kurzban et al. 2013; Inzlicht et al. 2014). Interestingly, one comment by Justin Harrison and Ryan McKay on a new ‘opportunity cost’ model proposed by Kurzban et al. (2013) noted how motivational accounts of self-control are directly relevant to central questions in the cognitive science of religion (Harrison & McKay 2013b).

However, psychological models of the nature of self-control have only been sparsely applied to the accumulating empirical evidence on religion's influence on self-control measures. For example, one study reporting that personal prayer improved self-control in a Stroop task also noted that whereas their results were in line with related studies, "the processes underlying the beneficial effects... are unknown" (Frieze et al. 2014, p.93). Other studies of religion and self-control have relied on the 'strength' model of self-control (e.g. Rounding et al. 2012), which may soon be superseded by motivational accounts.

On this background, the aims of the present paper are threefold: First, to critically review available evidence on the relationship between religion and the self-control ability of its adherents. Second, to review and discuss the cognitive models currently available that may explain the empirical findings. Third, to consider the implications of these models for current theorising in the cognitive science of religion that implicitly or explicitly involves claims about self-control.

To forego the conclusion, this introduction will show that the available correlational and experimental evidence modestly support a relationship between religion and general self-control ability, with some caveats; that the current status of psychological research on self-control suggests that purely motivational models of the relationship are most plausible; and that an integration of motivational models from Kurzban et al. (2013), Inzlicht (2014), and Steel & König (2006) fruitfully can be used to explain current findings on religion and self-control as well as to provide new predictions for future research.

2. Definitions of Religion and Self-Control

2.1. An anthropologist from Mars: Framing the issue

To grasp the phenomena in question it is helpful to start by adopting the perspective of an outsider. This is especially true in our case, as self-control and religion are central to human experience and evidently unique to our species. Therefore, let us begin by briefly considering how the relationship between religion, a web of beliefs and practices relative to supernatural beings, and human control of behaviour might appear to a Martian anthropologist:¹

Humans are a bipedal, middle-sized species of primate that have spent most of their recent evolutionary history in nomadic hunter-gatherer bands (Foley & Gamble 2009). Compared to their closest relatives among extant primates, humans have larger brains and a uniquely intricate social system. In their social interactions, they rapidly learn complex information from each other, helped by sophisticated auditory signals emitted from their vocal tracts. Importantly, they pass down information through the generations, so that each generation builds their knowledge on the accumulated wisdom of their ancestors (Tennie et al. 2009). The complex know-how this generates has enabled them to colonise nearly every land surface of Earth. For their complex social systems to function, they have evolved both biological and cultural adaptations that buffer their interactions from conflict between the group's and the individual's interests (Boyd & Richerson 2009). For example, they possess a suite of emotions that makes them experience pleasure when they honour the ideals of their group ('pride') or pain when they fail to do so ('shame'). These emotions change their brains' computations of the costs and benefits of behaviours, rendering them more likely to behave in ways that align with the

¹ Fortunately, our Martian cognitive anthropologist is well-read in the earthlings' scientific literature and in his description leaves references to human scientists who have made observations similar to his own.

group's interests. Furthermore, some populations have shared beliefs about invisible forces and creatures that may punish or reward them for certain behaviours (Boyer & Bergstrom 2008; Pyysiäinen & Hauser 2010; Sosis 2009). For instance, they might believe that deceased humans are still present in invisible form, and that these agents can cause diseases as punishment for selfish behaviour. They also have social practices where they communicate with each other and/or themselves to remind them of the beliefs of their group and how they should behave to live up to them. These shared beliefs and practices are passed down the generations through social learning, and generally influence their brains' computations of the costs and benefits of behaviours in ways that favour the group (Norenzayan & Shariff 2008; Xygalatas et al. 2013; Sosis & Alcorta 2003).

Interestingly, the lifestyles of humans have changed dramatically in recent geological time. Around 12,000 earth years ago, many populations began to move from nomadic, hunter-gatherer bands to sedentary, agricultural societies (Norenzayan et al. *in press*). This brought along new challenges related to the patience and planning needed to maintain crops and the social tolerance required to manage their social structures in a sedentary context (McCullough & Carter 2011; Dunbar 1993). Whereas this change of lifestyle brought about little change in their biological blueprint, it was followed by significant changes in their cultural adaptations (Chudek & Henrich 2011), leading to e.g. formalised rules for unacceptable behaviour and for how wrongdoings should be punished ('legal systems'), and formal systems for passing on knowledge between the generations ('schools'). Their beliefs and practices related to invisible forces and creatures ('religion') also changed systematically: Among foraging bands, beliefs about "spirits" and "deities" tend to ascribe to these beings only limited powers and limited concern with human misbehaviour. However, among populations that moved towards bigger, sedentary, agricultural

lifestyles, such beliefs tend to be about beings that are all-powerful, all-knowledgeable, highly interested in human behaviour, and who deliver punishments and rewards according to how well humans meet their group's behavioural standards (Norenzayan, 2013; Norenzayan et al., *in press*). The behavioural practices associated with beliefs of these beings also tend to be more organised, repetitious, and regular, to ensure members of the group represent the beliefs in a uniform way. These beliefs and practices seem to help solve problems of cooperation in larger groups where humans are only distantly genetically related, by readjusting the value of behaviours that stabilises the group. The new cultural systems of such beliefs and practices spread so successfully that the majority of humans at present adhere to one of just a few major religious systems that arose in tandem with the historical development of larger, organised groups (Norenzayan, 2013; Norenzayan et al., *in press*).

Presently, the ecology of humans is rapidly changing because of their development of systematised methods for testing and improving their knowledge about the world. Therefore, they increasingly find themselves in situations that generate conflict between short-term and long-term behaviour. For example, they have developed tools that enable copulation without pregnancy, allowing them unrestrained sexual activity whilst keeping population growth under control. But historically, many of their tribes and societies required tight control of sexuality because reduced paternity certainty could threaten group stability. Therefore, these groups developed cultural practices and beliefs that contained (extra-pair) sexual activity, including threats of ostracising, death, and strong disapproval by invisible all-knowledgeable and all-powerful beings (Strassmann et al. 2012). As a result, the extant human populations now perceive the development of contraceptive technology in different ways, depending on which complex of cultural beliefs their brains use to compute the situation: Some groups have

developed new belief complexes in which promiscuous sexual activity carry limited negative weighting in their brains' cost-benefit analysis. Other groups denounce birth control altogether as disapproved by mystical beings, or denounce its use for sexual activity outside a socially and mystically approved pair-bond (Srikanthan & Reid 2008). Individuals within the latter groups are more likely to follow a behaviour strategy that excludes these contraceptive technologies.

Humans often consider their behaviour in terms of what they call 'self-control', because some of their neural computations are accompanied by conscious awareness of conflicting behavioural options. Generally, when an individual's actual course of action favours the group's interests over her own, or her own long-term interests over immediate reward, she is said to 'exercise self-control' (Duckworth & Steinberg 2015). Curiously, some human scientists suggest that their brains contain a self-control 'resource' that allows them to follow long-term over short-term rewards (Baumeister et al. 1998), instead of simply assuming that their behaviour follows whatever course of action that is computed as having the highest overall pay-off. The background for understanding human theorising on this topic, however, is centuries of discussions about whether their behaviour is predetermined by prior states of physical matter (Baumeister, Mele, et al. 2010; Baumeister, Bauer, et al. 2010). Interestingly, these discussions are in turn linked to their beliefs about invisible, powerful beings, as some such beliefs assert that supernatural beings set their behaviour free from ordinary biological and physical logic.

More research on humans is needed to understand their peculiar ways.

2.2. What is religion?

With the Martian anthropologist in mind, let us clarify our concepts of interest. A recent review of research on the relationship between religion and morality (McKay & Whitehouse 2015) observed that conceptual confusions about the term 'religion' have frequently impeded

research. One of the reasons for this is that religion is not a coherent naturalistic structure (Mckay & Whitehouse 2015; Boyer 2010), so the boundaries of what is included in the term are largely arbitrary (cp. Jong 2015). Historical definitions tend to conceptualize religion either in terms of an essence of ‘belief in spiritual beings’ (Tylor 1903), or in functional terms as a set of beliefs and practices relative to sacred things that unite its adherents into a moral community (Durkheim 2001). The current consensus in the cognitive science of religion, however, is to view ‘religion’ as a suite of by-products of evolved psychological mechanisms (Boyer 2003), with a standard delineation being the following: Religion and religious thought concern mental representations of supernatural agents, as well as artefacts, ritual practices, moral systems, ethnic markers and specific experiences associated with those representations (Boyer & Bergstrom 2008).² Thus, religion refers to a diverse set of cultural beliefs and practices (from statues and amulets to rituals and moral understandings) with the uniting feature that they are linked to mental representations of supernatural agents (e.g. ghosts, spirits, gods, and witches). Religion is thus not one thing with a single neurological underpinning, but a by-product of many different cognitive systems (Boyer 2003; Boyer 2001).

The problem of heterogeneity in the religious domain needs to be kept in mind when discussing how ‘religion’ affects or explains certain domains of behaviour, including self-control. In an assessment of the status of research on religion and morality, McKay & Whitehouse (2015) pointed out that there is “no pithily characterizable relationship” between the two on the horizon, because of the breadth of phenomena that both ‘religion’ and ‘morality’

² McCollough & Willoughby (2009) defined religion similarly in the context of self-control, as “cognition, affect, and behavior that arise from awareness of, or perceived interaction with, supernatural entities that are presumed to play an important role in human affairs“ (p. 79).

cover. The same is likely to be true for the relation between religion and self-control. The fact that concepts have fuzzy boundaries, however, does not imply that it is unimportant or impossible to study their relations. What it does imply, is that we should not expect a simple answer to whether ‘religion’ improves self-control. In the case of religion and morality, McKay & Whitehouse (2015) pointed out that the study of their relationship should be thought of as a matrix of separate relationships between fractionated elements: “... some aspects of “religion” may promote some aspects of “morality,” just as other serve to suppress or obstruct the same, or different, aspects” (McKay & Whitehouse 2015, p.465). This may also be the case for the relation between religion and self-control, in that some aspects of religion might help and others hinder successful self-regulation (McCullough & Willoughby 2009).

2.3. What is self-control?

In the scientific literature, ‘self-control’ has similarly proven tricky to define, as the term is enmeshed with discussions about free will, the boundaries of what counts as conscious processing, and the nature of metacognition (Baer et al. 2008; Baumeister et al. 2008). However, the domain that researchers investigating self-control are interested in is the ability of humans to exert control over their inner processes and external behaviour (Vohs & Baumeister 2004). Some researchers use the terms *self-control* and *self-regulation* synonymously as referring to “any efforts by the human self to alter any of its own inner states or responses” (Vohs & Baumeister 2004, p.2; cf. Baumeister et al. 2007). Others distinguish the terms and use *self-regulation* as a broad concept that includes reflexive and non-conscious regulatory processes (such as maintaining body homeostasis), and *self-control* more restrictively for instances of self-regulation where a person exerts deliberate and conscious effort to control the self (Hagger et al. 2010; Baumeister et al. 2007). In this sense, *self-control* is the “effortful capacity of the

individual to regulate his or her emotions, thoughts, impulses, or other well-learned or automatic behavioural responses” (Hagger et al. 2010; cf. Vohs 2006). As an example, imagine two friends, Paul and Nina, who go to a restaurant. They are both vegetarians and order only salads. Nina is disgusted by meat and happily chooses from the non-meat options. Paul, however, enjoys meat and must consciously suppress his desire for the flame-grilled steak to behave in line with his goal of eating vegetarian. The psychological processes Paul and Nina go through as they order their food can in both cases be analysed as instances of self-regulation, but only Paul’s behaviour would also count as self-control (cp. Duckworth & Steinberg 2015).

For the purposes of this dissertation, I will distinguish between the terms *self-control* and *self-regulation* in the manner just described. That is, I will use self-regulation as a broader term for goal-directed behaviour that includes both implicit and explicit processes (cf. McCullough & Willoughby 2009; Carver & Scheier 1981) and reserve the term self-control for instances of self-regulation that require deliberate and conscious suppression of prepotent responses.

The ability to exercise self-control relative to personal long-term goals or the norms of a community is crucial for ordinary functioning. In clinical cases, frontal lesions may make patients incapable of following regular social conventions and living ordinary lives (Strub 1989; cp. the case of Phineas Gage, e.g. Damasio 1994). Among non-clinical populations, children’s ability to delay gratification – a key element of self-control – predicts social and academic competence later in life, as well as their ability to cope with stress (Mischel et al. 1989). Similarly, studies have found that children with better inhibitory control (measured by e.g. waiting for their turn, being less easily distracted, and having greater persistence on tasks) grow up to be more law-abiding, have better physical and mental health, and higher income as adults, controlling for IQ, gender, social class and family circumstances (Moffitt et al. 2011).

Importantly, however, people's ability to exercise self-control fluctuates with mental state and environmental context. Even those who are considered by themselves and others to be successful at controlling their behaviour routinely fail to exercise successful self-control, from procrastinating on a research paper to caving in to a desire for sweets when on a diet (Vohs & Heatherton 2000; Ferrari et al. 2005; Steel 2007). On the mental state side, researchers have found that one important source of failure to adhere to long-term goals is mood - if people feel bad, they are more likely to do things that make them feel momentarily good even if it clashes with their long-term goals (Tice et al. 2001). On the environmental side, factors that increase the likelihood of successful self-control include distracting oneself from temptations and not having things visibly present (Mischel et al. 1972; Painter et al. 2002).

3. Evidence: Religion on Self-Control

But they that wait upon the LORD shall renew their strength; they shall mount up with wings as eagles; they shall run, and not be weary; and they shall walk, and not faint. (Isaiah 40:31)

But the God of all grace, who hath called us unto his eternal glory by Christ Jesus, after that ye have suffered a while, make you perfect, stablish, strengthen, settle you. (1 Peter 5:10)

... know that what they follow is their lusts. And who goeth farther astray than he who followeth his lust without guidance from Allah? (Quran 28:50)

3.1. Why should we care?

Why is it important to consider how complexes of religious beliefs and practices relate to self-control? First, many accounts of religion start out with the observation that religious practices such as initiation rites, taboos, sacrifices, temple services, and prayers impose significant proximate costs on their practitioners in the form of time, energy, unpleasant emotions, or material costs. Moreover, such costs often seem to outweigh the rewards that people receive from participation (Sosis & Alcorta 2003). Thus, one of the central observations to explain for the study of religion is how to explain such behaviour, which seems in conflict with rational actor models (Sosis 2003). A standard explanation is that religious behaviours serve as ‘hard-to-fake’ signs of commitment to the group: proximate costs enable such behaviours to serve as ‘costly signals’ of group commitment which brings ultimate benefits from increased intra-group cooperation and longevity (Irons 2001; Sosis & Alcorta 2003; Sosis 2004). This

implies that certain features of religion enable religious adherents to control their behaviour in a way that they otherwise would not, suppressing their immediate impulses in the interest of religious goals. Similarly, the 'Big Gods' hypothesis (Norenzayan 2013) suggests that the shift in religious beliefs and practices towards morally interested, powerful gods and structured, repetitive rituals helped solve cooperation problems in big societies. This, too, implies that certain features of religion enable people to suppress selfish impulses and act in ways that benefit the group.

Only few suggestions have been given as to which proximate psychological mechanisms would enable religious believers to bear the costs of religious behaviours that allow those behaviours to function as costly signals with ultimate benefits. Sosis (2003) suggested that religious believers through mechanisms of self-perception (Bem 1972) and cognitive dissonance (Festinger 1957; Harmon-Jones & Mills 1985) internalise the beliefs and values that justify their investment in ritual activities. These beliefs and values in turn make believers perceive the opportunity costs of religious activities differently from skeptics. Shariff & Norenzayan (2007) suggested that the imagined presence of supernatural beings triggers reputation management mechanisms that increase prosocial behaviour. However, relative to the prolific theorising about ultimate benefits of religion, there is a shortage of solid proximate explanations. Given that the central question is how people are able to pay immediate costs in order to reap long-term (group) rewards, psychological research on the nature of self-control should be exceedingly relevant. Indeed, a commentary on Kurzban et al. (2013)'s article on opportunity costs as explanation for self-control decline suggested that this new frontier of self-control studies would be directly applicable for explaining many elements of religious behaviour (Harrison & McKay 2013).

Second, religion is intimately linked with morality (McCullough & Willoughby 2009; McCullough et al. 2012; Rounding et al. 2012). Indeed, religion has been viewed as a cultural creation that functions to suppress selfishness and increase group cohesion, trust, and coordinated action (Haidt & Kesebir 2010; Wilson 2002). In turn, morality is inextricably linked with self-control, in that morality tends to concern behaviour in situations of conflict between selfish impulses and the interests of the group (Haidt & Kesebir 2010; Geyer & Baumeister 2005). Many classical conceptions of vice and virtue revolve around self-control: For instance, the Christian tradition's "Seven Deadly Sins" lists lust, gluttony, greed, sloth, wrath, envy and pride – all of which involve failures to override lower impulses (Lyman 1978; cf. Geyer & Baumeister 2005). Similarly, Aquinas' list of cardinal virtues includes prudence (foregoing immediate benefits in order to weigh long-term implications and risks before acting), temperance (acting with moderation), and fortitude (remaining resolute in the face of adversity, pain or passion; Rickaby 1986; cf. Geyer & Baumeister 2005). Self-control has therefore by some researchers been referred to as the 'master'-virtue, in that it makes moral virtues possible (Baumeister & Exline 2000).

In sum, costly commitments associated with religious adherence as well as the related link between religion and morality gives ample reason to expect that developments in psychological research on self-control are important to scholars of religion. Let us turn now to the empirical findings on the relationship.

3.2. Correlational findings

3.2.1. Religiosity and goals

In the first place, religion may impact self-regulation by influencing the domains in which people attempt to exert self-control (McCullough & Willoughby 2009). Some work has looked

into general effects of religiosity on goals and values. Saroglou et al. (2004) conducted a meta-analysis of associations between religiousness and values in 21 surveys conducted in 15 different countries using the Schwartz Value Survey and a measure of religious salience or behaviour (e.g. personal importance ascribed to one's religion or frequency of church attendance). Across the samples, religiousness irrespective of specific religion (Christianity, Judaism, Islam) was significantly and positively associated with the value ascribed to Tradition (scores on items such as being "respectful", "helpful", and "responsible", $r = .45$), and Conformity (items such as "politeness", "self-discipline", and "honouring parents and elders", $r = .23$). In contrast, religiousness correlated negatively with the value ascribed to Hedonism (items include "enjoying life", "self-indulgence", and "pleasure", $r = -.30$), Stimulation (e.g. "exciting life", "varied life", $r = -.26$), and Self-Direction (e.g. "freedom", "creativity", and "independent", $r = -.24$). Similarly, an analysis of goals among 672 American undergraduates by Roberts & Robins (2000) found that emphasis put on religious life goals (e.g. "participating in religious activities") correlated positively with emphasis put on social goals (e.g. "working to promote the welfare of others", $r = .32$) and relationship goals (e.g. having a satisfying marriage or relationships with family, $r = .19$) but were uncorrelated with the pursuit of hedonistic (e.g. "having fun") and economic goals (e.g. "having a high standard of living and wealth"). Thus, religion may generally encourage pursuit of goals related to family and community cohesion and discourage or be neutral towards goals related to individual independence and personal pleasure (McCullough & Willoughby 2009; Graham & Haidt 2010; Wilson 2002).

Other correlational research has investigated how goals vary with religious differences. For example, one study compared self-identified Christians and Buddhists from North American universities and found that Christian students put a greater value on experiencing high-arousal

positive emotional states (e.g. “excited”, “euphoric”) than did Buddhist students. In turn, Buddhist students put a greater value on low-arousal positive emotional states (e.g. feeling “calm”, “peaceful”) than did the Christian students. The authors pointed out that this finding was consistent with an analysis of religious texts, which found Christian texts to ascribe higher value to high-arousal positive affective states relative to low-arousal positive ones than did Buddhist texts (Tsai et al. 2007). Similar research has looked into goals regarding the control of thoughts. Thus, Cohen (2003) and Cohen & Rozin (2001) found that religious Protestant and Catholic Christians to a greater extent than religious Jews believe that thoughts about certain acts (e.g. lust, violent actions) can be as immoral as the actual behaviours. Therefore, religious Protestants and Catholics may to a greater extent than religious Jews set goals about controlling their thoughts (McCullough & Willoughby 2009; cp. Cohen & Rankin 2010). Similarly, Sica et al. (2002) and Abramowitz et al. (2004) found that the value ascribed to being able to control one’s thoughts increased with religiosity in Catholic and Protestant samples.

Finally, some studies have investigated the effect religion may exert by sanctifying certain goals. Thus, it might be expected that goals attributed to a sacred source would be considered more important than a comparable secular goal (Emmons 1999). Mahoney et al. (2005) had 150 participants from a US community sample list 10 important goals and rate them on several characteristics. Overall, goal sanctification (as measured by the extent to which a goal is perceived to express or manifest God, or to have sacred qualities) correlated positively with perceived goal commitment (r s around .36), goal importance (r s around .44), and likelihood of success (r s = .32). The participants also spent 34% more time “thinking, reading, or studying” and 43% more time “doing things or talking with others” in pursuit of their two most sanctified goals than in pursuit of their two least sanctified goals (Mahoney, Pargament, et al. 2005).

Similarly, one study of US college students found a positive correlation between the extent to which participants viewed their bodies as a manifestation of God, and indices of health (e.g. wearing a seatbelt, getting sufficient sleep, subjective satisfaction with their bodies, and abstinence from illicit drug use; Mahoney, Carels, et al. 2005).

Thus, religiosity may impose greater adherence to group goals that require self-restraint, and attributing goals to a sacred source may lead to higher commitment, self-efficacy, and persistence (see also Emmons et al. 1998). As we will return to, the interpretational problems of correlational research should be kept in mind – in the case of sanctification, for example, people might be more likely to report goals as religiously mandated if they are committed to them in the first place.

3.2.2. Religiosity and self-control ability

A range of work in personality research has found that people who score higher on measures of religiosity also score higher on measures of self-control and personality dimensions that subsume self-control (e.g. conscientiousness). In one of the first studies, Hartshorne et al. (1929) found positive associations between length of Sunday school attendance and a performance-based measure of persistence in children. Since then, a range of studies have followed this lead (e.g. Aziz & Rehman 1996; Bergin et al. 1987; Bouchard et al. 1999; Desmond et al. 2013; French et al. 2008; Longshore 2004; McClain 1978; Pfefferbaum & Wood 1994; Richards 1985; Walker et al. 2007; Welch et al. 2006; Wills et al. 2003). Out of 12 studies, 11 have found positive associations between measures of religiousness and self-control, with correlation coefficients or standardised regression coefficients ranging from .21 to .38 (cf. McCullough & Willoughby 2009). For example, Desmond et al. (2013) found that religiousness among adolescents (as measured by self-reported importance of religion, frequency of prayer,

and frequency of church attendance) was positively associated with self-control ability (self-reported ease of paying attention, getting homework done, and focusing on a task at hand). This correlation held up when controlling for sex, age, race, socioeconomic status, parental education, family structure, attachment to parents, and religious denomination³. Similarly, Aziz & Rehman (1996) found that higher scores on religiousness (measured with a 27-item self-report tool) in a sample of postgraduate Pakistani Muslims was associated with higher self-control (Self-Control subscale of the California Personality Inventory, see e.g. Gough 1987), $r = .35$. Other studies have looked at self-control as a moderator of effects found of religiousness. For example, Briki et al. (2015) found in a sample of young Muslims in France that self-control mediated a positive relationship between religiosity and health-related outcomes. Similarly, Pirutinsky (2014) found that higher self-control mediated a negative relationship between religiosity and criminal behaviour.

Related research has looked into the relationship between parents' religiosity and their children's self-control ability (Bartkowski et al. 2008; Brody & Flor 1998; Brody et al. 1996; Lindner-Gunnoe et al. 1999). These studies, which all have used US data, generally find positive associations between parent religiosity (self-rated importance of religiousness or measures of engagement in religious activities) and measures of their children's self-control (Lindner-Gunnoe et al. 1999, β s = .40 and .49; Brody et al. 1996, r s = .10 and .21; Brody & Flor 1998, $r = .16$). For example, Bartkowski et al. (2008) investigated the impact of religion on dimensions of psychological development and social adjustment in early childhood, using data from 17,000

³ Readers may be aware that these results were reported by McCullough & Willoughby (2009) as "Desmond, S. A., Ulmer, J. T., & Bader, C. D. (2008). *Religion, prosocial learning, self control, and delinquency*". However, Desmond et al.'s paper underwent a couple of revisions and was not actually published until 2013, under a different title, which is the one cited here (Scott Desmond, personal communication on 10th November 2015).

children in the Early Childhood Longitudinal Study, a representative survey of US first-graders. Bartkowski et al. found children's self-control (measured by e.g. respecting the property rights of others and not throwing tantrums) to be positively associated with their parents' frequency of religious attendance.

The findings from the correlational studies are not unequivocal. Many studies find that *style* of religiousness affects the association between religion and self-control (Bergin et al. 1987; Bouchard et al. 1999; Klanjšek et al. 2012; McClain 1978). For example, Bergin et al. (1987) found that only intrinsic religiousness (cf. Allport & Ross 1967; Ryan et al. 1993) was positively related to self-reported self-control, as measured by Rosenbaum's Self-Control Schedule (Rosenbaum 1980). For extrinsic religious orientation, there was a *negative* correlation with self-control. Moreover, some studies fail to find an overall association between religiousness and self-control in the first place. For example, in a sample of 296 US undergraduates, Pfefferbaum & Wood (1994) found a near-zero correlation ($r = .04$) between a single-item measure of personal importance of religion and the Self-Control subscale of the California Psychological Inventory. All things considered, however, the results from cross-sectional studies do indicate that some elements of religion have a recurrent relationship with self-control.

Finally, a few longitudinal studies have investigated relative timings of shifts in scores on religiosity and self-control, giving clues to causality. Wink et al. (2007) used an archival sample from California upper middle class families with a time lag of 50 years between the first measurement and a follow-up. They found mixed evidence for the idea that higher religiousness scores lead to subsequent higher scores on personality traits related to self-control: For women, religiousness in adolescence was linked to an increase over the course of life in Agreeableness (a trait which may reflect the ability to control oneself out of concern for the feelings and desires of

others, cf. McCullough & Willoughby 2009). However, religiousness in adolescence had no correlation with scores on Conscientiousness over the life span for either sex. In contrast, a few studies have found that higher scores on self-control relevant traits earlier in life are associated with higher religiousness later in life. Thus, McCullough et al. (2003) found in a longitudinal study of Californian children that those high in conscientiousness became more religious as adults ($\beta = 0.14$), controlling for background variables such as gender and religious upbringing. Other longitudinal studies have found similar results (Wink et al. 2007; Regnerus & Smith 2005; Heaven & Ciarrochi 2007).

It is difficult to interpret the correlational findings. First, the cross-sectional studies are unable to speak directly to a causal relation between religiosity and self-control. Rather than certain religious beliefs and practices causing improved scores on measures of self-control, the causal arrow could go in the opposite direction. For example, if participation in some religious practices requires self-control, then people with low self-control might be less attracted to religion in the first place. Indeed, this suggestion seems moderately supported by the longitudinal studies. Second, the interpretation of these studies are made difficult by the fact that ‘religion’ and ‘self-control’ are not clearly defined concepts, and that the available studies often operationalise them in different ways. Thus, it is not unanimous from the evidence which psychological mechanisms of ‘self-control’ the findings point to, or which elements of ‘religiosity’ are thought to affect them. Third, these studies rely on self-report measures, which brings along an array of interpretational difficulties. For example, are people who score higher on measures of religiousness in fact better at suppressing impulses that conflict with their long-term goals, or do they just perceive themselves to be so? Or might highly religious people be

more likely to feel embarrassed by admitting to low self-control, leading biased reporting to create a false correlation?

In aggregate, however, the correlational evidence does suggest that religion and self-control have important relations with one another. Let us turn now to a survey of relevant experimental research, which (ideally) should address the blind spots of the correlational evidence in a more precise manner.

3.3. Experimental findings

3.3.1. Findings from current studies

Whereas correlational studies of religion and self-control are relatively numerous, experimental studies of the relationship remain few. At the time of McCullough & Willoughby (2009)'s exhaustive review of the literature on religion and self-control, the only available experimental evidence was Fishbach et al. (2003). This paper tested the hypothesis that repeated attempts at self-control would create associations between 'tempting' stimuli and the goal that such temptations threaten to undermine. In this way, automatic temptation-goal associations would be a rudimentary form of self-control, making relevant long-term goals more salient in the face of temptation. In four experiments, Fishbach et al. subliminally primed participants with various words and asked participants to categorise subsequently presented stimuli as words or non-words as quickly as possible. In one experiment, they primed participants with temptation-related words (e.g., drugs, temptation, premarital, sex), words related to religious goals (e.g., prayer, bible, religion, god), or neutral words irrelevant to religion or temptation (e.g. noon, basket, talk, friends). They found that subliminal priming with temptation-related words, but not neutral words, led to faster subsequent recognition of religious words. In contrast, subliminal presentation of religious words made participants slower to recognise subsequently presented

temptation-related words. In a fifth experiment, the authors used naturalistic priming and placed participants in an office with sports and diet magazines (sports prime), in an office with chocolate magazines and fattening foods (fat prime), or in a neutral setting. They similarly found that participants in the sports and fat prime conditions were quicker at recognizing the target word *diet* in a lexical decision task and more often chose an apple over a Twix bar when given a choice of snack. Moreover, participants in the fat prime condition had a higher self-stated intent to stay away from fattening foods. These studies suggest that people may automatically activate goal concepts (including religious goals) to help them exercise self-control in the face of temptation. Conversely, salience of mental content related to one's long-term goals (including religious goals) may reduce the accessibility of temptation-relevant mental content.

Since the paper by Fishbach et al. (2003), a number of researchers have carried out experimental work explicitly aimed at investigating effects of religious beliefs and practices on self-control measures. One much-cited study by Rounding et al. (2012) investigated effects of religious priming on self-control in four separate studies, using a scrambled-sentence task adopted from Shariff & Norenzayan (2007) as the priming procedure. In a scrambled-sentence task (Srull & Wyer 1979), participants are given a number of sentences in scrambled order (e.g. "sky the seamless blue is"), and the participant's task is to assemble four of the words into a sentence (e.g. "the sky is blue"). In Rounding et al.'s religious prime condition, five out of ten sentences contained a word associated with religion, such as *God*, *spirit* and *divine*. They found that, compared to the control condition, participants in the religious prime condition drank more of an unsavory juice (they were paid a nickel for each ounce they were able to drink), were more likely to pick a larger, delayed, reward (when given a choice between returning to the lab the next day for a \$5 reward, or one week later for a \$6 reward), persisted longer on an impossible

puzzle task before giving up, and had shorter reaction times in a Stroop task. In line with the ‘strength’ model of self-control (see chapter 4), Rounding et al. interpreted their findings as evidence that reminders of religion ‘replenish’ self-control resources. Another recent study by Friese & Wänke (2014) investigated the effects of prayer on self-control. They found that instructing participants to pray (as opposed to think freely) before going through a standard self-control experiment buffered against decline of self-control ability over time: For participants who had been praying, the error rate in a Stroop task did not increase after an emotional suppression task. For participants in the free thought condition, however, the error rate in a Stroop task went up after emotional suppression, in line with the ‘ego depletion’ effect (cf. Hagger et al. 2010; Baumeister et al. 1998). This finding was conceptually replicated by Friese et al. (2014) using a variation of the ‘white bear’ thought suppression paradigm (cf. Wegner et al. 1987) instead of suppression of emotional reactions. Finally, Inzlicht & Tullett (2010) took a more neuroscientific approach and investigated whether religious priming would affect error-related event potentials in the anterior cingulate cortex (ACC) during a Stroop task. They found that religious priming (using the scrambled sentence-task or asking participants to write about what religion means in their life) led to a diminished EEG signal from the ACC as well as a lower error rate in the Stroop task, but only for religious participants (cf. Shariff et al. 2015).

Alongside such studies looking for general effects of religious priming on measures of self-control, recent work investigates how religious priming may have differential effects on different outcome measures and show cultural and individual variation. For example, Laurin et al. (2012) suggested that reminders of God would have differential effects on different aspects of self-regulation, specifically on active goal pursuit (actively engaging in goal-directed behaviour) and temptation resistance (refraining from behaving in ways that derail goal pursuit). In a series

of experiments, they primed participants with religious concepts either using a scrambled-sentence task or by having participants read a speech excerpt about God. In relation to active goal pursuit, they found that participants primed with religion generated fewer words in a word-generation task (but only if they believed external factors could influence their performance), and reported less willingness to invest effort in pursuing desirable careers. In relation to temptation resistance, they found that participants primed with religion had more negative associations with junk food in an Implicit Association Test (IAT), ate fewer cookies in a tasting task, and reported greater willingness to resist temptation to reach long-term goals. Interpreting their results, the authors suggested that reminding people of an omnipotent being in control over the outcome of their actions might reduce motivation to work hard to achieve goals and desired end-states. However, when temptation resistance is the more salient aspect of self-regulation, reminders of God will increase motivation to exert self-control because a salient supernatural watcher decreases anonymity.

Sasaki & Kim (2011) explicitly investigated how cultural factors would modify the link between religion and self-control in a comparison between South Korea and the US. In an analysis of mission statements by Christian churches, they found that the themes highlighted on US denominations' websites to a much greater extent than Korean emphasised personal growth and learning to control one's inner acceptance of situations. Korean denominations, on the other hand, tended to emphasize the social benefits of getting to know people within the church, which the authors interpreted in line with the distinction between 'independent' and 'interdependent' cultural perspectives (Morling et al. 2002; Morling & Evered 2006). Sasaki et al. went on to investigate whether effects of religious priming on behaviour in a social situation would therefore differ between European Americans and Asians/Asian Americans. In a religious

priming condition, participants rated the importance of “religious values” and “romantic values” and wrote about one of these values. Afterwards, participants completed a cognitive test on which they won a prize for top performance. When the experimenter gave them the prize, he ostensibly by mistake gave them their last choice rather than their first choice of prize, and the dependent measure was whether or not participants protested about the mistake. Results were that European Americans protested less when primed with religion than in a control condition (rating and writing about “relations with friends/family” or “romantic values”). However, there was no effect of religious priming for Asian/Asian Americans.

Finally, Sasaki et al. (2015) investigated whether individual genetic differences moderate the effects of religious primes on self-control in a social context. Specifically, they tested whether individual variations of the OXTR oxytocin receptor gene (GG vs. AA/AG genotypes) would influence religious priming effects. Thus, variations of the rs5376 polymorphism in the OXTR have been linked to differences in social sensitivity, where people with two copies of the G allele of rs5376, compared to carriers of the A allele, tend to exhibit greater maternal sensitivity and dispositional empathy (Rodrigues et al. 2009; Bakermans-Kranenburg & van IJzendoorn 2008; Smith et al. 2014). Their experimental setup was a variation on Sasaki & Kim (2011), in that they asked participants to complete a cognitive test followed by a scrambled-sentence task, in which one half of participants were given a version containing religious words. Afterwards, the participants received a prize for top performance in the cognitive test, where the experimenter ostensibly by mistake gave participants their last choice rather than first choice of prize. Sasaki & Kim found that priming religion with a scrambled-sentence task increased self-control behaviours (i.e. less protest to receiving the wrong prize) for people with GG more so than people with AA/AG genotypes. The authors interpreted this finding to mean that people

with GG genotypes of OXTR are more sensitive to social influences in the environment compared to people with AA or AG genotypes, which makes them more likely to be influenced by religious priming.

The experimental studies cited suggest that religion can have a causal effect on self-control. There are some important caveats, however. First, most of the studies reviewed tell us little about which elements of religion are causal factors. Many studies operationalise effects of 'religion' to mean behavioural effects of minimal priming with a scrambled-sentence task in which a few religious words are strewn over a purported test of language ability (Bargh et al. 1996). It is not obvious which elements of religion this priming informs us of, or whether it is a meaningful experimental intervention to study the relationship between religion and self-control, which in the real world is linked to tight-knit communities, embodied rituals, and explicit reminders of religious beliefs. Similarly, remembering our discussion of the breadth of the religious domain, we should also be cautious of attempts to isolate pure effects of 'religion', particularly in a scrambled-sentence priming paradigm. In one of the experiments by Rounding et al. (2012), for example, they attempted to separate effects of priming 'religion' from that of priming with 'morality' and 'death', by choosing slightly different words to include as target words in the scrambled-sentence task. This may be a useful strategy to get closer to which kind of beliefs influence which behaviours when salient, but makes little sense if the aim is to get to effects of the 'essence of religion' (Boyer 2010).

Second, these experiments tell us little about the cognitive routes through which religious priming would influence self-control. For example, Rounding et al. (2012) loosely interpreted their findings as a replenishment of self-control resources by religious priming. Harrison &

McKay (2013a) argued that some of Rounding et al.'s results implied a decrease of temporal discounting by religious priming, and attempted to replicate the finding that religious priming increases preference for a larger, delayed reward over a smaller, more imminent one, using an auction task that measures temporal discounting in a non-social context. Harrison & McKay, however, failed to find any effect of religious priming and suggested that Rounding et al. (2012)'s findings were not due to increased self-control strength or decreased future discounting, but only to increased social motivation: the subjective value of waiting a week for \$6 is worth \$6 plus what waiting says about the participant's character, and religious priming might increase the perceived importance of portraying strength of character (Harrison & McKay 2013a). Similarly, it is unclear by which mechanism prayer could buffer against ego-depletion. Friese et al. (2014) suggest that prayer might make personal values more salient, which somehow counteracts self-control decline over time (Agrawal & Wan 2009), or maybe prayer bolsters self-control to the extent that a person *believes* that praying rejuvenates cognitive strength (cf. Job et al. 2010), or maybe prayer somehow increases social motivation and cognitive resources necessary to maintain smooth social interactions (Ybarra et al. 2008; Friese et al. 2014). There is no agreed framework for interpreting the effects, and the available experimental studies are at present more 'proofs of concept' for a relationship between self-control and religion than illustrative of clear cognitive routes.

To sum up, the experimental studies into religion and self-control have made a good start. The first study by Fishbach et al. (2003) suggested a general relationship between exposure to temptations and automatic activation of personal goals (including religious ones). Recent work have found evidence of beneficial effects of religious priming in a range of self-control tasks, such as the Stroop test, and other studies have begun to uncover cultural and individual variation.

However, we are still short of clear theorising and delineation of what we are investigating (i.e. which elements of ‘religion’ make a difference), how to understand what we see (i.e. which cognitive routes explain the relationships between religion and self-control), and how to organise the findings (i.e. which larger framework of the mechanisms of self-control should they be placed within).

3.3.2. Digression on the validity of religious priming

As we have seen, most experimental research on the influence of religion on self-control has been done as priming studies. In social psychology, ‘priming’ is generally understood as an unobtrusive activation of social knowledge structures that influences subsequent behaviour without the person being aware of this influence (Bargh 2006, p.147). In other words, when researchers study behavioural effects of religious beliefs using a priming paradigm, they find a subtle way to make such beliefs mentally accessible, and observe whether this influences an outcome measure. The main reason for conducting studies in this way is to overcome problems related to demand characteristics if the religious manipulation is obvious to the participants (Bargh 2006; Van Elk et al. *in press*).

In an industry of research, social psychologists found that nearly all forms of social representation can be primed, with various behavioural effects to follow. Srull & Wyer (1979) were the first to use the scrambled-sentence task as priming intervention and found that participants exposed to words related to hostility in a purported ‘language study’ afterwards formed a more hostile impression of a target person from an ambiguous description, than did a control group. Similarly, in a heavily cited study by Bargh et al. (1996), participants primed with words semantically related to an elderly stereotype subsequently walked more slowly down a hallway than did control participants. The related literature on priming with religious concepts

has primarily focused on relations between religion and prosocial behaviour (Norenzayan & Shariff 2008; Shariff et al. 2015). Shariff & Norenzayan (2007) found that participants primed with religious words in a scrambled-sentence task allocated more money to anonymous strangers in an economic game, and Randolph-Seng (2007) found that participants primed with religious words cheated less on a subsequent computer task. Among the few studies that have used more ecologically valid methods, Aveyard (2014) found less cheating in a maths task after Muslim participants had been exposed to the Islamic call for prayer, and Xygalatas (2012) found in a field experiment that participants who played a common-pool resource game in a Hindu temple were more generous than participants playing the same game in a restaurant.

However, a great deal of controversy has accumulated recently over priming studies. One study by Doyen et al. (2012) that sparked intense debate attempted to replicate the finding by Bargh et al. (1996) that priming with words related to an elderly stereotype decreased walking speed. Doyen et al. were unable to replicate the effect when their research assistants were blinded to the hypotheses. However, they *were* able to replicate the original finding when they manipulated the research assistants' expectations, so that they *expected* participants to walk more slowly in the experimental condition. Doyen et al. concluded that Bargh's original finding was an artefact of experimental setting. Other large-scale failures to replicate highly cited unconscious priming studies have raised similar questions about the robustness of priming effects (Gomes & McCullough 2015; Shanks et al. 2013; Xu et al. 2014).

The controversy surrounding priming studies has in turn been linked to the larger debate about incentives in scientific research where novel and positive results are considered more publishable than replications and negative results (Nosek & Lakens 2014), which creates incentives to avoid or ignore the latter, at the expense of accuracy (Giner-Sorolla 2012; Nosek et

al. 2012; Nosek & Lakens 2014). Thus, there is broad concern over questionable research practices that increase the likelihood that effects reach statistical significance (Simmons et al. 2011; Shariff et al. 2015), making published findings more likely to be biased, and clear null-results more likely to end up in researchers' file-drawers (Francis 2012; Van Elk et al. *in press*). Very recently, the results of the Reproducibility Project were published in *Science* (Open Science Collaboration 2015), containing replications of 100 experimental and correlational studies randomly selected from 2008 publications in three important psychology journals. Whereas 97% of original studies had significant results ($p < .05$), this was the case for only 36% of replications, and the mean effect size (r) of findings that did replicate was half of the original effects (Open Science Collaboration 2015).

Should this raise concern when interpreting relevant findings from religious priming studies? One way to estimate the state of the field is meta-analyses in which a large number of studies is surveyed to reach an overall conclusion. Shariff et al. (2015) conducted a recent meta-analysis of 93 studies of religious priming effects with a total of 11,653 participants. They attempted to correct for publication bias and questionable research practices by using the "trim and fill" method to estimate studies that are missing due to publication bias (Duval & Tweedie 2000; Shariff et al. 2015) and by conducting an analysis of the distribution of p values (p curve analysis, see Simonsohn et al. 2014; cf. Shariff et al. 2015). They concluded that religious priming has a small but reliable effect on a variety of behavioural measures, including prosocial ones. However, religious priming effects do not reliably affect non-religious participants, and explicit priming techniques (e.g. contextual manipulations such as religious environments) result in stronger effects than do implicit priming techniques (e.g. subliminal priming or scrambled-sentence tasks; Shariff et al. 2015). Shortly after the publication of Shariff et al.'s meta-

analysis, Van Elk et al. (*in press*) argued that their analysis suffered from several methodological and statistical shortcomings. For example, the “trim and fill” method of correcting for publication bias rests on the assumption that selective reporting is explained by researchers being hesitant to report small effect sizes, whereas in practice results are normally left unreported because the p-value does not reach the threshold of .05 (Simonsohn et al. 2014, cf. Van Elk et al. *in press*). Moreover, a number of manuscripts were excluded from Shariff et al.’s analysis, such as van Elk et al. (2014) which reported six experiments showing a null-effect of religious priming for both religious and non-religious participants. Van Elk et al. (*in press*) conducted a re-analysis of the data using two alternative techniques: A PET-PEESE meta-analysis (Stanley & Doucouliagos 2014) suggested that religious priming effects are driven solely by publication bias. However, an analysis using Bayesian bias correction (Guan & Vandekerckhove *in press*), suggested a positive signal of religious priming effects after controlling for publication bias (Van Elk et al. *in press*). Van Elk et al. concluded that meta-analyses are not robust enough to settle the question: rather, the current situation requires large-scale preregistered replication experiments to give us better evidence. One answer to their call, Gomes & McCullough (2015) conducted a pre-registered replication attempt of the widely-cited study by Shariff & Norenzayan (2007) in which people allocated more money to anonymous strangers in a dictator game following a scrambled-sentence task that included religious words. Gomes & McCullough used a much larger sample of participants ($n = 650$) than Shariff & Norenzayan (study 1: $n = 50$, study 2: $n = 78$), but failed to find an effect of religious priming, leading the authors to conclude that the effect of religious priming on dictator game allocations is either not reliable or very sensitive to minor differences in methods or populations. Shariff & Norenzayan in turn replied with a

critique (*in press*), suggesting that Gomes & McCullough's participants were already highly generous on average, leaving little room to detect an effect of religious priming.

What do we conclude from this? Let us remind ourselves why priming studies are conducted in the first place. Religious scholars have little interest *per se* in whether interspersing five words with religious connotations among hundreds of others in a scrambled-sentence task slightly bias subsequent behaviour in an economic game. What we are interested in is whether religious beliefs and practices play a causal role in important real world phenomena, from charity donations to terrorist acts. The problem is that designing experiments to unambiguously demonstrate a causal effect of certain beliefs and values on behaviour is difficult to do. In the real world, behaviour is routinely (and trivially) affected by consciously held norms of how we are expected to behave within certain contexts – and whether we are being observed in those – from restaurants, schools, and bathrooms, to churches and mosques. However, we have yet to find a convincing way of experimentally showing the causal role of the beliefs and forms of practices involved, because recreating the ordinary settings in the lab will inevitably see the results confounded by demand characteristics: Because the subject knows that she is taking part in an experiment, it is difficult to tease out the ordinary influence of the beliefs and practices involved from the influence of the participant's awareness that the experimenter expects her to act in a certain way. This is the main reason an endless number of experiments are conducted in which a few words with religious connotations interspersed between other words in a scrambled-sentence task is equated with an effect of 'religion' on behaviour.

The reason I spell out what might seem obvious is that it implies that conclusions of meta-analyses like Shariff et al. (2015) of 'effects of religious priming' should be carefully

interpreted. It may be that large-scale replication projects of previously published religious priming experiments would come out in favour of the null hypothesis. However, this would more likely reflect the present methodology in experimental research on religion rather than a judgment of whether religious beliefs, values, and environments influence people's behaviour. 'Priming' in a broader sense as a change of behaviour as a result of changing the perceived behavioural norms and degree of anonymity implied by the environment is a trivial phenomenon, and so should priming effects of religious contexts be. People do in fact behave differently depending on whether they are in a church or at a soccer stadium (in the US, people find relatively few behaviours socially appropriate in religious settings, and self-control the most appropriate trait to express in such settings, Kenrick et al. 1990; Price & Bouffard 1974). What is *not* necessarily a true phenomenon is priming effects of the subtle breed that have been studied in the lab, where unconscious effects have been a central focus. In our effort to avoid demand characteristics, the subtle priming paradigms in the lab have come to tell us little about real world behaviour, because the most obvious effects of religious beliefs and behaviour are driven by exactly those conscious expectations and understandings that we for methodological reasons avoid in the lab.

3.4. Summary

The empirical observation that religious practices often impose costs on their practitioners in the form of time, energy, unpleasant emotions, and material costs, as well as the links between religion and morality, give reason to expect that religion has an interesting relationship with self-control. While systematic research on the matter has only recently begun, survey evidence on goals and values indicates that religiousness in general is associated with adherence to group-goals that involve self-restraint such as being respectful and polite. Similarly,

cross-sectional evidence has consistently found positive associations between scores on measures of religiosity and measures of self-control. In several studies, the association is qualified by religious orientation: Only intrinsic religiosity is positively correlated with self-control ability. The correlational evidence, however, is limited by inability to assess causality, by reliance on self-report measures, and by substantial variation in ways of operationalising both ‘religion’ and ‘self-control’. Experimental studies have recently begun, with the current findings suggesting a positive relationship between priming with religious concepts and performance on self-control measures. However, the experimental studies tend to rely on priming methods with limited external validity, and also tell us little about which cognitive processes underpin the findings. Moreover, current concerns of lack of reproducibility in psychological research – including religious priming studies – suggest caution in interpreting the evidence.

Overall, the available studies do give modest support to claims of a positive effect of recurrent elements of religion on self-control ability. Let us turn now to the psychological theories of the nature of self-control.

4. Models: Self-Control as Strength and Motivation

4.1. Cybernetics and self-control

The way many researchers think about self-regulation and self-control has been influenced by cybernetic models of behaviour control (Carver & Scheier 1981; Powers 1973). In Carver & Scheier (1998)'s frequently cited model, self-regulation (and self-control) is seen as a dynamic process where people bring their behaviour in line with their goals by virtue of several integrated feedback functions. In their model, three main elements are required for self-regulation: First, an *input* function that detects the state of a system (e.g. perception of oneself and the environment). Second, a *comparator* function that compares the state of the system to a reference value (e.g. comparing to goals, standards, ideals). Third, an *output* function that is activated when there is discrepancy between the system's state and the reference value (e.g. modifying thoughts or behaviour to bring oneself or the environment in line with one's goals). In this cybernetic way of thinking, self-regulating systems (including humans) need to monitor for discrepancies between actual states and desired states and then implement outputs to minimise those discrepancies (Carver & Scheier 1998; McCullough & Willoughby 2009; Baumeister & Exline 2000). This general frame sits well with current neuroscientific theories on metacognitive control. Here, 'meta-cognition' is defined as control processes that use representations of properties of other cognitive processes (i.e. metacognitive processes; Shea et al. 2014). Thus, Shea and colleagues recently put forward a theory of meta-cognition and cognitive control in which metacognitive processes monitor other processes in the mind and control is exercised when a mismatch is perceived between the desired and the actual state of the world. This cognitive control can in turn happen on two levels, corresponding to the distinction between a System 1 and a System 2 (e.g. Kahneman 2011): Cognitive control exerted by System 1 processes occurs swiftly and

automatically, and without conscious awareness. For example, experimental participants may automatically slow down after committing errors they are not consciously aware of having made (Logan & Crump 2010). Cognitive control exerted by System 2 processing, by contrast, is slower, conscious, capacity-limited, and likely unique to humans. It is readily influenced by instructions and beliefs (Middlebrooks & Sommer 2012; Dickinson 2012), and may originally have evolved for the purpose of coordinating control between two or more actors. System 2 cognitive control provides a direct mechanism for the influence of cultural beliefs and practices on behaviour (Shea et al. 2014). Applying the distinctions we introduced in section 2.3, cognitive control exerted by both System 1 and System 2 processes would count as *self-regulation*, whereas control exerted by System 2 processes can be identified with conscious, deliberate, and effortful *self-control*. This control model is depicted in Fig. 1.

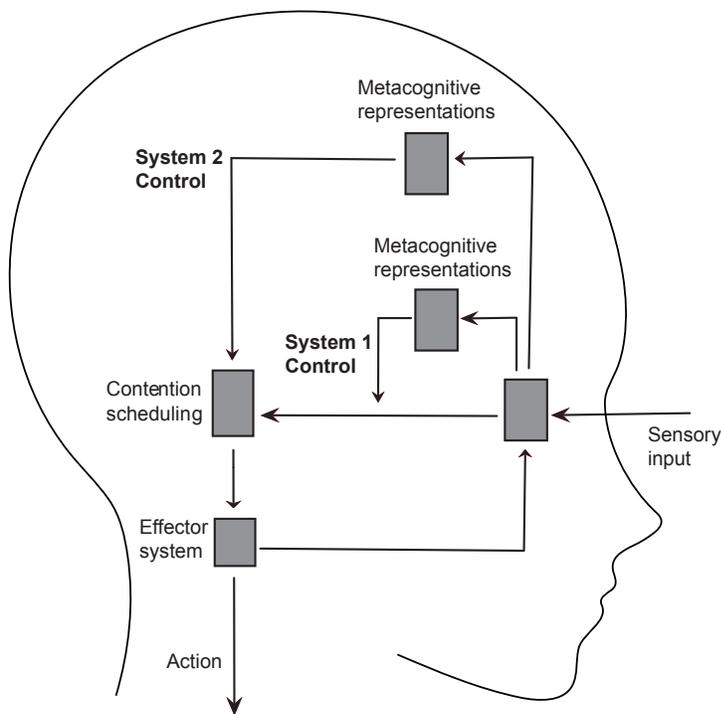


Figure 1 (adapted from Shea et al. 2014). Self-regulation and self-control exerted via System 1 and System 2 metacognitive control processes. The ‘contention scheduling’ block is a mechanism for resolving competition between processes that have conflicting demands on action system requirements (Norman & Shallice 1986; cf. Shea et al. 2014). System 1 control occurs automatically and unconsciously, for example estimation of the reliability of sensory signals that automatically gives greater influence to some perceptual inputs over others (Shea et al. 2014). System 2 control is conscious, slower, and capacity-limited. It relies on metacognitive representations derived from information in System 1, but in a form that is available for verbal report and readily influenced by instruction and cultural beliefs.

However, if people consciously and unconsciously meta-represent themselves and their environment relative to their goals, the central puzzle for self-control theories is that we routinely fail to regulate our behaviour in accordance with consciously held standards. In other words, there seems to be restrictions on the cognitive control exerted by System 2 processes. The empirical studies of such limitations of self-control have tended to explore four main categories (cf. Baumeister & Exline 2000): First, impulse control, which concerns resisting temptation and refraining from acting on undesirable impulses, such as impulses for sexual acts, violence or aggression, eating unhealthy food, etc. (Baumeister & Exline 2000). Second, exerting control over one's thought processes, such as concentrating and reasoning (Baumeister & Newman 1994) or suppressing unwanted thoughts (Wegner et al. 1987). Third, emotional regulation, which involves efforts to alter one's emotional and mood states (Baumeister et al. 1998). Fourth, controlling performance processes, such as persisting on an uncomfortable task to achieve optimal performance (Baumeister & Exline 2000). The most important empirical observation across domains of self-control is that people's ability to successfully regulate their behaviour and suppress immediate impulses and distracting stimuli declines over time when exerted continuously. How can this be explained?

4.2. The Strength Model

One of the most influential explanations of the self-control experiments has become known as the 'strength' model of self-control (e.g. Baumeister et al. 1994; Baumeister et al. 2007). The core assumption of this model is that acts of self-control, no matter the domain, draw from a limited "reservoir" of cognitive resources. Consequently, self-control begins to fail as these resources are depleted (Muraven & Baumeister 2000). The main observation supporting this idea is that experimental participants who complete two consecutive tasks requiring self-control tend

to perform worse in the second task than control participants for whom the first task does not require self-control. For example, in one of the early papers introducing the strength model, Baumeister and colleagues (1998) found in a series of experiments that participants assigned to eat radishes in the face of tempting chocolates subsequently quit faster on an unsolvable puzzle than did participants who were allowed to eat the chocolates; participants who had to make a personal choice about which of two speeches to record subsequently quit faster on an unsolvable puzzle than did participants who did not have to make a choice; participants who suppressed emotional reactions to a funny video clip subsequently performed worse in an anagram-solving task than participants who did not have to suppress their emotional responses; and participants who had to concentrate on crossing out letters in a paragraph of text when multiple rules were met, were subsequently slower to make an active choice of stopping a boring movie than were participants who did an easy version of the letter-crossing task. This effect, “a temporary reduction in the self’s capacity or willingness to engage in volitional action (including controlling the environment, controlling the self, making choices, and initiating action) caused by prior exercise of volition” (Baumeister et al. 1998, p.1253), has become known as ‘ego depletion’ (Baumeister et al. 1998). To date, more than 200 experiments have been published inspired by the strength model of self-control (Carter et al. 2015). The first published meta-analysis of 198 published experiments concluded that the depletion effect is consistent across experimental contexts, and of medium-to-large magnitude ($d = 0.62$, Hagger et al. 2010; Carter et al. 2015 reaches a different conclusion as will be discussed in section 4.3.).

The idea that self-control is analogous to muscle strength also led researchers to suggest that self-control might improve with repeated exercise (see Baumeister et al. 2006 for a review). This would imply that regular exertion of self-control in one domain should improve self-control in

general. Some studies have found support for this idea, finding for instance that practicing self-control by avoiding sweets or holding a handgrip before trying to quit smoking make attempts at quitting smoking more successful (Muraven 2010a; Muraven 2010b). Similarly, giving students a strict exam study schedule makes them more likely to avoid junk food and stick with their exercise routines during the exam period (Oaten & Cheng 2006).

Surprisingly few efforts have been devoted to investigating what actual resource would underlie acts of self-control. An often cited suggestion, however, is that glucose is the physical substrate. For example, Gailliot et al. (2007) found that acts of self-control reduced blood glucose levels, that blood glucose levels after engaging in a self-control task predicted performance in a subsequent self-control task, and that consuming a glucose drink prevented ego depletion effects in cognitive tasks (Gailliot et al. 2007; Gailliot et al. 2009; cf. Wagner & Heatherton 2011). The suggestion by these researchers is that ego-depletion effects occur because effortful tasks temporarily reduce brain glucose stores in relevant areas (Heatherton & Wagner 2011).

4.3. The trouble with the strength model

However influential the strength model has been, empirical findings and theoretical arguments have mounted that it is in need of a major revision (Carter et al. 2015; Kurzban et al. 2013; Inzlicht et al. 2014). On the empirical side, numerous studies have found moderators of the ego depletion effect that seem hard for the strength model to account for. For example, studies have found that depletion effects disappear if participants are sufficiently motivated to work on a task (e.g. Muraven & Slessareva 2003), and interventions such as allowing participants to smoke cigarettes (Heckman et al. 2012), watch a favourite TV show (Derrick 2013), or even pray

(Friese et al. 2014) have been shown to counteract depletion effects. Other studies have found that ego depletion effects are moderated by subjects' beliefs about the nature of self-control: Martijn et al. (2002) found that subjects who engaged in an emotional suppression task, but were told that the limited resource model of self-control was false, showed *increased* performance on a subsequent hand-grip task. And Job et al. (2010) found that individual differences in beliefs about willpower moderated ego-depletion effects, with no ego-depletion present among participants who did not view self-control as limited. The meta-analysis by Hagger et al. (2010) included three studies with 10 independent tests of the effect of motivational strategies on performance in sequential-task experiments. The meta-analysis found a large effect size of the interaction between depletion effects and motivation, $d = 1.05$.

The research on glucose, the only avenue so far to directly explore the putative self-control resource, has also been called into question. Studies attempting to replicate the finding by Gailliot et al. (2007) that self-control exertion lowers blood glucose, have varied in success (Lange & Eggert 2014; Kurzban 2010). One study, which assessed carbohydrate metabolism with highly precise measurements of blood glucose levels under carefully standardised conditions, found that acts of self-control did not lead to lower blood glucose levels (Molden et al. 2012).

New research suggests that the depletion effect itself is, at the very least, less robust than assumed. A recent study tested the ego depletion effect in community and student samples using methods well-established in the literature but failed to find any evidence of the depletion effect (Xu et al. 2014). A new meta-analysis of the depletion effect (Carter et al. 2015) relied on more stringent inclusion criteria than the meta-analysis by Hagger et al. (2010), included both published and unpublished findings, and used novel statistical procedures to correct for

publication bias. This analysis found evidence of small-study effects (in which studies with larger samples find smaller effect sizes than studies with smaller samples), which may indicate publication bias where studies are unlikely to be published if they fail to find positive results (Egger et al. 1997). After accounting for small-study effects, the meta-analysis found only scant evidence for the depletion effect being different from 0, and concluded that ego depletion might not be a real phenomenon (Carter et al. 2015; see Inzlicht et al. 2015 for a critical response).

Theoretically, the strength model has been criticised for being vague and open to multiple interpretations (Kurzban et al. 2013). The most straightforward interpretation, namely that depletion of a self-control resource sets a hard cap on self-control, seems refuted by the evidence on interventions that counteract depletion effects. An alternative interpretation is that interventions such as experiencing positive affect in between two self-control tasks (Tice et al. 2007) causally create more of the cognitive resources. This interpretation, however, is hard to reconcile with the idea of a physical resource underlying ego depletion (Kurzban et al. 2013). Yet another interpretation, favoured by Baumeister and colleagues, is that ego depletion effects reflect a “partly depleted resource, rather than full incapacity because the resource is completely gone” (Baumeister & Vohs 2007, p.11). The implication of this interpretation is that no data should be directly explained by depletion of cognitive resources, but rather by the amount left over of this resource in conjunction with motivational strength, which jointly determine self-control performance (Kurzban et al. 2013). A lingering problem with this interpretation is that it makes the model border on non-falsifiability in absence of tools to measure motivation and the putative resource directly.

In addition to being vague, the strength model has been criticised for being functionally implausible. In humans, the increased behavioural flexibility gained from suppression of

dominant responses should have been favoured by natural selection (Beedie & Lane 2012). At the same time, there are advantages to setting limits on the extent to which we can suppress basic tendencies, such as those set by a limited self-control resource – being able to override all basic instincts needed for survival would not be a good strategy (Cohen et al. 2007). But it would make little sense for such limits to be based on hard resource constraints as opposed to adjusted motivational priorities (Inzlicht et al. 2014).

4.4. Motivational-computational models

The main alternative to the strength model is pure motivational accounts. According to these, the shortfalls of self-control are caused solely by changing motivational priorities over time rather than by depletion of a limited resource (cf. Hagger et al. 2010). Two recent complementary attempts at explaining the findings of the self-control literature in such terms come from Kurzban et al. (2013) and Inzlicht (2014).

4.4.1. Self-control and opportunity costs: Kurzban et al. (2013)

Kurzban and colleagues (2013) suggest that the decline in performance over time in self-control tasks, and the concurrent subjective feelings of mental effort, should be explained by shifting cost-benefit analyses of task value. Their theory relies on the following reasoning: First, certain mental abilities, such as working memory and attention, have limited capacity (cf. Miller & Cohen 2001) and face simultaneity constraints in that “not everything can be done at once” (Kurzban et al. 2013, p.664). Therefore, their use has ‘opportunity costs’, which is to say that if I have the option of performing task A or task B, then the cost of using my limited mental abilities to perform task A is equal to the value of the foregone task B. Second, the solution to simultaneity constraints is prioritization, which involves assessing costs and benefits of available

tasks, and then performing the task that is more valuable. Third, subjective feelings of boredom or mental effort are evolved states for prioritisation. That is, they should be understood as “the felt or experienced output of motivational systems, directing behavior toward net positive fitness outcomes and away from net negative fitness outcomes” (Kurzban et al. 2013, p. 665). Thus, these subjective feelings function to motivate reallocation of mental resources to behaviours with higher payoff.

This model suggests that the decline of self-control over time is not due to a reservoir of limited resources running out. Rather, the opportunity costs of continued engagement in typical self-control tasks increase over time, which in turn motivates disengagement, causing decreased performance and increased subjective fatigue. This implies that the effects of interventions that moderate the depletion effect should be explained by how they alter the perceived opportunity costs of continued self-control exertion. A recent PhD thesis followed up on the Kurzban et al. model and assessed how changing value factors impact subjective boredom in tedious and repetitive tasks: the thesis found that increasing task difficulty, increasing wage rates, adding task feedback, or adding social monitoring and approval all reduced ratings of subjective boredom after the task, providing initial support for Kurzban et al.’s model (Markey 2014).

4.4.2. Self-control and balancing ‘want-to’ and ‘have-to’ goals: Inzlicht (2014)

A question the Kurzban et al. (2013) model does not address is why exerting self-control in typical laboratory tasks should be perceived as less valuable over time in the first place. A new motivational formulation of self-control by Michael Inzlicht (2014) has an explanation. According to Inzlicht, the ultimate explanation for ego depletion effects comes from selection pressures for balancing exploitation and exploration. That is, to survive and reproduce successfully, animals need to find an optimal trade-off between the benefits of exploiting

established sources of reward and the benefits of exploring the environment for new opportunities. For example, foraging animals need to decide between continuing to harvest a known source of food and surveying their surroundings for other stores of food (Kurzban et al. 2013). At a proximate level, an animal's control systems must therefore regulate the extent to which it favours task engagement (exploitation) versus task disengagement and sampling of other opportunities (exploration; Inzlicht et al. 2014; cf. Charnov 1976). In humans, Inzlicht suggests, this translates into a proximate desire for balance between externally rewarded labour and inherently rewarding leisure (Kool & Botvinick 2014), or between 'have-to' and 'want-to' goals. Ego depletion effects therefore reflect the adaptive design of a system in which continued self-control on extrinsically rewarding 'have-to' tasks over time leads to up-regulation of motivation for intrinsically rewarding 'want-to' tasks (Inzlicht 2014). This model is supported by preliminary evidence finding that 'depleted' experimental participants have more lapses of attention on externally mandated tasks (Inzlicht & Gutsell 2007) but conversely have amplified attention and emotions related to intrinsically gratifying 'want-to' goals, such as food (Schmeichel et al. 2010). If this model is correct, it offers an explanation to why (in the terminology of Kurzban et al.) opportunity costs should become higher over time in self-control tasks, with ego depletion effects to follow.

4.4.3. Main motivational factors: Temporal Motivation Theory (TMT)

A shortcoming of both Kurzban et al. (2013)'s and Inzlicht (2014)'s models is that they are formulated at a high level of abstraction and do not specify how different motivational factors such as task value and timing of task outcomes feed in to the cost-benefit computation that affect self-control. Unfortunately, though decades of research on self-determination theory have yielded valuable insight into categories of intrinsic and extrinsic motivation (Ryan & Deci 2000),

there is as of yet no clear integrated understanding of how different motivational factors relate to self-control (Steel & König 2006). However, one useful mid-level framework comes from procrastination research.

Procrastination has been defined as “to voluntarily delay an intended course of action despite expecting to be worse off for the delay” (Steel 2007), and is almost a paradigmatic case for studying self-control (Reynolds et al. 2006). Based on decades of empirical studies and theorising in piceconomics (Ainslie 1992), expectancy theory (e.g. Vroom 1964), cumulative prospect theory (Tversky & Kahneman 1992) and need theory (e.g. Dollar & Miller 1950), Steel & König (2006) developed *temporal motivational theory* (TMT) as an integrative theory of human motivation, and applied it to findings in procrastination research. The simplest formulation of TMT is as follows (adapted from Steel 2007):

$$Utility = \frac{V \times E}{D \times I}$$

TMT has five core features: value (V), expectancy (E), time or delay (D), sensitivity to delay (signified here with I for ‘impulsivity’), and different utility curves for losses versus gains (cf. Tversky & Kahneman’s prospect theory; Tversky & Kahneman 1992; Kahneman & Tversky 1979). Value (V) represents how much satisfaction (in economic theories) or drive reduction (in need theories) the outcome(s) of an action is perceived to realise. Expectancy (E) represents the perceived probability that the outcome(s) will occur. The time or delay (D) element represent how close in time the outcome(s) is – the closer in time a possible outcome is, the greater influence it will have on behaviour. The delay is in turn weighted by the person’s sensitivity to delay (I), which is equivalent to impulsivity (Monterosso & Ainslie 1999) – a stable personality trait yet changeable by e.g. alcohol consumption (Steele & Josephs 1990) or drug use (Giordano et al. 2002; cf. Steel & König 2006). Finally, value and expectancy are calculated slightly

differently for gains and losses (not depicted in the equation above for simplicity)⁴, following Kahneman & Tversky's research on how utility curves differ depending on whether an outcome(s) is framed as a gain or a loss (Tversky & Kahneman 1981).

Steel & König (2006) illustrate the model with an example of procrastination on an academic paper. Imagine three college students, Betty, Anne and Colin, who have been assigned an essay on September 15th, which is due on December 15th. The students can choose to socialise or to work on the essay. They all like to socialise, but hate to write. However, they also like getting good grades, and not being overly stressed. There are some individual differences – Betty finds good grades somewhat less important than Anne and Colin (lower V for getting good grades on the paper, in the TMT equation), and has a lower sense of self-efficacy (lowering E for good grades). Colin desires good grades more than Anne, but is also the most impulsive. From these factors, hypothetical utility curves of the value of socializing vs. studying can be drawn, as depicted in Figure 2:

⁴ The full formulation of the TMT model is as follows: $Utility = \sum_{i=1}^k \frac{V_{CPT}^+ \times E_{CPT}^+}{Z+1 \times (T-t)} + \sum_{i=k+1}^n \frac{V_{CPT}^- \times E_{CPT}^-}{Z+1 \times (T-t)}$ (adapted from Steel & König 2006). This more complex formulation spells out details that remains implicit in the simple formulation. Thus, the complex formulation shows a) separate calculations for outcomes perceived as gains and losses (the separate terms on either side of the plus sign), b) summation signs in front of each term, because multiple outcomes (and hence multiple gains and losses) may be considered for a given act, c) an indication of delay as “ $T-t$ ”, i.e. as “time reward” minus “time now”, d) a constant Z which is included to prevent the equation from rocketing towards infinity for situations where delay is effectively zero (Steel & König 2006).

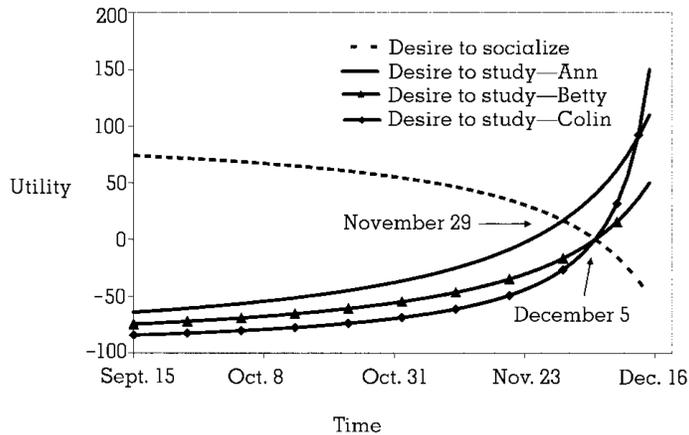


Figure 2 (adapted from Steel & König 2006). Illustration of the TMT model using hypothetical utility curves for three students deciding whether to write a term paper or socialise. The paper is assigned on September 15th and is due on December 15th – as the deadline approaches, the perceived costs and benefits change, with writing becoming increasingly more likely.

Early in the semester, the positive consequences of socialising are immediate while socialising's negative consequences for writing productivity are temporally distant. This gives socialising a high utility evaluation. The opposite is the case for writing, which gives writing low utility. As the students get closer to the essay deadline, the positive component of socialising remains immediate, but its negative impact on writing comes closer, diminishing socialising's overall utility. For writing, the negative component remains present, but its positive consequences become more imminent, increasing writing's overall utility. Work on the essay therefore becomes increasingly more appealing as the deadline approaches. Note the differences between when this is expected to occur due to personality differences between the three.

This framework may fruitfully be combined with Kurzban et al. (2013) and Inzlicht (2014), as it provides an integration of major motivational factors that influence calculation of opportunity costs.

4.5. Discussion and integration

4.5.1. Discussion

At the present state of the evidence, the strength model seems increasingly misleading. Thus, the strength model's most straightforward interpretation – a hard limit on self-control set

by amount leftover of the limited ‘cognitive resource’ – seems implausible since a range of interventions modify depletion effects and since the proposal of glucose as physical substrate has not held up to scrutiny. Motivational accounts seem the better place to start. However, a cautionary note should be made about Kurzban et al. and Inzlicht’s evolutionarily inspired critiques of the strength model: The same phenomenon can be given a range of explanations that belong to logically separate levels of analysis. Ethologist Niko Tinbergen suggested a taxonomy of four levels of explanation which in the literature has come to be simplified to just two, namely proximate (‘how’) and ultimate (‘why’) explanations (Tinbergen 1963; Scott-Phillips et al. 2011). Proximate explanations refer to mechanistic explanations of behaviour, whereas ultimate explanations refer to the evolutionary selective pressures that have shaped a certain type of behaviour. For example, a proximate explanation for why babies cry could involve describing the structure of tear glands, whereas ultimate explanations could involve the benefits to survival and reproduction of being able to notify caregivers by crying. The point is to be careful about whether different explanations are in competition or whether they belong to different levels of explanation. In our case, Inzlicht (2014) suggests that the explanation for changes in performance over time in cognitive tasks that require self-control is that foraging animals need to balance exploitation of current resources and exploration of new ones. This suggestion is not in itself an alternative to limited resource models. It could be an entirely correct ultimate explanation, but the limited resource model could still be a correct proximate explanation: the ultimate problem of balancing exploitation and exploration needs to be implemented by a proximate mechanism which could be a finite resource that runs dry to indicate that more exploration is due. Similarly, the suggestion by Kurzban et al. (2013) that ego depletion effects reflect a system designed to solve the adaptive challenge of prioritising the use of capacity-

limited cognitive abilities is not in itself an argument against the strength model: the proximate mechanism for keeping track of opportunity costs could still rely on a depletable resource. At the same time, of course, we should avoid the reverse fallacy, which is to assume that ultimate and proximate levels of explanation are irrelevant to each other (cf. Slingerland & Bulbulia 2012). As we saw, Inzlicht (2014) pointed out that limited resource models seem an inflexible and implausible proximate solution to the adaptive problem of balancing exploration and exploitation. This concern, in combination with the empirical evidence, lends credibility to motivational accounts.

On the other hand, purely motivational accounts are still in their infancy, and leave important questions about their relationship with specific behaviours and motivational factors unsettled. Therefore, a certain theoretical eclecticism is necessary at present to use purely motivational accounts in practice. The three different approaches to motivational models reviewed, Kurzban et al. (2013), Inzlicht (2014), and Steel & König (2006), brings complementary perspectives that can usefully be integrated.

4.5.2. Integration of the motivational models

To see how the perspectives of Kurzban et al. (2013), Inzlicht (2014), and Steel & König (2006) integrate, it is useful to consider them in relation to Steel & König's TMT model:

$$Utility = \frac{V \times E}{D \times I}$$

Steel & König's integrative framework suggests that we partition the influences on behaviour into the motivational factors value, expectancy, delay, and sensitivity to delay. Based on the weights of these factors, people follow the course of action that is perceived to have the greatest utility. The addition from Kurzban et al.'s theory of opportunity costs is to remind us that the

computation of utility takes place in a context where some actions exclude others. Our subjective experience of struggling with self-control indicates the perceived opportunity costs: If alternative behaviours are available with higher reward value than the one we currently pursue, the opportunity costs of the current behaviour will be high and the current action will feel effortful and/or boring to complete, motivating disengagement. The addition from Inzlicht's theory is to point out that an action's status as externally mandated ('have-to') or intrinsically motivated ('want-to'), can affect its value (V). If an action is externally mandated, and a person has already invested continuous effort in 'have-to' tasks, then the perceived value of continued engagement in the current behaviour will decrease. This predicts that moving an action's perceived status from 'have-to' to 'want-to' should make an action less vulnerable to performance decline over time.

The models are all formulated at a high level of abstraction and do not go into detail on the lower-level inputs which form their basis. Kurzban et al. (2013) is broadly framed in terms of opportunity costs of actions but leaves out the factors that feed in to the computation of value in the first instance. Inzlicht broadly suggests that opportunity costs change over time as we try to strike a balance between 'have-to' and 'want-to' goals, i.e. between engaging in extrinsically and intrinsically motivated tasks. TMT provides more detail by parsing the utility of actions into four factors, but what feeds into 'value', 'expectancy', 'delay', and 'sensitivity to delay' could in turn be broken down into more specific theories. For example, models of individual differences in trait or state impulsivity would shed light on the 'sensitivity to delay' dimension. Similarly, the TMT's four factors do not necessarily carve the mind at its joints – there could be multiple overlapping cognitive functions feeding in to more than one dimension. For the purposes of our general consideration of the relationship between religion and self-control, however, this level of

abstraction is a useful mid-level framework. Specific investigations into how motivational factors such as delay of expected outcomes influence self-control behaviour, and how they are affected by cultural elements, could benefit from engagement with more specialised theories.

Finally, according to this motivational perspective, the proximate reason for why people fail to act in line with their long-term goals or ideals is simply that the cognitive cost-benefit analysis did not favour doing so. In other words, people do whatever is computed as having the highest utility, even if it conflicts with consciously held long-term goals or social standards. Some readers might feel that this dismantles the notion of self-control altogether, reducing it to cold computation. What happened to the subjective experience of struggling to control ourselves? To reiterate Kurzban et al. (2013), the phenomenology of self-control conflict, e.g. of struggling to continue work on a boring task, is indeed ‘just’ the subjective experience of cognitive cost-benefit analyses. In terms of whether this explains away the struggles of self-control, my position is the following: Conscious states and brain states are identical – the exact brain state underlying a specific subjective experience cannot happen without the related conscious state also occurring (Hill & McLaughlin 1998; Papineau 1995; Papineau 2002). For example, if I consciously remind myself of something (e.g. imagining my ideal self) it may tip my behaviour in favour of making the ‘right’ choice (e.g. working out). This course of action would not have happened without this specific trajectory of subjective experience. However, this is the same as saying that this specific course of action would not have occurred without the specific trajectory of physical brain states that accompanied my conscious experience. Conscious experience is not irrelevant, but it is continuous product of and contributor to the operations of a biological computational machine, not an independent arbiter of it (Brogaard 2015).

4.6. Summary

Whereas *self-regulation* involves all regulation of behaviour relative to a desired state, *self-control* refers to self-regulation featuring deliberate, conscious suppression of prepotent responses. Self-control in this sense is a function of a capacity-limited cognitive system that monitors the state of the self and the environment relative to consciously accessible meta-cognitive representations. The central puzzle in self-control research is why people often fail to regulate their behaviour in accordance with their goals and standards. An intuitively appealing explanation is given by the strength model according to which we possess a limited reservoir of cognitive resources. These resources get depleted with continued use, which leads to increasing risk of self-control failure. The strength model has guided a vast range of research, including on religion and self-control, but is heavily criticised. New models consider lapses of self-control in purely motivational terms: We may well monitor ourselves relative to beliefs and social standards and have the capacity to exert top-down control accordingly, but whether or not we do so depend on mental cost-benefit analyses – is the value of the outcome, achieved by behaving in line with long-term goals or social standards, worth it compared to the pay-off of alternative behaviours? Four main motivational factors affect overall task utility: the perceived *value* of an outcome, perceived *likelihood* of the outcome, *how far away in time* the outcome is, and *individual sensitivity to delay*. How valuable an extrinsically motivated outcome is perceived to be is affected by a person's current balance between engagement in externally and intrinsically motivated tasks, which people try to balance. Our subjective experience of struggles with self-control and how some tasks feel more effortful and/or boring than others to persist on, is our conscious experience of mental computation of the costs and benefits of various courses of action.

5. Perspectives and Implications

5.1. Religion and motivational theories of self-control

Let us revisit the relationship between religion and self-control in light of the evidence and theories reviewed. As we have seen, self-control relates to conscious and deliberate suppression of conflicting impulses in order to behave in line with long-term goals or social standards. The observations that religion involves ‘costly’ acts such as engagement in time-consuming or uncomfortable rituals and behavioural taboos, that religion is closely linked with morality, and that religious traditions put an emphasis on exercising self-control in the face of temptation suggest that religion and self-control are intimately related. And indeed, a number of authors have proposed that religion systematically influences and improves self-control (Geyer & Baumeister 2005; McCullough & Willoughby 2009; Koole et al. 2010; McCullough & Carter 2011; Rounding et al. 2012). The elements of religion that have been highlighted as relevant to self-control include goals and standards (e.g. moral teachings, rituals that transmit teachings to religious adherents), systematic tools to monitor behaviour relative to standards (e.g. rituals that encourage personal and public monitoring such as prayer and confession, beliefs about monitoring supernatural beings), and tools to minimise discrepancy between the self’s situation and social standards (e.g. changing the environment to avoid temptation, norm-enforcing religious communities that trigger emotions such as guilt and pride, Geyer & Baumeister 2005; McCullough & Willoughby 2009). Some scholars have followed the strength model and argued that religion by facilitating repeated self-control exertion would increase general self-control by creating a stronger self-control “muscle” (Geyer & Baumeister 2005; Desmond et al. 2013), and that reminders of religion may ‘replenish’ self-control resources (Rounding et al. 2012). Our review of current work on the nature of self-control, however, suggests that a better route

forward is to consider religion in relation to purely motivational models, and classify aspects of religious beliefs and practices in relation to the motivational factors they influence. Main motivational factors include the perceived value/reward of an action's outcome(s), the likelihood with which the outcome(s) is perceived to occur, and the delay before reward or punishment occurs (weighted by the individual's sensitivity to delay). People seek to balance engagement in extrinsically and intrinsically rewarded tasks, so if an action is perceived to be only extrinsically rewarding, its value will decline over time with continuous engagement. Adjusting motivational factors in turn changes behaviour and the conscious experience of self-control – subjective experience reflects cost-benefit analyses of behavioural options, with greater perceived self-control caused by higher perceived opportunity costs of an action.

To avoid confusion when considering the relationship between religion and self-control, it is important to distinguish two questions: The first question is how religion affects the way people perceive *specific* acts. For example, how religious adherence affects the cognitive evaluation of completing five daily prayers or living in celibacy. This question considers specific actions first, and asks about the extent to which people differing in religiosity perceive those actions as requiring effortful self-control. The second question is whether religion affects the general ability to handle situations where behaving in line with long-term goals or social standards requires conflicting impulses to be overridden. That is, whether religion is able to improve self-control in general independently of what the actions are. The former question of how individual costly acts are perceived (irrespective of general self-control ability) is what concerns the literature on religion as costly signalling (e.g. Sosis 2004; Sosis 2003). The latter question of general self-control ability has been the focus of most correlational and experimental work on religion and self-control. Let us consider each of the questions in turn, starting with general self-control.

5.2. Religion and general self-control

In our review of the correlational findings, we observed two things. First, most available studies find a positive correlation between scores on religiosity and on measures of self-control. There are interpretational difficulties, but the experimental evidence supported a causal role of religion. Second, the correlation between religiosity and general scores on self-control measures is qualified by an interaction with religious orientation: only scores on intrinsic religious orientation correlate positively with self-control measures – the relationship may even be negative for extrinsic religious orientation. More research is needed to substantiate these links, but if a causal relationship between common features of religion and general self-control ability is genuine, which explanatory routes would we give from the motivational approach to self-control?

In the first instance, the motivational account may seem to exclude general improvements of self-control, as it focuses on computation of utility of individual actions with no role for general self-control ‘strength’. However, some beliefs or practices may have a sufficiently broad influence to increase self-control in general. For example, if a religious tradition puts value in itself on always acting in accordance with one’s long-term goals, irrespective of the specific domain, the net effect could be to increase the perceived value of any action aligned with long-term goals in situations of conflict between short-term temptations and long-term goals or social standards. Correspondingly, religious primes in an experimental context might increase general self-control ability not by ‘replenishing self-control resources’, but by reminding the experimental participant that suppressing conflicting impulses is valuable in itself. An alternative route would be to generally increase the expected likelihood of success for behaviour aligned with long-term goals, which would increase such behaviours’ overall utility. For example, if a religious tradition preaches belief in free will, this might increase adherents’ confidence in their

ability to suppress conflicting impulses (Baumeister, Bauer, et al. 2010), perhaps similar to studies where induction of disbelief in free will makes people more willing to cheat (Vohs & Schooler 2008) and increases aggressive behaviour (Baumeister et al. 2009). An increase in expectancy of successful self-control could also come about simply if religious commitment facilitates repeated success at suppressing impulses in the pursuit of long-term goals. To the strength model this would appear like practicing a ‘self-control muscle’ through religious affiliation, but should actually be explained by increased optimism in one’s ability to exercise self-control. Finally, it should be possible to bring about a general increase in self-control ability by generally reducing the perceived delay of the outcome of actions aligned with long-term goals or social standards. Such a reduced delay can be brought about through social monitoring: if others observe me as I struggle to stay on the path of virtue, their praise or condemnation can be immediate. Therefore, to the extent that religion leads to permanent supervision of one’s actions, we would expect this to be one route to improved self-control. This is one way to think about the supernatural watcher hypothesis (Shariff & Norenzayan 2007), as reminders of the presence of morally interested deities might reduce the perceived delay of disapproval of not behaving virtuously. Alternatively, in so far that religious involvement makes it intrinsically rewarding to behave in line with one’s long-term goals and social standards, this would similarly reduce the delay: a personal feeling of pride or guilt may then follow immediately after success or failure in aligning one’s behaviour with long-term goals or social standards.

This brings us to the observation that only intrinsic religious orientation is systematically correlated with scores on measures of self-control. To recap the distinction, Allport & Ross (1967) created a typology in which an ‘extrinsic’ religious orientation refers to people who use religion for their own ends – i.e. who are religious because it provides them security, sociability,

status and self-justification, and who holds their creed more lightly. People with an intrinsic orientation, by contrast, find their master motive in religion, and try to bring all other needs into harmony with religious beliefs and prescriptions (Allport & Ross 1967). Ryan et al. (1993) discuss the distinction in relation to self-determination theory (SDT; Ryan & Deci 2000) and suggest that the intrinsic orientation corresponds to an ‘identified’ religious internalisation, where people adopt religious beliefs as their own personal values, and perceive behaviour emanating from those beliefs as free choices. In contrast, an extrinsic orientation corresponds to an ‘introjected’ religious internalisation, in which behaviours associated with religious beliefs are more likely to be “performed because one “should” do them” (Ryan et al. 1993, p.587).

Consider the intrinsic/extrinsic religious orientation distinction in relation to the motivational routes discussed above through which religion would be able to increase general self-control ability. We might expect the relationship to be missing for the extrinsic religious orientation, because a more instrumental approach to religion makes people a) less likely to internalise a general value of behaving in line with long-term goals and social standards, b) less likely to develop a general expectancy of successful self-controlled action (this seems supported by Ryan et al. 1993, who report a negative correlation between self-esteem and extrinsic orientation), c) less likely to be continuously in the presence of moralistic audiences or hold sincere beliefs about supernatural watchers, and therefore not have a reduced perceived delay of the consequences of not exercising self-control. An additional explanation would come from Inzlicht (2014)’s suggestion that people desire a balance between engagement in externally mandated ‘have-to’ tasks and intrinsically rewarding ‘want-to’ tasks: Following Ryan et al. (1993)’s characterisation of the ‘introjected’ internalisation typical of extrinsic religious orientation, people with an extrinsic orientation may be less likely to perceive general

suppression of impulses in service of long-term goals as something that emanates from their own self, as ‘want-to’ behaviour. Therefore, attempts to exercise self-control among people with an extrinsic religious orientation should be more vulnerable to decline, for example by the end of a working day when people feel they have engaged in externally mandated ‘have-to’ tasks all day, as compared to people with an intrinsic religious orientation.

5.3. Self-control and ‘costly’ acts

As noted, many theories of religious behaviour start out with observations of ‘costly’ acts and ask which psychological processing enables the believer to perform them. From our review of theories of self-control, religious believers are able to continue investment in practices such as observing food taboos or spending time and energy on daily prayers not because of superior self-control as such, but because of how they perceive the relevant motivational factors. We can consider this in two parts. First, which settings of motivational factors enable the utility of ‘costly’ acts to be computed as sufficiently high for believers to “pay the costs of religious adherence” (Sosis 2009)? Here, we should analyse specific costly acts by considering how adherents and outsiders perceive the value of the outcomes, their likelihood, and the delay between actions and outcomes. Second, how is this subjectively experienced by the believer? On this, we would expect the subjective experience of self-control struggle to reflect the perceived opportunity costs of the focal actions in the context of other behavioural options.

Let us examine an example. Consider the five daily prayers prescribed by Islamic tradition. For simplicity, let us imagine a situation where a prayer is performed in solitude, ignoring from consideration rewards from a physically present social environment. In terms of reward value of the prayers, we would believe of extrinsic outcomes such as heavenly rewards for following the right path, to influence this factor positively. Reward value would also increase if prayer is

perceived as intrinsically rewarding. In terms of expectancy, the confidence in heavenly rewards should increase with religiosity. If prayer is intrinsically rewarding, intrinsic rewards will reliably occur if the practitioner performs the prayer correctly. In terms of delay, extrinsic rewards attributed to the afterlife should be subject to heavy temporal discounting, diminishing their contribution to overall utility. This discounting would be minimised by bringing the consequences into the present, e.g. if the practitioner experiences guilt if the prayer is not performed, or if it is believed that Allah is immediately monitoring the praying behaviour. If prayer is perceived to be intrinsically rewarding, this reward would occur without delay. Thus, the utility of prayer will increase, and the successful engagement in prayer be more likely, to the extent that practitioners hold genuine beliefs about extrinsic rewards and find prayer to be intrinsically rewarding, have confidence in the likelihood of these outcomes, and bring the outcomes into the present. In terms of the practitioner's subjective experience of whether the activity of prayer requires effortful self-control, this depends on which other options for behaviour are perceived to be available. The closer the utility of the second-best alternative option to the utility of prayer, the higher the perceived opportunity cost and the greater experienced self-control struggle. If other options are held constant, then, the experienced self-control struggle to pray should decrease with increased extrinsic and intrinsic rewards of prayer. If prayer is intrinsically rewarding, this would bolster the activity from fatigue after continued engagement in externally mandated tasks, e.g. prayer following a day of work. Importantly, however, if a believer has engaged in daily prayers for years, the behaviour may have become an engrained habit that relies more on automatic behaviour control, bypassing the processing of other options and leading to low perceived opportunity costs and little experienced self-control struggle (Cushman & Morris 2015; Dezfouli & Balleine 2013).

This application of motivational theories to costly acts is similar to Sosis (2003), who addresses the question of how religious believers are able to pay the short-term costs of ritual commitment in order to achieve the long-term benefits assumed by the costly signalling theory of religion (Irons 2001; Sosis & Alcorta 2003; Sosis 2004). Sosis (2003) suggests that costly practices through mechanisms of self-perception (Bem 1972) and cognitive dissonance (Festinger 1957; Harmon-Jones & Mills 1985) make their adherents internalise values and beliefs associated with their religious commitments. In turn, these values and beliefs make believers perceive the costs and benefits of religious commitment differently than skeptics: “the internal evaluation of opportunity costs will be higher for skeptics than for believers” (Sosis 2003, p. 103). Sosis’ approach is reminiscent of what I have presented here. However, Sosis (2003) lacks an explanatory model that addresses *how* changes in values and beliefs lead to changes in perceived opportunity costs. This is supplied by the present paper, where the models of self-control suggest the motivational factors through which religious values and beliefs influence the utility of behaviours. This adds much-needed proximate psychological detail to the proposed theories of religion’s ultimate benefits (Wilson 2002; Sosis & Bressler 2003).

5.4. Discussion and directions for future research

Let us end by revisiting caveats about the meaning of ‘religion’ and point out directions for future research.

We saw that the available correlational and empirical evidence give modest support to a general relationship between religion and self-control ability, and discussed how we might explain this in terms of motivational factors. However, in the definitions section (2.2.) I emphasised the heterogeneity of the concept of religion and suggested that any relationship to be discovered with self-control was likely to be complex and dependent on the specific element of

religion under consideration. If this seems contradictory, let me clarify: Any consistent relationship between ‘religion’ and measures of self-control does not indicate an effect of some religious essence, nor that all religions are similar. Rather, we expect from our motivational framework only that *in so far* religious systems put a general value on being able to suppress responses that conflict with long-term goals or social standards, *in so far* they increase people’s expectancy that they will be able to succeed, and *in so far* they bring the perceived outcomes of actions into the present (e.g. by means of imagined presence of supernatural watchers), religiosity should correlate with scores on generalised measures of self-control. This involves no claim that specific religious beliefs or practices will necessarily have those effects – rather, it raises our awareness to which factors to look for and what effects to predict on general self-control.

Similarly, we might consider whether any elements recurrent in religions affect self-control in ways unique to the religious domain. Thus, in discussions of religion and prosociality, scholars have explicitly pointed out that e.g. reminders of secular moral authority have similar effects on generous behaviour in economic games (Shariff & Norenzayan 2007), and that the cultural spread of secular norm-enforcing institutions such as courts and policing authorities have shaped the course of human prosociality no less than religious traditions (Norenzayan & Shariff 2008). To see if there is anything special about religion, we should first consider whether there is any specifically ‘religious’ cognition in the human brain that might have a special role in self-control. The consensus answer from the cognitive science of religion is a no – religious beliefs and practices are by-products of ordinary cognitive mechanisms, with no special circuitry ‘for’ religion (Boyer 2003). The question to ask, then, is whether there is anything special about the way in which what we define as religion tweaks the ordinary cognitive circuitry involved in self-

control. As we saw in the definitions section, for beliefs and practices to fall under the religious domain they need to have a connection to representations of supernatural beings. Is there anything special about the way beliefs about supernatural beings can tweak our ordinary self-control systems? Is there any principled difference between, say, the way sanctioned deadlines set by a business manager affect the ability of his employees to suppress conflicting impulses and get unpleasant work done, and a person suppressing sexual desire out of fear for God's judgment in the hereafter? The differences should lie in the properties that beliefs can have *only* by virtue of being 'supernatural' or 'counterintuitive' (Boyer & Ramble 2001). Compare a private business that deters theft by using reminders that CCTV is in action with a religious community deterring theft by reminding that God is watching you and may punish wrongdoings in the afterlife. Whereas supervision by CCTV is restricted to those places where it has been physically installed, supervision by God can be extended to anywhere for all time, unhindered by any human and technical limitations. To the best of my judgment, however, the boundary is blurry with no principled difference between supernatural concepts and other means (cp. Jong 2015). Scientific advances have led to tools and technologies that may be as psychologically counterintuitive as religious beings (and with near-similar surveillance powers). Therefore, the break of intuitive expectations by a certain class of traditional cultural representations ('religion') should not hold a permanently privileged position in relation to self-control.

Finally, some notes on future directions. As the research reviewed in the present paper would attest, the relationship between religion and self-control is a fruitful area of inquiry with psychological theories on self-regulation having good potential to inform our understanding of cognitive processes central to religious behaviour. However, research that explicitly takes self-control as its starting point to the study of religious phenomena is still sparse, with the current

state of the evidence more suggestive than conclusive of actual relationships. At present, the correlational and experimental research would benefit greatly from the following developments:

Most correlational research has found positive associations between measures of religiosity and self-control, but its reliance on self-report measures has an array of interpretational problems: We cannot from the current correlational research assess whether the positive correlations indicate better ability to exercise self-control in general, better self-control relative to only the respondent's specific daily tasks, or simply biased reporting where religious people are more likely to value self-control in the first place and overestimate their own ability. A big step forward for correlational studies would be to use objective measures of general self-control ability (e.g. a portable Stroop task) rather than self-report, to narrow the range of possible interpretations.

The experimental research has found positive effects of religion on self-control, but has relied on broad effects of 'religious priming' and largely ignored the detail of which specific elements of religious beliefs, values, or environments would make a difference, and the cognitive routes through which they would affect self-control. For example, Rounding et al. stated broadly that "If religion does function as a means of cultivating self-control, then even subtle reminders of religious concepts should result in higher levels of self-control." (2012, p. 635). Whereas the experimental work has yielded interesting findings, future research should focus on specific elements of religious beliefs and practices and derive predictions from a specific cognitive framework. For example, some specific predictions derived from the models reviewed in the present paper include the following: Kurzban et al. (2013) suggested that the subjective experience of self-control struggle reflects the perceived opportunity costs of continued task engagement. Therefore, if religious beliefs readjust the opportunity costs of religiously

sanctioned acts as Sosis (2003) suggests, then reminders of those beliefs could cause a decrease in subjective mental effort when completing religiously sanctioned acts. Inzlicht (2014) suggested that people desire balance between working on externally mandated 'have-to' tasks and personally motivated 'want-to' tasks. This has the prediction that the effect of some religious reminders on self-control tasks (e.g. on self-restraint in social situations) could be mediated by a greater sense of volition. Finally, Steel & König (2006)'s TMT model has simple associated predictions that can guide and organise research, by breaking the effects of religion on behaviour into its influence on a) the rewards assigned to focal acts (higher reward => higher utility), b) how likely the action is to succeed (increased expectancy of reward => higher utility), and c) the delay of rewards (lower delay to reward => higher utility).

6. Conclusion

From ritual piercings to food taboos, religion is ripe with behaviour that requires people to suppress their immediate impulses and follow the code of conduct prescribed by the group. It is therefore not surprising that many traditional and current theories of religion view religion as a sophisticated cultural control system serving to direct people's behaviour towards that which benefits the group. However, it is only recently that studies of religion have started to draw on work from cognitive psychology on the workings of self-control, that is, the ability to suppress conflicting impulses and behave in line with long-term goals or social standards. The purpose of the present dissertation has been to introduce current empirical evidence on the relationship between religion and self-control and the available psychological models to explain it. From our review of the relatively sparse correlational and experimental literature, there is modest support for the idea of a general relationship between recurrent elements of religion and self-control: Survey evidence indicates that religiosity irrespective of specific religion is associated with adherence to group-goals that involve self-restraint; cross-sectional evidence consistently finds positive associations between scores on measures of religiosity and on measures of self-control; and experimental studies have found religious priming to improve performance on self-control tasks. The correlational evidence, however, is limited by interpretational difficulties, not least due to reliance on self-report measures of self-control, and the experimental evidence is limited by reliance on methods with low external validity and lack of clear explanatory models. Some researchers have used the strength model of self-control to explain the findings, but this model struggles to explain the interventions that modify decline of self-control over time, and appears functionally implausible. My review of the current evidence and models of self-control in the psychological literature has favoured purely motivational models. Such models are still in their

infancy, but I have shown how ideas from Kurzban et al. (2013)'s opportunity cost model, Inzlicht (2014)'s model of self-control in relation to a need for balance between 'have-to' and 'want-to' goals, and Steel & König (2006)'s Temporal Motivational Theory can be beneficially integrated. Together, these models give a useful framework for thinking about the main motivational factors that religious beliefs and practices affect and how this is subjectively experienced as differences of ease at exercising self-control. My theoretical integration provides results similar to Sosis (2003) who presents a model assuming that differences in beliefs and values lead to differences in perceived utility and opportunity costs of religious commitment. However, Sosis (2003) lacks specification of which motivational factors that beliefs and values influence in the first place, and how this influences the subjective experience of self-control. This is provided by the models introduced in the present paper. At the current state of evidence, more empirical work is needed to solidify the findings on relationships between religion and self-control. Nevertheless, the current research has clearly demonstrated that the intersection of psychological models of self-control and religious behaviour is fertile ground with potential to elucidate central questions in the study of religion. Based on my review, I have presented recommendations for future research, where addition of objective measures of self-control to the correlational research and better use of clear, predictive cognitive models in the experimental research will bring clarity to this important field of research.

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