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Religion and dual-process cognition: a continuum of styles or distinct types?

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Over the last two decades, various lines of research within cognitive science and social psychology have converged to create dual-process theory. The received view of this theory suggests two distinct cognitive processes: one is intuitive and the other reflective. But the defining features of these two types have been called into question by recent critiques. In response, new constraints have refined the distinctive features of each type, and distinguished between distinct types of processes and differing modes of the same type. This reformulation of dual-process theory bears upon the cognitive science of religion by reorganizing our understanding of religious cognition in relation to these two types of processes. Religious belief has been traditionally associated with type 1, intuitive, processes. This paper reviews the theoretical and empirical literature on dual-process theory and religion in order to suggest that while these basic intuitive processes may support religious beliefs, we must also expand our view to understand belief in relation to varying cognitive modes. These modes exist on a continuum, and are properly understood as type 2, reflective, processes. Thus they present a more nuanced and complex framework for understanding the relationship between varying types of religious belief and cognitive styles.

Keywords: analytical thought; cognitive styles; dual-process; intuitive thought; religious cognition

Introduction

As the discipline of cognitive science has sought to understand religious cognition over the past two decades, it has taken a variety of approaches. One approach has been to explore the way that religion may have arisen as a cultural byproduct of other, evolutionarily adaptive, cognitive mechanisms. An early example is Stewart Guthrie's (1995) argument that our tendency to over-attribute agency is part of the cognitive origins of religious belief. Since then, others have argued that our adaptive intuitions about other minds (Epley, Converse, Delbosc, Monteleone, & Cacioppo, 2009), immortality (Bering, 2006), teleology (Kelemen, 2004), and our propensity to believe minimally counter-intuitive ideas (Boyer, 1994) to name a few, all contribute to the cognitive foundations of religious belief.

Dual-process models, from the wider discipline of cognitive science, have provided a theoretical framework within which to situate these cognitive mechanisms. These models arose from a convergence of research suggesting two distinct types of cognitive processes. One type, often called intuitive, has been characterized as fast, automatic, associative, contextualized, and largely non-conscious. The other type, called reflective,

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is distinguished by being slower, abstract, rule-based, serial, and primarily conscious (Evans, 2010, p. 21). As the cognitive science of religion has employed dual-process models, it has predominately focused on the intuitive processes that have given rise to religious belief.

But the fertility, and resulting diversity, of dual-process theory has led to inconsistencies. For example, the dual-processes are varyingly described as implicit/explicit, intuitive/reflective, automatic/controlled, heuristic/analytic, non-conscious/conscious, and many more; but these features are then often grouped into two types (Evans & Stanovich, 2013, p. 227). But the traits do not align so neatly. Thought processes that are largely implicit are not necessarily intuitive, automatic, heuristic, and non-conscious as well. Critics have focused on this misalignment of features (see Keren & Schul, 2009). While any demand for clear alignment insists on too high a standard, it has nevertheless brought up important issues concerning the essential features of the dual processes.

These clustering problems carry over into the cognitive science of religion, leading to inconsistencies about how to characterize various aspects of religious cognition. The various criticisms mounted against dual-process theory have led Evans and Stanovich (2013), two prominent advocates of the theory, to suggest a more rigorous articulation of the model. They provide constraints to refine the characteristic attributes of the two types and prevent the clustering problem described above. Furthermore, they suggest a distinction between different *types* of cognition and a continuum of *modes* in which type 2 processes might be expressed. The next section will explore these suggestions in detail.

In this paper I argue that these new constraints also help reorganize and broaden our understanding of religious belief in relation to diverse cognitive process. By bringing the empirical work on belief and dual-process theory into dialogue with Evans and Stanovich's (2013) reformulation, I suggest that while religious belief may be supported by intuitive processes, it must also be understood in relationship to the varying modes of reflective processes. This reorganization is supported by existing evidence linking belief to cognitive style and opens new lines of research to explore the diverse styles of religiosity.

Dual-process theory

As mentioned above, type 1 processes, also traditionally called intuitive, have been characterized as fast with a high capacity for information. Other defining features of this type of cognitive process have been suggested as: parallel processing, non-conscious, biased, contextualized, automatic, associative, implicit, and evolutionarily older, to name a few (Evans, 2010). Type 2 processes, often called reflective, are generally contrasted with the characteristics of type 1. Where type 1 is fast and intuitive, type 2 processes are slow and deliberative. Various other characteristics include being: capacity limited, serial, conscious, normative responses, abstract, controlled, rule-based, explicit, and evolutionarily more recent (Evans, 2010).

Despite the apparent resonance between these two clusters of characteristics, the wide range and diversity of models make it misleading to speak about dual-process theory as a singular theory. The discussion is further complicated by critiques that have sought clarity in the ways that researchers evoke dual-process theory (e.g., Keren & Schul, 2009; Kruglanski & Gigerenzer, 2011). In response to these critiques, and as a means of reining in the theory, Evans and Stanovich (2013) have proposed a new formulation of the theory.

Their first point of clarification is to distinguish between processes and systems. Some theorists have used the word system to designate the two sets of properties (e.g., Kahneman, 2011), but this is a stronger claim than most theorists wish to make since it implies distinct neural or cognitive systems responsible for the differing characteristics. Instead of system, Evans and Stanovich (2013, p. 226) have encouraged the terms type 1 and type 2 processes since they "indicate qualitatively distinct forms of processing but allow that multiple cognitive or neural systems may underlie them." Indeed, stronger evidence would be necessary to imply the existence of distinct systems, so I follow their lead in my use of the terms type 1 and type 2.

Furthermore, they cull the wide range of attributes down to the primary characteristics of the two different types of processes. One feature is differences in working memory. Specifically, type 1 processes do not require working memory while type 2 processes do (Evans & Stanovich, 2013, p. 225). The other primary difference is that type 1 processes are largely autonomous while type 2 processes often require mental simulation (Evans & Stanovich, 2013, p. 225). The empirical evidence for differences centered upon these two features is the most solid. The typical clusters also have an empirical basis, but the evidence is more ambiguous and the traits can often blur or conflict (e.g., see Bargh, Chen, & Burrows, 1996 on issues surrounding automaticity, control, and non-consciousness). While the place of other features within dual-process theory will likely remain a point of debate and research, these constraints help to clarify the model and respond to the various critiques that arose from the profusion and confusion of characteristics.

But, for the discussion at hand, the most relevant distinction that Evans and Stanovich make handles the difference between cognitive styles and cognitive types:

> We also believe it is essential to avoid confusion between dual types and dual modes of thinking… Modes of processing are cognitive styles and are manifest within the domain of what we regard as Type 2 thinking. Unlike types, they typically represent two poles of a continuum of processing styles. (Evans & Stanovich, 2013, p. 226)

Evans and Stanovich are distinguishing *types* of mental processes from differing *modes* that exist on a continuum. Types (i.e. type 1 and type 2 as defined above) are distinct; there is no gradient between a process that does or does not require working memory. Modes, on the other hand, refer to different thinking dispositions that lay along a gradient and are often influenced by individual differences or culture.

For example, Buchtel and Norenzayan (2009) provide a strong argument for cultural differences in thinking styles. Contextualization, holistic associations, and nonverbal processing have been traditionally taken as characteristics of type 1 processes, but Buchtel and Norenzayan (2009) cite various studies that show that these modes of thinking are effortful and trained. In a series of studies, Norenzayan, Smith, Kim, and Nisbett (2002) found that Koreans were more sensitive to contextual cues and associations of features than European Americans, who were generally more sensitive to abstract rules that depend on single features.

This difference in sensitivity to context is also apparent in research on explanations for behavior. For example, Choi, Dalal, Kim-Prieto, and Park (2003) gave a sample of Koreans and European Americans a murder mystery along with 100 pieces of information that could be relevant to the murder. Participants were then asked to exclude the irrelevant clues. Europeans Americans tended to exclude 60% of the clues, nearly twice as many as Koreans, who only excluded around 30% (as cited in Buchtel & Norenzayan, 2009, p. 227). This increased attention to situation and context among East Asians has been

corroborated by various other studies (Choi, Nisbett, & Norenzayan, 1999; Masuda & Kitayama, 2004; Norenzayan, Choi, & Nisbett, 2002). Each of these studies supports the claim that it is an effortful and deliberate choice to attend to context or to decontextualize. In other words, both holistic and analytic styles of thinking are type 2 processes.

Buchtel and Norenzayan (2009, p. 222) summarize the relevance of these studies to dual-process theory: "If we take the 'culturally taught' aspect of System 2 definitions seriously, then holistic thinking may be a different cultural form of deliberate, System 2 thinking; contextualizing, but taught." Ignoring the carryover use of "system" instead of process, the cultural dependence of styles of thought undermines any direct association between holistic versus analytic tendencies and dual-process theories. Instead, type 2 processes may be holistic, analytic, or anywhere on the spectrum in between.

These cases are the type of examples that critics of dual-process theory brought forth. They are clear instances of the supposed clusters misaligning; how can a process be both holistic and deliberate? Evans and Stanovich's (2013) reformulation resolves this inconsistency by clarifying that modes of thought, in this case holistic/analytic, are not to be confused with types of processes. In other words, many of the pairs that had been clustered alongside type 1 and type 2 processes are actually polar ends of a spectrum of modes. How do we tell if a process is primarily a mode or a type? In the case above, both holistic and analytical modes share the more essential characteristic of deliberateness. Evans and Stanovich (2013) suggest that the defining features of types are working memory and mental simulation. They also suggest that if the characteristics exist on a continuum, then they are likely modes of thought, not types (p. 229).

I have dwelled on these distinctions because it is not entirely clear within the cognitive science of religion literature whether we are dealing with modes or types. Often researchers use the analytic/intuitive dichotomy as if it were describing distinct types (e.g., Aarnio & Lindeman, 2007; Gervais & Norenzayan, 2012). But, if the cross-cultural research cited above is any indication, then perhaps analytical and intuitive reasoning are best understood as differing modes instead of types. Before considering the empirical work that puts pressure on this question, it is worth reviewing the theoretical backdrop within which this work takes place. This backdrop partially explains the tendency to associate religious beliefs with type 1 processes.

Cognitive science of religion and dual-process theory

Oviedo (2013) recently provided a comprehensive review and critique of the various ways that theorists within the cognitive science of religion have engaged the dual-process model. This review focuses on the work of Pyysiäinen (2004), Whitehouse (2004), Slone (2004), Tremlin (2006), Barrett (2004), and McCauley (2011) among many others. The group varies in how explicitly they employ the dual-process model and in where they situate religious belief, but Oviedo argues for a more integrated view that holds religion as a combination of both types of cognition. Before exploring his conclusion, it is worth reviewing how these theorists engage dual-process models.

Whitehouse's (2004) distinction between "cognitive optimal" and "cognitive costly" religions roughly follows the contours of a dual-process model. Cognitively optimal modes of religiosity are presented as reliant on episodic memory and more intuitive representations – thus the label "optimal." This mode stands in contrast to doctrinal modes of religiosity that rely on semantic memory and more complex representations that depend on instruction and elaborate institutional organizations (as cited in Oviedo, 2013, p. 13). While Whitehouse does not explicitly engage dual-process theory, Oviedo argues

that these two modes of religiosity reflect traits suggested by a dual-process model of cognition: doctrinal religiosity, with its reliance on instruction and complex representations, roughly aligns with type 2 processes, while the cognitively optimal imagistic modes of religiosity are suggestive of intuitive type 1 processes (p. 13). Here we should not confuse Whitehouse's use of "mode" with the technical use given by Evans and Stanovich above.

Actual religious practitioners will often resort to both modes: "the 'doctrinal mode,' requiring more effort, can lean towards more imagistic modes, or to a 'cognitive optimum,' more comfortable to endure and transmit. This process has been designed as a form of 'cognitive decay'" (Oviedo, 2013, p. 13). While this hints at an interaction between the two modes of religiosity, Oviedo finds the framework of "decay," or "growth" one would assume, too limited to fully portray the complex interactions of religious cognition. It is worth noting that while Whitehouse employs a model roughly resembling dual-process theory, he also acknowledges how the two forms of religiosity can often blend into each other.

I will not repeat Oviedo's full review here, but this initial summary of religious forms will help guide us: "in most cases, the quoted works appeal to the naturalness of the non-conscious intuitive form and the less natural character of the consciously-based second [reflective] form" (Oviedo, 2013, p. 12). This assertion of the naturalness of religious cognition is exemplified by McCauley's (2011) work. Drawing from multiple advances in the cognitive science of religion, McCauley attempts to define the boundary between religion and science in terms of "naturalness." More specifically, he argues that popular religion is a "maturationally natural" tendency, requiring little environmental input, which arises from deeply engrained cognitive mechanisms such as theory of mind or the tendency to attribute agency (p. 37). This distinguishes religion from the more cognitively difficult enterprise of science, requiring significant training and reinforcement, which McCauley dubs "unnatural." McCauley's framework, which is admittedly more nuanced than this cursory summary, follows dual-process models by aligning maturationally natural processes with type 1 processes and unnatural forms of cognition as examples of type 2 cognition (p. 59).

The cleanest critique of this framework comes from Xygalatas (2013) who notes that McCauley compares popular, or non-formal, religion with institutional, highly formal, versions of science. This means that institutionalization, expertise, and complexity are all confounds for what McCauley seeks to argue is a cognitive difference between religion and science. As Xygalatas (2013, p. 163) argues, "organized religion and theology are just as complicated and hard to grasp as theoretical science." But rather than compare formal, costly, and institutionalized versions of religion with science, McCauley has chosen to focus on the non-formal versions of religion. This is a misleading oversight on McCauley's part as it fosters the assumption that religious cognition is primarily a type 1 process. Yet, as Oviedo's review found, McCauley's use of the dual-process model seems to be characteristic of most theorists.

Oviedo argues:

> the standard model of [the cognitive science of religion] has tried to explain in recent years a good deal of the proper mechanics of the intuitive religious mind, but it will fall short in truly representing how the religious mind works as long as it continues to dismiss the role and function played by the second, slower conscious dimension. (Oviedo, 2013, p. 20)

McCauley's bracketing of formal religious institutions is a prime example of this heavy focus on type 1 processing within the cognitive science of religion. This focus has deepened our understanding of certain intuitive and often non-conscious cognitive functions that likely undergird religious cognition. But, as Oviedo argues, this understanding needs to be brought into fuller integration with type 2 expressions of religious cognition.

Baumard and Boyer's (2013) recent article presents the clearest example of how this integration is typically proposed. They outline the various cognitive mechanisms that likely give rise to religious belief, including: threat detection (see Boyer & Lienard, 2006), the experience of synchrony (see Konvalinka et al., 2011), and moral intuitions (Baumard & Chevallier, 2012), among others. These vary from the normally cited type 1 mechanisms, such as hyperactive agency detection (Guthrie, 1995), theory of mind (Barrett, 2004), and minimal counterintuitiveness (Barrett, 2000), but the general framework is indicative of the broader understanding of religious belief within a dual-process model. As Baumard and Boyer (2013, p. 295) argue, "the specific perspective we adopt here, which bears some resemblance to the dual-process perspective, implies that religious beliefs are reflective and serve to justify, comment on, and explain prior intuitions."

While this article was not yet available for Oviedo's review, it still fits within the overall trends that he highlights; intuitive structures are given primary focus while reflective instances of religious reason are taken to build upon this foundation. Oviedo argues, and I would agree, that this trend has helpfully illuminated important aspects of religious cognition by exploring its potential evolutionary origins and explaining the cognitive defaults that make religious belief easy, or "natural" as McCauley might say. But, Oviedo (2013, p. 3) continues, this trend toward focusing on the type 1 aspects of religious cognition needs to be balanced by "a more integrative program, able to account for some neglected aspects of the religious mind and to build a more comprehensive image."

Oviedo sees developments from the psychology of reasoning, specifically work on heuristics, as a promising conversation partner for the current dual-process models of religion. Oviedo uses Gigerenzer and Gaissmaier's (2011) definition of heuristics as "ignoring information or variables that could render things too complex and harder to manage" (as cited in Oviedo, 2013, p. 23). The idea is to study how different forms of religiosity may lead people to develop different heuristics.

Oviedo's suggestion here raises important questions about the direction of causation. In most of the literature reviewed above, the common assumption is that intuitive processes give rise to religious belief. But Oviedo suggests that religious cognition can give rise to new heuristics. We will return to this question of directionality below, but it is worth noting that Oviedo's position has an empirical basis. Oviedo is not forcing an either/or decision; he is simply recognizing that just as the majority of theoretical work aligns religious cognition with intuitive processes, it also assumes the relationship to be one-directional. His suggestion to examine heuristics may be a promising direction for research, especially as a way to highlight the various errors to which religious thinking is prone, but it misses an avenue within cognitive science that is already available for integration.

I will advance Oviedo's review in two important ways: first, Oviedo, following the theorists he has reviewed, adopts a version of dual-process theory that Evans and Stanovich (2013) argued against above. He maintains the distinction between type 1 processes as intuitive, slow, and non-conscious, and type 2 processes as reflective,

conscious, slower, and more complex. I agree with Oviedo's overall argument that research should consider a more integrative spectrum of religious reasoning, but before attempting such integration, we should be precise about which dual-process model to use. Otherwise it remains unclear whether the integration should seek to describe the relationship between distinct cognitive types or explore a spectrum of cognitive styles. The distinction advanced by Evans and Stanovich (2013) helps map this terrain.

Secondly, Oviedo only cursorily treats the empirical evidence connecting religious cognition and cognitive processing styles. He mentions research by Shenhav, Rand, and Greene (2012), as well as Gervais and Norenzayan's (2012) work, but dismisses these findings as "unconvincing" given the low correlation coefficients (Oviedo, 2013, p. 16). Granted, the correlation coefficients rarely reach $r > 0.2$, but a robust body of research corroborates these two articles, making them increasingly significant.

In the next section, I will review this empirical research and examine how it continues to perpetuate an association between religious cognition and type 1 processes. I will finish by arguing that this research may be more appropriately integrated if we look at religious beliefs in relation to a continuum of cognitive modes, all of which are type 2 processes. This hypothesis extends Baumard and Boyer's (2013) model and echoes Oviedo's (2013) call for a more integrative approach to understanding religious cognition by providing a suggestion of how we might understand the differing forms of religiosity within a dual-process framework. More simply, it moves beyond the focus on type 1 mechanisms that have dominated cognitive science approaches to religion up until now.

The empirical work

Early attempts to study the correlation between religiosity and dual-process theory are exemplified by Aarnio and Lindeman's (2005, 2007) research on paranormal and religious beliefs among students in Finland. Their 2005 work surveyed 3141 students in 14 universities and six vocational schools across Finland about their acceptance of various paranormal beliefs and their preference for various thought styles. The results showed "that paranormal beliefs correlated negatively with analytical thinking, $r = -.14$, $p < .001$, and positively with intuitive thinking, $r = .34$, $p < .001$" (2005, p. 1231).

Aarnio and Lindeman interpret this correlation as a direct relationship between thinking styles and tendency toward paranormal belief. Higher preference for analytical thinking was shown among university students and, within the universities, among those majoring in medicine and psychology. These students also had the lowest levels of paranormal belief. In their 2005 study there was no statistically significant difference in religious beliefs between the university and vocational students (Aarnio and Lindeman, 2005, p. 1230). But in a follow-up study, Aarnio and Lindeman (2007) found a preference for high intuitive thinking and low analytical thinking among both paranormal believers and religious believers. They conclude that along with experience and social relationships, "a tendency to rely on intuitive thinking explain[s] the pull of both belief types to a great extent" (p. 8). Importantly, intuitive thinking is framed within a dual-process model to indicate a type 1 process (p. 2).

More recent studies on the relationship between dual-process theory and religion support similar conclusions. Shenhav and colleagues (2012) used the cognitive reflection test (CRT; Frederick, 2005) to measure participants' preference for analytical thinking. The CRT is a series of three math problems that have intuitively compelling incorrect answers. The theory behind this test suggests that those participants with a preference for analytical thinking will be able to resist the intuitively compelling wrong answer and then

reason out the correct response. Shenhav et al. (2012) examined the correlation between CRT scores and belief in God and found that participants who showed a preference for the intuitively compelling answers also reported stronger belief in God (p. 424). This positive correlation between intuitive cognitive style and belief in God held across education level, income, political orientation, IQ, and other personality and demographic variables.

This relationship between religious belief and intuitive cognitive style was also supported by a third study done by Shenhav and colleagues (2012). In this empirical study they found that priming intuitive processing, via a writing task, increased participants' religious belief over the short term. This causal relationship is further supported by a 2012 study from Gervais and Norenzayan, which found that priming analytical processing promotes religious disbelief.

In a series of three studies, Gervais and Norenzayan primed individuals with various analytical tasks. When they subsequently surveyed the participants about their religious beliefs, they found a modest decrease in reported belief after performing the analytical task. While Gervais and Norenzayan (2012) are careful to not overextend their findings, the resulting conclusion is the same as above: "analytic processing – which empirically underlies all experimental manipulations – promotes religious disbelief" (p. 495).

These empirical findings are further confirmed by various research projects advanced by Pennycook and colleagues (2012, 2013, 2014). Pennycook argues that these correlations emerge, not because of the intuitive appeal of supernatural beliefs, but because of the counterintuitive nature of these beliefs, which is dispelled by a preference for analytical thinking. In other words, Pennycook's framework is built on the argument that religious beliefs violate materialistic intuitions (2014, p. 1). This may seem to invert the framework assumed by Shenhav and others, that religious beliefs "may be intuitive for reasons related to more general features of human cognition that give rise to tendencies toward dualism… anthropomorphism… and promiscuous teleology" (Shenhav et al., 2012, p. 427).

But Pennycook et al.'s (2014) more recent work on conflict sensitivity helps to resolve the technical discrepancy by focusing on conflicting beliefs about the immaterial and material world. This, Pennycook et al. (2014) argues, is what is being captured by some of these tests: "part of the reason why some people are nonreligious may be because they are better at detecting and responding to conflicts during reasoning and decision making" (p. 8). Highlighting this dissonance between belief in the supernatural and belief in a material world has the advantage of explaining why a tendency toward analytical processing may lead to religious disbelief in some contexts. Regardless of these differing theoretical emphases, the various lines of research agree on the more substantive matter: an analytical cognitive style is associated with religious disbelief.

Using the CRT, Pennycook's research team (2012) measured the specific type of belief that corresponded to analytical cognitive style. Fitting with the trend, belief in a personal God dramatically declined with increased number of correct responses on the CRT. But, belief in less conventional views of God, such as pantheism, deism, or varieties of agnosticism, showed less direct correlations with analytical cognitive styles (p. 341). Having these alternatives helps present a more comprehensive picture of the complicated relationship between varieties of religious belief and cognitive style: "analytic cognitive style predicted different degrees or graded kinds of God belief, from personal God to atheism" (p. 339). It would appear that a preference for analytical thinking does not necessarily lead to religious disbelief; instead it may lead individuals to a variety of less conventional, and potentially more nuanced, beliefs about the sacred.

A follow-up study by Pennycook and colleagues (2013) looked more carefully at reasoning performance and response times as participants worked on syllogisms. This study again confirmed the correlation between analytical reasoning performance and religious disbelief. Not only did religious believers get more answers wrong, they spent less time than skeptics working on the syllogisms.

While correlation coefficients are modest at times, each of the studies above has statistically significant results. Oviedo (2013) was perhaps too hasty in his dismissal of this body of research. Furthermore, these conclusions fit with past studies that have shown a preference for analytical thinking among atheists (see Caldwell-Harris, 2012). For example, Hunsberger and Altemeyer (2006) found that most atheists gave rational or scientific explanations for why they rejected belief in God. And various other studies linking higher intelligence to disbelief may also fit this story (see Zuckerman, Silberman, & Hall, 2013), but we will return to this connection between intelligence and belief later. The relationship between cognitive style and differing types of religious belief or disbelief would appear to be well founded, but the question remains whether we are talking about distinct types of cognition or different styles of the same type.

Styles or types?

Given the various dual-process models, it is somewhat difficult to decipher the coherence of this research. Many of the models use the language of "intuitive processing" for type 1, and "reflective processing" for type 2. And it is often assumed that analytical thinking is one of the primary features of reflective processing. So at first glance it would seem that we are seeing a difference between distinct types of cognition: one primarily comprised of intuitive instincts, and one that reflects on and scrutinizes these instincts. But this account depends on the unsustainable clustering features of the two types. Given Evans and Stanovich's (2013) distinction between types and modes, these differences between analytical and intuitive cognitive styles are more appropriately described as differing reflective responses to type 1 processes. If that is the case, then it is likely that we are seeing the relationship between religious belief and differing modes of type 2 thought.

Most of the research teams reviewed above use the word "style," so it may seem that the distinction that I am pushing is unnecessary; but *style* and *type* are often conflated in their discussions. For example, see Shenhav et al.'s introductory framework:

> One potentially relevant aspect of cognitive style is the extent to which individuals form their judgments intuitively, as opposed to through reflection… By *intuitive* judgments we mean judgments made with little effort based on automatic processes, and by *reflective* judgments we mean judgments in which the judge pauses to critically examine the dictates of her intuition(s)… the two processes have been studied as competing components in a number of conceptually similar dual-process models… Under this general framework, constructs related to intuitive thinking include thinking that is reflexive, heuristic, associative, holistic or experiential in nature, whereas reflective thinking has been related to processes such as controlled, systematic, analytic, rule-based, or "rational" thinking. ([emphasis in the original] Shenhav et al., 2012, p. 423)

These distinctions between intuitive and reflective judgments are described as a difference in distinct types. This is largely because they rely on the dual-process model, which clusters a variety of processes together, that Evans and Stanovich (2013) argue against above. Religious beliefs, judgments in this case, are therefore aligned with type 1 processes that are refuted by type 2, reflective processes. However, many of the features

that are used to make this characterization (e.g., associative, holistic, and heuristic, versus controlled, systematic, and analytic) are those features that above were described as modes of type 2 processes. Remember Buchtel and Norenzayan's (2009) finding that holistic and analytic processes were both deliberate and controlled processes, depending on the cultural context.

This association of religious belief with type 1 processes, which are refuted by type 2 reflective processes, echoes the theoretical work highlighted above. But it also limits the type of religious cognition that we are able to study. I will explore this consequence further, but for now it is worth noting that if the model is framed in terms of distinct types, then there is little room for the diversity of religious belief or for recognizing and studying highly analytical forms of religiosity. But before engaging these consequences, it is worth acknowledging that this is not the only study where it is unclear whether we are dealing with different modes of type 2 processes, or an interaction between type 1 and type 2.

Gervais and Norenzayan (2012, p. 493) are more careful but verge on a similar confusion: "Available evidence and theory suggest that a converging suite of intuitive cognitive processes facilitate and support belief in supernatural agents, which is a central aspect of religious beliefs worldwide… Religious belief therefore bears many hallmarks of System 1 processing." This association leads them to conclude, "if religious belief emerges through a converging set of intuitive processes, and analytic processing can inhibit or override intuitive processing, then analytic thinking may undermine intuitive support for religious belief." (p. 493). Here again, religious belief is closely associated with type 1 processes that are dispelled by the type 2 process of reflection.

But, it remains unsubstantiated whether analytical reasoning stands in contrast to and overrides direct type 1 processes that support religious belief, or whether the difference is between two modes of type 2 processes: one that is more intuitive, holistic, and contextual, and another that is more analytic and systematic. Are these two opposed processes, or two ends of a continuum?

The reframing of the dual-process model, outlined above, helps resolve these difficulties. As described above, the tightening constraints put forward by Evans and Stanovich (2013) distinguish between dual types, which are qualitatively distinct, and modes, which differ along a continuum. Types differ in use of working memory and cognitive decoupling, or simulation. Modes, on the other hand, are cognitive styles that span a continuum, and can be assessed via thinking-disposition measures (p. 225).

Since most of the studies highlighted above rely on the CRT as a measure of preference for analytical thought, it is worth exploring this performance measure more closely. Frederick (2005) describes the task as measuring an individual's tendency to stop and reflect on intuitively compelling answers. For example, here is one of the questions from the test: "A bat and a ball cost $1.10. The bat costs $1.00 more than the ball. How much does the ball cost?" (Frederick, 2005, p. 26). The intuitively compelling answer is 10 cents, but this would mean the bat costs $1.10 and the total would be $1.20. To arrive at the correct answer of 5 cents, participants must resist this initially compelling answer. The CRT is built explicitly around the traditional dual-process theory; Frederick frames the intuitive answers as arising from system 1, which must be overcome by system 2 reflection to arrive at the correct answer (p. 26).

But a more common interpretation is that the CRT captures our tendency to be cognitive misers; when faced with a problem we often tend to reserve cognitive effort and give the first response that comes to mind (see Stanovich, 2009). Toplak, West, and Stanovich (2011) found that the CRT was largely a measure of rational-thinking

performance, which made it an especially good predictor of heuristics-and-biases tasks (p. 1283). But Welsh, Burns, and Delfabbro (2013) have analyzed the CRT against more nuanced measures of intelligence and cognitive ability. Their conclusion is "that CRT is, at heart, a numerical task, correlating with quantitative ability and predicting bias only on tasks with a calculable, correct answer" (pp. 1591–1592). These two assessments vary but are not necessarily at odds. Through a mathematical modeling approach, Campitelli and Gerrans (2014) also argue that, while complex, the CRT is related to cognitive reflection and is a useful measure of cognitive style. These various analyses combine to support the assumption that the CRT captures some aspect of rational cognitive style, along with quantitative ability, and reflects differences in individual tendencies toward cognitive miserliness.

How does all of this influence our understanding of the studies correlating CRT performance to religious belief? For one, it complicates the straightforward interpretation that a preference for analytical thought overrides intuitive cognitions. Consider this discussion on modes by Evans and Stanovich:

> Unlike types, modes can vary continuously. For example, if we regard Type 2 analytic reasoning as the explicit processing of rules through working memory, then the processing could be engaged in a slow and careful but also a quick and casual manner or any point in between. The degree of effort that an individual expends on such processing is known to be a function of personality characteristics. (Evans and Stanovich, 2013, p. 229)

Here they refer to varying degrees of cognitive miserliness, effort expended on processing, as a continuum of modes rather than a conflict between types. So it would follow that the CRT is most appropriately framed as measuring distinct modes of type 2 processing, which are subsequently correlated with differences in religious belief and disbelief. Thus it is likely that we are not seeing a conflict between the two types as much as a difference in varying reasoning styles, aka modes.

I am not seeking to critique these researchers for not engaging a model that did not exist when they wrote; Evans and Stanovich's (2013) recent proposal came after most of this research. And even though there are theoretical wrinkles to be ironed out, these various research programs are nevertheless tracking real and consistent patterns. My argument within this article is that given the new formulation of dual-process theory, these differences in religious belief should be primarily understood in relationship to differing cognitive modes, not distinct types of cognition.

Moving forward: theoretical implications and future research

There are multiple advantages to this position. When Pennycook and colleagues (2012) gave participants an option of specifying the type of religious belief they held, it became apparent that a preference for analytical thinking led, not necessarily to religious disbelief, but to non-conventional religious beliefs. This result fits with their "asymmetric model of belief and disbelief" (p. 337) that suggests that non-conventional beliefs require a critical evaluation of commonly held, and more easily adopted, conventional beliefs. Furthermore, this result suggests a spectrum, or at least a diversity, of belief; which is precisely what we would expect if belief were primarily correlated with cognitive styles. If belief were more closely related to distinct types of processing, then we would have expected a cleaner dichotomy between belief and disbelief.

Furthermore, by focusing on types of cognition we are led to assume a false binary with religious belief supported by type 1 processes and undermined by type 2 processes.

This framework leads us to the same problem that McCauley (2011) encountered by bracketing off the forms of religious thought that engage and are supported by type 2 processes. By focusing on modes of thought, we are able to examine a wider diversity of relationships between various cognitive styles and various types of religiosity. We are therefore more appropriately situated to explore why some analytical modes of thought may lead to disbelief. Since modes of thought more appropriately capture cultural differences in cognition (Evans & Stanovich, 2013, p. 229), we can also begin to ask whether these relationships exist cross-culturally: does an analytical style of thought still undermine religious belief in communities that foster analytic and systematic avenues for religious thought (such as Tibetan Buddhist debate, Christian theological education, or Talmudic reflections)? If not, what is it about the Western context that fosters such relationships?

Opening our inquiry to examine a range of modes in relation to religious beliefs would also allow for easier integration with various other avenues of research. Consider, for example, various research projects led by Hommel and Colzato. Colzato et al. (2010, p. 87) found that "religious practice induces particular cognitive-control styles that induce chronic, directional biases in the control of visual attention." They used a global preference task to measure individual perceptual styles (i.e., whether people are more responsive to local or global features of their visual field), and found that Dutch Calvinists were more attuned to local features than their secular counterparts. But the trend reversed in Italy and Israel, where both Roman Catholics and Jews, respectively, were more attuned to global features than their secular participants (Colzato et al., 2010). Hommel et al. (2011) found a similar reversal between the Netherlands and Italy using the Simon task – a measure of action regulation via control processes (i.e., the ability to disregard irrelevant information cues; Simon & Rudell, 1967).

Similar studies have been conducted in a variety of cultural contexts and conditions (see Colzato, Hommel, & Shapiro, 2010; Colzato, van den Wildenberg, & Hommel, 2008; Paglieri et al., 2013). These findings coalesce to suggest that "adopting and living according to a particular faith leads to the acquisition of particular cognitive-control styles and corresponding biases in parameters that regulate not only the intake of information… [but,] the style and efficiency of decision-making as well" (Hommel et al., 2011). These studies bear primarily upon perception and control processes, so they may seem tangential to the discussion at hand.

They are relevant for multiple reasons. First, they push against the trends mentioned above: Dutch Calvinists were more perceptually biased to local details than Dutch atheists (Colzato et al., 2010), and were better at managing the interference from conflicting response alternatives (Hommel et al., 2011). This ability to isolate and attend to relevant information would seem to align more closely with an analytic style of thought than holistic styles (see Buchtel & Norenzayan, 2009). Thus if we were to cluster features of the two types of processes, then analytical processes would be more closely associated with religious belief in this context, not disbelief.

But such inconsistencies from clustering features were one of the main problems that plagued the traditional view of dual-process theory (Evans & Stanovich, 2013). The difficulty arises in part because perceptual and regulatory processes are different than the type of cognitive processes engaged to solve problems or to respond to a cue, which are the more typical purview of dual-process theory. In Evans and Stanovich's (2013) reformulation, the appropriate level to explore such family-like resemblances is among the modes of type 2 processes. And if we focus on the relationship between religious belief and varying cognitive modes, the inconsistencies of analytical thought undermining

belief in one context and supporting belief in another vanish. In fact, such cultural differences are precisely what we would expect.

This brings us to the wider reason that this group of studies is important; they provide examples of cultural differences in how religious practices and beliefs relate to, and may cause, different styles of cognition. This variance would be hard to explain if we maintain a strict alliance between type 1 processes and religious belief. The type 1 processes associated with religious belief – such as promiscuous teleology (Kelemen, 2004), hyperactive agency detection (Barrett, 2000), or minimal counterintuitiveness (Boyer, 1994) – are generally taken to be pervasive across cultures and time; this is the assumption that leads such cognitions to be called "natural" (e.g., Barrett, 2000; Boyer, 1994; McCauley, 2011). Such cognitive processes may support religious belief, but it would seem that belief is also associated with a much wider variety of differing cognitive modes across cultures. If we hope to understand the relationship between religion and cognitive processes, then we should also attend to this higher level of cognitive modes. Such attention may begin to address questions about the diversity of cognitive styles in relationship, not to a generalized religious belief in supernatural beings, but to the diverse varieties of religious thought. Do new age, orthodox, revitalist, syncretic, prophetic, messianic, or apophatic forms of religious belief, to name a few, correspond to differing cognitive modes? How do different cultural contexts influence these relationships? And how should we understand the causal relationship: do religious beliefs and practices influence cognition, or vice versa, or both?

This emphasis on cognitive styles may also open fruitful new lines of inquiry within psychology of religion. One promising direction may be to connect with existing research on the relationship between various forms of religiosity and self-control (see McCullough & Willoughby, 2009). A particularly relevant branch of this research uses delay-discounting tasks: an experimental measure of how individuals perceive value to diminish over time. Such tasks gauge self-control and impulsivity by tracking a person's willingness to forego an immediate reward to wait for a larger reward (see Madden & Johnson, 2010).

Carter and colleagues (2012) used this measure to show that religious commitment predicted self-control among American college students. In an empirical study, Rounding, Lee, Jacobson, and Ji (2012), found that a religiously primed group of students were twice as likely to wait for a larger reward than their neutrally primed counterparts. These findings would seem to suggest a straightforward connection between religion and self-control, but they are complicated by cross-cultural differences.

In a delay-discounting study examining cultural differences between the Netherlands and Italy, Paglieri et al. (2013) found that Dutch Calvinists displayed higher levels of self-control than their secular participants. But within Italy, this trend reversed; atheists discounted the future less than Catholics. Paglieri and colleagues convincingly argue that this difference is due to the different worldviews of Calvinism as opposed to Catholicism and how those worldviews have permeated the culture. As above, we see cultural differences in religiosity associated with different cognitive processes – in this case, self-control and impulsivity.

I highlight this vein of research between religion and self-control because it draws attention to the complex ways that religious cognition is formed by and forms our behaviors and thoughts. McCullough and Willoughby's (2009) review of religion and self-control found varying results across the studies; some studies predicted a strong association while others found none. Paglieri et al.'s (2013) work suggests that differing types of religiosity may explain part of this variance; had he grouped Catholics and Calvinists together, and just compared religious to nonreligious, the significance would

have vanished. This consideration leads to the question: are particular types of religiosity more conducive than others for lower impulsivity, delay of gratification, self-regulation, and other features of self-control? Are these relationships, in turn, mediated by differing styles of cognition? Koole et al. (2010) put forward an explanation for how religion, via religious standards and behaviors, may foster processes of implicit self-regulation. Yet, it would seem that not all religious beliefs and practices do foster self-regulation. The association between religion and modes may helpfully illuminate this relationship by providing a framework to explore diverse cognitive styles instead of implicit processing as a whole.

Furthermore, this reformulation may dovetail with research on the relationship between religious belief and individual differences in personality and thinking dispositions. Modes are understood as varying according to individual differences in the effort that one expends on analytical processing (Evans & Stanovich, 2013, p. 229). Thus the research reviewed above, which suggests a relationship between a preference for analytical thinking and religious disbelief, integrates with other research that finds a strong association between systematic thinking and religious disbelief (e.g., Beit-Hallahmi, 2006; Caldwell-Harris, 2012). The reformulation of dual-process theory is not necessary to make this connection, but it does encourage us to understand preferences for cognitive modes as expressions of individual differences. Thus, by exploring a wider diversity of cognitive styles, we may also illuminate the nuances of this relationship between systematic thinking and religious disbelief. What is it about an analytical or systematic cognitive style that corresponds to disbelief? The most recent work from Pennycook et al. (2014) suggests that sensitivity to conflict plays an important role in this relationship, but there is still ample terrain to be explored.

This association between cognitive modes and religious belief may also helpfully constrain the research on intelligence and religious belief. Most of this research confirms a negative relationship between religiosity and intelligence. As Zuckerman et al. (2013, p. 327) recognize, "most extant explanations (of a negative relation) share one central theme – the premise that religious beliefs are irrational, not anchored in science, not testable and, therefore, unappealing to intelligent people who 'know better'." Zuckerman et al. argue against this simplistic explanation by offering alternative interpretations that are better supported by the empirical data. One of these interpretations is that intelligence is linked to the propensity to think analytically (p. 341), yet they ground this explanation in the traditional version of dual-process theory. As I have argued elsewhere (Morgan, 2013), understanding religious belief and disbelief through individual differences helps guard against prejudiced and pejorative conclusions.

But that is not the only reason that I agree with Zuckerman et al.'s (2013) interpretation. For one, most of these studies define intelligence as analytic intelligence (Zuckerman et al., 2013), which makes cognitive style a strong potential confound. Even more convincingly, when Pennycook et al. (2012) controlled for analytical style, the correlations between intelligence and religious belief dropped from –.24 and –.15 ($p < .05$) to –.02 and –.08 ($p > .28$), respectively (as cited in Zuckerman et al., 2013, p. 342). Shenhav et al. (2012) also controlled for IQ in their research. The only caveat that I would add to this interpretation is the same argument I have been pushing throughout this paper – this propensity for analytical thought should be understood as a cognitive mode, not in direct contrast to type 1 processes. By examining a spectrum of cognitive modes, we will likely be in a better position to understand the relationship between different types of religious belief and measures of intelligence beyond the

analytical dimension. Furthermore, we will not be led to harmful and overly simplified associations between intelligence and belief.

This distinction between modes and types helps guard against the temptation to conflate religious belief with anachronistic, primitive forms of thought that are dispelled by the light of reason and rationality. The most prominent version of this theory comes from Frazer (1922/1962) and Mauss (1950/2001) who suggest that in the course of human phylogeny, modes of thought progress from primitive, magical, thinking to religious thinking, and finally culminate in analytical, scientific, thinking. But this myth of cognitive progress ignores the diverse modes of thought coexisting within modern society (Nemeroff & Rozin, 2000) and individuals. Those working within the cognitive science of religion do not explicitly hold this position, but as Oviedo (2013) argues, it is lurking at the edges of theories that overly associate religious belief with type 1 processes. Just as cultural differences in the preference for holistic versus analytical cannot be situated in a normative hierarchy, we should be wary of presenting religious cognition as more primitive than analytical thought. Exploring the relationship between religious beliefs and varying modes of cognition, instead of types, helps avoid this normative prejudice.

Conclusion

The recent constraints on dual-process theory suggested by Evans and Stanovich (2013) are by no means final. There will be continued debate within the field about which attributes are definitive features of each cognitive type. Nevertheless, there is enough evidence supporting the distinction between modes and types that it is likely to remain an important difference within the model moving forward.

Therefore it is important for the research on religious cognition to adjust and appropriately situate religious beliefs, and other religious cognitions, within the changing framework. Far from throwing out previous research and theory, these adjustments help to clarify various relationships. Much work has already been done on the relationship between intuitive, type 1, cognitions, and some basic forms of religious belief. But much more work is required to understand the relationship between various modes of type 2 processes and the existing diverse forms of religious belief and practice.

Yet the evidence suggests that these diverse forms of religious cognition are associated with various cognitive styles. Sometimes they are closely associated with a preference for heuristics and context-sensitive processing, but other times religious belief seems to align with a preference for analytical thinking. Thus it is likely that these religious cognitions shift alongside individual differences and available cultural expressions, both of which influence personal cognitive styles. The clarification between modes and types helps to situate our understanding of religious cognitions in relationship to dual-process theory. Furthermore, it suggests new avenues for research, and hopefully encourages a more empathic appreciation of religious beliefs as complex and sophisticated cognitions.

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