

# *Imag(in)ing the Buddhist Brain*

with Lorenza S. Colzato and Jonathan A. Silk, "Editorial Introduction"; Bernhard Hommel and Lorenza S. Colzato, "Religion as a Control Guide"; Florin Deleanu, "Agnostic Meditations on Buddhist Meditation"; Antonino Raffone et al., "Mindfulness and the Cognitive Neuroscience of Attention and Awareness"

## RELIGION AS A CONTROL GUIDE: ON THE IMPACT OF RELIGION ON COGNITION

by Bernhard Hommel and Lorenza S. Colzato

*Abstract.* Religions commonly are taken to provide general orientation in leading one's life. We develop here the idea that religions also may have a much more concrete guidance function in providing systematic decision biases in the face of cognitive-control dilemmas. In particular, we assume that the selective reward that religious belief systems provide for rule-conforming behavior induces systematic biases in cognitive-control parameters that are functional in producing the wanted behavior. These biases serve as default values under uncertainty and affect performance in any task that shares cognitive-control operations with the religiously motivated rule-conforming behavior the biases were originally developed for. Such biases therefore can be unraveled and objectified by means of rather simple tasks that are relatively well understood with regard to the cognitive mechanisms they draw on.

*Keywords:* attention; cognitive control; religious belief

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Religions have a major impact on our lives, be it because we are engaging in religious practices ourselves or because we are living in a cultural context that is either penetrated or (as in the case of secular societies) at least strongly influenced by religious traditions and history. From a psychological perspective, the relationship between religion and the individual raises many

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questions, such as why so many people are interested in having and sharing particular religious (or at least religiously inspired) beliefs, assumptions, and opinions, and how these beliefs, assumptions, and opinions affect one's general worldview and day-to-day decision making. Indeed, one of the most obvious psychological functions religions serve is that they provide guidance, with respect to general perspectives on life but also regarding important choices individuals are facing.

In this essay, however, we develop the probably less obvious idea that religions provide guidance (or biases) in tackling concrete cognitive-control dilemmas. This idea is not inconsistent with other possible functions, but it relates much more to procedural aspects of human cognition than to its content—the more obvious target of psychological consideration. We begin with some recent empirical observations from our lab, then develop a theoretical framework that explains these observations and relates them to an underlying cognitive mechanism. A better understanding of this mechanism and the logic of its workings, we argue, will provide us with a novel view on how religious systems affect human cognition.

#### PERCEIVING THE WORLD

Perceiving our world is an active process, a fact often overlooked in scientific analyses of human behavior. In such analyses, human cognition and action often are described as a chain of information-processing running from a given stimulus, and the many internal processes that are triggered by it, to decision making and the eventual execution of an action (Neisser 1967). Even though this view allows for myriad internal processing states and operations, the choice to start the theoretical analysis with the external stimulus has been taken over rather uncritically from behaviorism, where the stimulus carried the main burden in explaining behavior (Skinner 1938). However, our introspection does not fit with this stimulus-centered perspective at all. We do not have the impression that we are waiting for stimulus events to occur before getting in action or even beginning to think about action opportunities (Hommel 2009), and even perception is much more active than information-processing approaches suggest (Gibson 1979).

To emphasize the fact that we do not passively register the objects and events we encounter but actively explore and investigate them, proponents of the New Look perspective on human perception (for an overview, see Erdelyi 1974) suggest that our perception and attention reflect our moods, needs, expectations, and beliefs. Recent evidence that supports this approach comes from studies that focused on the impact of culture on human perception. For instance, persons growing up in the North American culture were demonstrated to be less sensitive to contextual cues and to show a more analytic cognitive style (that is, more attention to local features of objects and events) than persons growing up in an Asian culture (Masuda and Nisbett 2001). It seems that Westerners prefer attending to

salient objects while East Asians focus more on the relationship between focal objects and background elements (Nisbett and Masuda 2003; Nisbett and Miyamoto 2005). Moreover, East Asians allocate their attention more broadly than Americans do (Boduroglu, Shah, and Nisbett 2009).

If we define culture as a system of shared beliefs, values, rituals, and behaviors, the demonstration that culture affects perception raises the possibility that religions—which also can be defined as sets of systems of shared beliefs, values, rituals, and behaviors—affect perception as well. Indeed, this expectation was confirmed in a number of our recent studies. In one study, we investigated whether Dutch neo-Calvinists and Dutch atheists, brought up in the same country and culture, differ with respect to the way they attend to and process the global and local features of visual stimuli. In the Netherlands, Calvinism has been reformed into a postmodern version by former Dutch Prime Minister Abraham Kuypers (Bratt 1998). A hallmark of this neo-Calvinism is the concept of *sphere sovereignty*, which emphasizes that each sphere or sector of life has its own responsibilities and authority and stands equal to other spheres. This concept has penetrated Dutch culture and caused a considerable segregation of Dutch society. Applying the concept of everyday life has established the idea that, in a nutshell, everyone should mind his or her own business. In the Netherlands, this has led to a rather liberal policy regarding drug use, abortion, and euthanasia. In South Africa, to which the concept was exported by Dutch emigrants, it has provided the ideological basis for apartheid policy (Boesak 1984).

We speculated that shaping one's behavior to fit with the sphere-sovereignty concept would lead to an increased attentional focus on detail rather than context, as observed in the Westerners (as compared to East Asians) investigated in the study mentioned earlier (Masuda and Nisbett 2001). If so, neo-Calvinists should focus more on the local, rather than the global, aspects of perceived events than atheists do. We tested this by presenting participants with multilevel stimuli as shown in Figure 1. Such stimuli can be perceived in two ways, depending on the level one focuses on. What is a global rectangle can consist of local squares, and vice versa. Previous studies have shown that humans prefer attending to global shape(s) in general, as evident from faster responses to the global than the local shape of multilevel stimuli. We see the forest before the trees, so to speak (Navon 1977). However, the size of this global-precedence effect was significantly smaller in neo-Calvinists than it was in atheists matched for intelligence, age, education, and socioeconomic background (Colzato, van den Wildenberg, and Hommel 2008). In other words, both neo-Calvinists and atheists see the forest before the trees, but the former see the trees sooner.

Even though the participants in our experiments did not consider our stimuli as religious symbols, psychologically educated colleagues (in their functions as reviewers or audience at scientific meetings) have raised the

possibility that religious people may interpret geometric shapes as shown in Figure 1 as consisting of crosses—symbols with religious content. This is not impossible, but it is unlikely to account for our findings. Crosses emerge only from the global configuration of the stimuli and should thus attract attention to the global rather than to the local shape. This would suggest that Calvinists should show a larger, not smaller, global precedence than atheists. Moreover, as we shall see, additional investigations have revealed opposite effects in non-Calvinist Christians, who should be no less sensitive to crosslike stimulus aspects.

Further studies have ruled out that our initial observation reflects a mere difference between religious and nonreligious people. For instance, Lorenza Colzato and colleagues (forthcoming) compared Italian Roman Catholics with Italian seculars. Given that Roman Catholicism emphasizes social solidarity (John Paul II 1987) rather than the individualism suggested by neo-Calvinist theory, we thought that Catholics would show a larger global-precedence effect than seculars<sup>1</sup>—and this indeed was the case. The same was true for Orthodox Jews in Israel compared with nonbelieving Israelis, which, given the strong emphasis of Orthodox Judaism on social solidarity, fits with the comparable effect in Catholics. The different findings for Calvinists on the one hand and Catholics and Jews on the other are important because they show that religious people are not alike, as is suggested by the review of M. E. McCullough and B. L. B. Willoughby (2009). These authors looked into several studies that compared religious with nonreligious persons and concluded that being a member of a religious community makes one more likely to follow rules and less likely to commit crimes. Along these lines, one may consider that religious participants



**Fig. 1.** Example of hierarchical stimulus used by Colzato, van den Wildenberg, and Hommel (2008). The example shows a global rectangle made of local squares. Accordingly, participants should identify the stimulus as a rectangle under a global attentional instruction but as a square under a local attentional instruction. Other stimuli could show global rectangles made of local rectangles, global squares made of local squares, and global squares made of local rectangles. Global shapes commonly can be identified faster than local shapes, so reaction times are faster under global than under local instruction. The size of this global benefit is referred to as the global-precedence effect (Navon 1977). A large global-precedence effect thus indicates a relatively stronger advantage of global processing than a small precedence effect.

are just trying harder to follow the instructions to attend to local aspects of visual events in perception studies. If so, showing a smaller global-precedence effect may simply demonstrate that religious persons are doing better under difficult conditions, perhaps because they take instructions more seriously and/or are more used to following rules. However, this should apply to Catholics as well; they would be expected to also exhibit a smaller precedence effect. The fact that they actually show a larger effect thus confirms that the effect is specific for the particular religious background.

Further studies provided evidence that religious training has a gradual but long-lasting effect on perception. The global-precedence effect is smallest in very conservative neo-Calvinists, intermediate in liberal Calvinists, and largest in atheists (Colzato et al. forthcoming), suggesting that the perceptual bias is a more or less continuous function of the amount and strictness of the religious experience and/or training. Interestingly, baptized atheists (persons with a neo-Calvinistic education who left the religious community around puberty) showed a less pronounced global-precedence effect than unbaptized atheists. This shows that the perceptual bias does not need ongoing religious practice to be maintained but that it is ingrained through early religious experience.

#### CONTROL DILEMMAS

We have seen that religious practice seems to establish permanent attentional biases on perception and that the type of bias is related to the respective religious system. How is that possible, and how might that work? According to perceptual learning theory (Gibson 1979), experience can shape the way people process perceptual events, and it may well be that different religions shape these processes differently. This may be because a given religion emphasizes the importance of particular attentional states or biases, as in some Buddhist traditions (see Raffone et al. 2007), so that achieving these states and biases is essential for religious practice. It also may be because a given religion requires a particular behavior and/or the following of particular rules, which indirectly call for the development of specific biases. In Dutch neo-Calvinism, directing one's attention more to detail and away from the social context may be necessary, or at least functional for following and living the sphere-sovereignty principle. That is, Calvinists may acquire a local attentional bias because the behavior this generates is rewarded by their religious community. Along the same lines, Catholics may acquire a more global bias because the behavior this generates is rewarded by their religious community.

How can such biases be implemented in a cognitive system? As mentioned already, models of human behavior started out by reconstructing human action as a direct function of the stimuli people encounter. According to such models, adaptive behavior results from learning processes that rewire the associative chains from stimulus representations to action pro-

grams. However, increasing insight into the flexibility of human action—which shows that thousands of trials of stimulus-response association can be undone with a few words of instruction—has motivated the development of two-process models of behavior (see Baddeley and Hitch 1974; Logan and Gordon 2001). The general, not entirely novel (Ach 1935; Woodworth 1938), intuition is that stimulus-response associations (habits) compete with or are controlled by higher-level control processes (the will). As sketched in Figure 2, task-specific operations take care of basic perceptual and motor activities, whereas higher-level control operations parameterize these activities in such a way that the current goals can be reached. In other words, control parameters tailor cognitive processes to the task and goal at hand. How many control parameters exist and exactly how they achieve optimal control is not yet known. Interesting for our purposes, however, G. D. Logan and R. D. Gordon (2001) have distinguished between four parameters responsible for biases in attention and action, with one of them controlling whether visual attention is biased toward local or global aspects of an event.

Where do such control parameters come from? In experimental studies they may be provided or suggested by the instructions participants receive, but outside of the laboratory individuals must come up with control parameters by themselves. Some constraints for the choice of parameters may come from environmental conditions or the current task, which may render some parameter values more suitable than others. However, as pointed out by T. Goschke (2000), real-life situations often are so unpredictable that it may be impossible to identify optimal parameter values. People may face control dilemmas that make them vacillate between alternative parameter values. For instance, although persistence in sticking to the task at hand often is helpful in getting the job done, letting go if the goal turns out to be too ambitious is just as important. Fighting for one's interests may be a reasonable strategy under some circumstances, but sometimes flight makes more sense. Being fast is important when trying to save lives in general, but accuracy often is advisable for a surgeon. In real life, things

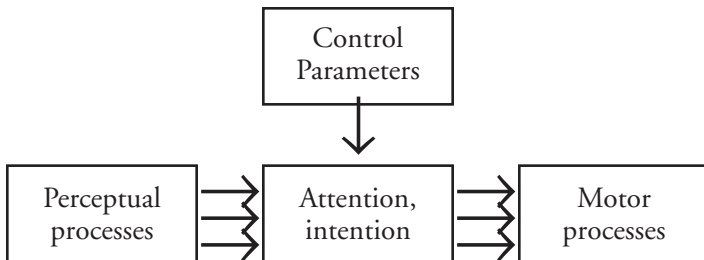


Fig. 2. Simplified version of Logan and Gordon's (2001) model architecture.

can be so difficult to predict that it seems impossible to define the optimal control parameter. This is likely to induce control uncertainty in individuals, who somehow have to deal with this uncertainty to configure their cognitive system.

As suggested by Colzato and colleagues (forthcoming), this is where default values for control parameters may come into play. In the absence of sufficient constraints for choosing one parameter value over another, individuals may fall back on standard or default values they have developed. Religious training is one way to develop these values. Neo-Calvinists learned to pick a more local parameter for controlling their attention than atheists, and Roman Catholics learned to pick a more global one. Religious systems may be functional in inducing particular control styles in their members, control styles that consist of systematic biases toward one or the other pole on control-parameter dimensions (persistent versus flexible; speed versus accuracy; fight versus flight). The default parameters responsible for these biases may be stored in long-term memory and reactivated whenever uncertainty arises about how to configure the cognitive system. Hence, the biases can be overcome in principle, but they do color the perception and behavior of believers.

#### RELIGION AS CONTROL BIAS

It is a truism that religion provides guidance, but our approach suggests that this is so in a more literal sense than commonly assumed. That is, religion may serve the purpose of providing individuals with particular control styles that bias the choices of control parameters under uncertainty. This is not the only purpose religions serve, of course, and it may not be the most important or obvious function. Yet the resulting biases do have a measurable impact on tasks that are unlikely to invite reasoning processes or the use of higher-level knowledge but tap into basic perceptual processes. This means that religion affects not just how we deal with and respond to particular events—which would hardly be surprising and would be almost defining of the membership in a religious community—but also how we perceive such events.

The same event thus may be interpreted in different ways by members of different religious communities, which may stand in the way of even the acknowledgment of what one considers to be basic facts. Therefore, we consider it essential to learn more about which other control parameters, if any, are affected by religious training and how. A. Miyake and colleagues (2000) have identified three more control functions that are responsible for the inhibition of unwanted actions, the maintenance and updating of working memory content, and the flexibility of shifting between thoughts or tasks. Especially with regard to the first, it is not far-fetched to consider the possibility that religious systems differ with respect to the degree to which they engage this control operation. But other factors are probably

no less important. There is increasing behavioral and neuroimaging evidence that Buddhist meditation practices enhancing “mindfulness” lead to systematic changes in control of attention (Raffone et al. 2007) that transfer to other, meditation-unrelated, tasks (Slagter et al. 2007). This practice propagates the free, unconstrained flow of perceptions and thoughts, which is likely to be related to the shifting factor considered by Miyake and colleagues. It is likely, therefore, that religious training affects human perception and attention beyond the processing of multilevel stimuli, which suggests that the available evidence is just the tip of the iceberg. More tasks would need to be studied, and more religious and other kinds of belief systems (such as political attitudes), to better understand the connection between training and permanent biases of control parameters.

An important implication of our approach is that different religions are assumed to affect different control parameters in different ways. This does not necessarily exclude the possibility that being a religious person as such has a general impact on cognition and behavior. Being a member of a religious community does reduce the likelihood of performing criminal acts, among other things (McCullough and Willoughby 2009). However, there is evidence that interindividual differences in cognitive-control abilities are not very sensitive to environmental conditions and learning. N. P. Friedman and colleagues (2008) carried out a behavioral genetics study to investigate the relative contributions of genetic endowment and environmental influences on control abilities. Genetics accounted for no less than 99 percent of the interindividual differences. This leaves very little room for religious training and other educational attempts to change control processes as such. At the same time, genetics do not determine how these control processes are used and parameterized, which is why we consider the parameterization process the main target of religious training.

To summarize, we assume that the selective reward that religious belief systems provide for rule-conforming behavior induces systematic biases in cognitive-control parameters that are functional in producing the wanted behavior. These biases serve as default values under uncertainty and affect performance in any task that shares cognitive-control operations with the religiously motivated rule-conforming behavior the biases were originally developed for. Such biases therefore can be unraveled and objectified by means of rather simple tasks that are relatively well understood with regard to the cognitive mechanisms they draw on. In other words, the cognitive effects of religion can be objectively diagnosed in principle.

## NOTES

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1. Note that our prediction presupposes that the official, published doctrine predicts and represents daily religious practice. Given the rather formalized and uniform education about and training of religious practices in mid-European Calvinists and South European Catholics,



this is a reasonable assumption regarding these particular groups. The link between doctrine and practice is much less pronounced in other religions, such as Buddhism, which may make concrete predictions more difficult.

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