Ritual Behavior in Obsessive and Normal Individuals

Moderating Anxiety and Reorganizing the Flow of Action

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ABSTRACT—*Ritualized behavior is characteristic of obsessive-compulsive disorder (OCD), but it is also observed in other, nonclinical contexts such as children's routines and cultural ceremonies. Such behaviors are best understood with reference to a set of human vigilance–precaution systems in charge of monitoring potential danger and motivating the organism towards appropriate precautions. Ritualized behavior focuses attention on low-level representations of actions, probably leading to some measure of intrusion suppression. Cultural rituals too may be understood in this framework.*

KEYWORDS—*ritual; obsessive-compulsive disorder; stereotypy; anxiety disorders*

Consider a man who needs to prepare a cup of tea every day before sitting down to work—but with a special twist. The cup of tea must always be placed right against the wall on his kitchen countertop; after filling up the cup, he must carefully throw away the teabag; after examining the cup repeatedly to make sure it is still full, he empties its contents in the sink; he then checks repeatedly, many times, that the cup is indeed empty. After about 10 minutes of this routine, he can get to work. If he is stopped from doing any of this, or if he is not sure that he performed this sequence in the right way and in the right order, intolerable anxiety prevents this man—who never, by the way, drinks tea—from getting on with ordinary life.

Ritualized behavior of this kind is characteristic of obsessive-compulsive disorder (OCD). But it is also found in normal children and in other nonclinical contexts. In its various manifestations, ritualized behavior is characterized by compulsion (the person feels she must perform these actions), goal-demotion (no obvious connection between action and goal, such as pre-paring tea to avert anxiety rather than to drink the tea), redundancy (actions repeated a given number of times), and rigidity (actions must be accomplished without deviation from the prescribed sequence). Why do people engage in such behaviors?

OBSESSIVE PATIENTS AND THE NONCLINICAL CASE

OCD pathology is characterized by intrusive thoughts about potential danger and a compulsion to engage in stereotyped activities. Patients' typical obsessions center around themes of contamination and contagion, infliction of harm to others—often one's offspring—and the fear of offending others and being ostracized (Mataix-Cols, do Rosario-Campos, & Leckman, 2005). Typical ritualized behaviors include repeated sequences involving obsession-relevant actions like washing things or safety checking. Many other intricate ritualized behaviors also involve obsession-irrelevant acts, performed in the exact same manner every time. Most patients report that performance of such actions reduces their anxiety level, although the net effect is probably a gain in anxiety in the long run.

In neurophysiological terms, OCD stems from a dysfunction of a specific brain circuit, the cortical-striato-pallidal-thalamic circuit, and particularly a dysfunction of the basal ganglia (Rapoport, 1990, Rauch et al., 2007). There seems to be reduced inhibition of strongly motivated routines (washing, cleaning, checking one's environment, monitoring other agents' behavior) initiated in the striatum, because striatal networks over-respond to cortical inputs and/or because their inhibitory effect on thalamic networks is diminished (Fitzgerald et al., 2005; Rauch et al., 2007; Saxena, Brody, Schwartz, & Baxter, 1998). In metaphorical terms, one could say that vigilance networks in the brain are too loud, the spontaneous reactions to danger they suggest are too salient, and the systems that usually inhibit them are too weak.

Neither the intrusive thoughts nor the associated responses are exclusive to OCD pathology. The nature and frequency of intrusive thoughts seem roughly similar in people with and

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without OCD (Rachman & de Silva, 1978); it is the appraisal of these thoughts that is vastly different. In cognitive models of OCD, appraisal is seen as the origin of the pathology, as patients wrongly appraise intrusive thoughts, threats in the environment, and their responsibility in the likelihood of a bad outcome. Obsessions and compulsions would stem from a failure to represent one's responsibility in a realistic way (Salkovskis, 1985) or from a failure to accept low control of events (Moulding & Kyrios, 2006).

Although routines are common in many adults, obsessive thoughts peak in adults at particular lifetime stages, notably around pregnancy and early parenthood (Leckman et al., 2004). The content of intrusions is related to the specific lifetime stage. Pregnant women report heightened fears about contamination. New fathers report fears about harming the infant (Abramowitz, Schwartz, Moore, & Luenzmann, 2003). They also develop rituals related to these intrusions.

Most children from 2 to 7 engage in ritualized behaviors, characterized by perfectionism, preoccupation with ordering items just right, concerns about dirt, preferred routines, awareness of details of one's home, hoarding, and eating and bedtime rituals. Rituals are connected to anxiety states with targets such as fear of strangers, the risk of inflicting harm to self or others, and contamination (Evans, Gray, & Leckman, 1999).

In these various domains, the thoughts that prompt rituals revolve around a limited number of themes, such as contagion and contamination, aggression, and safety from intrusion. Ritualized behaviors also include many recurrent themes, such as washing, cleansing, ordering and securing one's environments, or avoiding particular places. So is there a model for the occurrence of ritualized behaviors in these different contexts?

VIGILANCE–PRECAUTION SYSTEMS

Abed and de Pauw describe OCD as a disruption of a "psychological immune system" (Abed & de Pauw, 1998). The hypothesis is that obsessive phenomena are an exaggerated version of thought processes selected because they lead to risk avoidance. Central to the hypothesis is the fact that intrusive thoughts consist of scenarios of possible danger, an "Involuntary Risk Scenario Generating System" (Abed & de Pauw 1998, p. 246).

From a neurophysiological standpoint, Szechtman and Woody explain OCD in terms of a "security motivation" system (Szechtman & Woody 2004). The neural circuitry involved includes an appraisal system that handles environmental cues of potential danger. If detection occurs, evolved security-related programs are engaged (e.g., visual inspection of one's environment). However, there can never be positive evidence that a potential danger has been eliminated. The absence of germs or predators does not signal itself. So the response of the security motivation systems must be an internally generated variable (Szechtman & Woody, 2004).

We have tried to integrate these accounts in a synthetic, evolutionary model, proposing that human minds comprise specialized, evolved vigilance–precaution systems that handle indirect threats to fitness and motivate the organism into taking precautionary behaviors (see also Cosmides & Tooby, 1999). There are probably multiple systems involved in vigilance–precaution. For instance, humans prefer open landscapes with potential refuge and escape routes but also good visibility. This could be understood as an evolved precaution against predators. Humans also distaste festering meats. This could be conceived as prevention against pathogen ingestion. The two precautions are probably handled by distinct systems, orienting attention to different cues and triggering specific reactions and learning. Precautionary behaviors correspond to the operation of distinct systems geared to predation by large animals, assault by other individuals, social exclusion and status loss, contamination, and probably other specific threats as well.

Normally, the outcome of engaging precaution programs is a type of satiety signal feeding back into the appraisal system and temporarily dampening its operation. The system fails when feedback from performance of security-related behavioral programs has no effect on the operation of the system. The agent feels compelled to re-enact the precautionary behavior, as the level of concern about danger has not perceptibly abated. So rituals are not adaptive themselves but result from a disruption of adaptive function.

Given such evolved motivations, some patterns of ritualization make more sense. For instance, the higher attentional load of parental preoccupation and the intrusive thoughts about harm to the infant seem highly adaptive, as unmonitored automatic action by fatigued parents may result in extreme fitness costs. Also, given human dependence on others for survival, constant monitoring of social relations may also be highly worthwhile. So OCD appears to be a pathological exaggeration of normal function rather than an aberration. But the question remains: Why this peculiar form of behavior?

ACTION MONITORING IN RITUALIZED BEHAVIOR

Ritualized behaviors are of a special kind. They mandate the precise execution of particular gestures ("tap the doorframe three times"), in a particular manner ("with your left little finger"), often with negative rules ("but make sure not to touch the door"). To understand these features, we must consider how action is parsed in ordinary behavior.

Human beings parse their own and other's behaviors in meaningful units. Zacks and colleagues distinguish between the levels of simple gestures (e.g., putting the left foot in a shoe), behavioral episodes (putting one's shoes on), and scripts (getting dressed to go out). People spontaneously describe and recall behavior in terms of the middle-level units (Zacks & Tversky, 2001), the level at which goals are associated with behaviors.

By contrast, in ritualized behavior, attentional focus is brought back to the lowest level of representation, that of gestures. As an illustration, let us contrast the task of "cleaning the desk" in an ordinary and a ritual context. In the ordinary situation, the goal provides only a rough guide to the actual gestures (one can wipe the surface in different ways, as long as one does it) and the terminating point is easily specified (once the desk looks clean, the task is over). In a ritual situation, however, the particular gestures are specified (e.g. "wipe the desk twice horizontally, then three times vertically, making sure to follow straight lines at all times"). This creates what we call "goal demotion": Even though there is a list of highly specific actions to perform, there is no obvious connection between these details and the overall goal. For instance, why would following straight lines be crucial to eliminating germs? The person is careful to apply the rule without linking it to a particular goal. Finally, the termination point is more difficult to specify (e.g., "stop wiping only if you think you got rid of all the germs").

We proposed that, in both patients and nonclinical cases of ritualization, the attentional focus on low-level features of action, requiring high cognitive control during performance, would have effects on working memory. One of the effects of prescribed, compulsory action sequences is to overload working memory. Typically ritualized behavior requires focused attention on a set of different stimuli. To return to our example, one must both count the number of wipes and make sure they follow straight lines. Also, in ritualized behavior there is frequently a combination of a positive prescription ("one must do x") and a negative one ("while avoiding doing y"). This engages working memory and executive control in a way that is not typical in everyday action flow.

Our contention was that working-memory loading might make it more difficult for intrusive thoughts to become conscious. In this view, ritualized behavior may constitute a spontaneous and moderately efficient form of the *thought-suppression* processes that Dan Wegner and colleagues have studied in depth (Wegner, 1994). There are however some differences. Thoughts suppressed in experimental contexts are generally neutral and externally generated. By contrast, the thoughts patients are attempting to repress or neutralize are ones that specifically cause them anxiety.

Tasks that cannot be accomplished automatically may be successful at reducing intrusive thoughts because they recruit working memory to a greater extent than do most everyday tasks, whatever their degree of difficulty. (For instance, threading a needle may be very difficult without requiring high working-memory load).

Note that ritualized behavior in the sense used here is the opposite of *routinized* behavior, which people can accomplish "without thinking." Unfortunately, the term "ritual" is commonly applied both to highly focused, controlled behavior, on the one hand, and to highly reutilized, quasi-automatic, "going through the motions" behavior, on the other. This conflation is highly misleading, as these forms of behavior are diametrical in terms of underlying processes. The present model is only about the highly controlled, rigid sequences among both clinical and nonclinical populations. Typically, patients who engage in ritualized activity, in the sense we mean, are highly focused, as inaccurate or incomplete performance causes them anxiety (Moulding & Kyrios, 2006).

CONNECTION WITH CULTURAL RITUALS

In most human societies we find culturally specific "rituals," although the term is ambiguous here too. Many collective ceremonies include highly rigid, prescriptive sequences that may be best understood in terms of the model described here (Lienard & Boyer, 2006). In such situations, actions are divorced from their usual goals (e.g., washing perfectly clean objects). Many actions have no empirical goal (e.g., walking around a sacrificial animal several times). The sequences are typically compulsory and rigid. Although rituals as a whole often have overt purposes (e.g., fending off danger), the component actions are not directly connected to the stated goals. These rituals subsist (among many other reasons) because people find them more attention-grabbing and compelling than other, nonritualized ways of behaving (Sperber, 1996). We proposed a speculative scenario for why this is the case. When people perform collective ritualized behavior, they typically receive information about potential danger and the appropriate reaction is presented as a sequence of rigidly described precautionary measures (e.g., "you must do x this way, lest. . ."). We considered that such information probably activates vigilance–precaution systems, making the prescribed actions particularly compelling and attention-grabbing. This creates a bias in cultural transmission, as collective ceremonies that include such ritualized behavior are, all else being equal, more likely to seem intuitively appropriate and compelling than are ceremonies that do not include it (Lienard & Boyer, 2006).

OUTSTANDING QUESTIONS

Boundaries and Dynamics of ''Ritualized Behavior''

Some patients perform arbitrary ritualized behavior, such as tying their children's shoelaces in a particular order and manner to make sure that they travel safely. But other patients are different. Many of them need to wash their hands or bodies endlessly or repeatedly check their environment for signs of danger. In such cases, the patient performs the appropriate precautionary actions, given their intrusive thoughts. But the action does not trigger the normal satiety or "just right" feeling (Szechtman & Woody, 2004). There are also composite cases in which both unending precaution and arbitrary actions are combined, such as washing one's body in a rigid sequence or risk having to start the sequence again. Are all these behaviors supported by the same neurocognitive processes? To address

that question, we need evidence that is lacking, concerning the precise ethological parameters of ritualized behaviors: What do people do, how differently from the normal case, how often, how precise? Clinical case studies do not generally probe behavior at that level of precision (but see Eilam, Zor, Szechtman, & Hermesh, 2006). Also, we need to consider how patients' behaviors evolve through time. Predictions of vigilance–precaution models should be tested by studying symptom dynamics.

What Is the Process Triggered by Ritualized Behavior?

There is still no precise computational and neuro-physiological model of the intrusion and suppression process. We know that ritualized behavior is of a special kind (in terms of rules, combination of actions, requirement of divided attention, and compulsion), but we do not have a precise model of why these particular features would result in moderately efficient thought suppression. To investigate this, we should run, first, systematic studies of the effects of demanding cognitive tasks (of the kind used in ritualized behavior) on the various subsystems of working memory; second, we should operationalize the connections between conscious attention and intrusive thoughts.

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