cognition (Nelson 1986, 1996). Children easily establish these forms of knowledge representation when encountering repeated events (Bauer & Mandler 1990). Already at ages 1 to 2 years, children can retain and reproduce causal, temporal, and goal-directed structures of events (Bauer et al. 1998). Scripts become increasingly abstract or schematized with experience (Fivush & Slackman 1986). However, Farrar and Goodman (1992) indicate that younger children (aged 4 versus 7) are more schema-dependent when encoding an event.

Higher prevalence of ritualistic behavior, synchronized with the prevalence of script knowledge structures, may signal a child's need for cognitive mastery of the environment (see also Piaget 1952). Computational economy, rather than the notion of reaction to inferred threats to fitness, could better explain such a rich cognitive and behavioral canonical repertoire.

Shifting now to child psychopathology, one particular case unexplored by the target article is that of autistic spectrum disorders. Here again, rituals, as cornerstone psychopathological features, are performed without any clear connection to threat avoidance. "Need for sameness," restrictive interests, and repetitive behaviors are classical autistic symptoms (Kanner 1943). But autistic rituals are performed out of the realm of consciousness. And more basic brain mechanisms involved in change detection seem to function atypically in this case: people with autism have some difficulty in involuntary attention switching when processing unexpected infrequent stimuli (Gomot et al. 2006). Behavioral, ritualistic "avoidance of change" would then be a secondary dysfunction, an adaptive behavior aimed at keeping the environment as predictable as required by such an atypical neural/cognitive system.

The ethnological approach distinguishes coercion within tradition from compulsion within individual threat-responding ritual behavior.

In order to locate the segment of tradition we are addressing, we need to temporarily set aside the questions of origins of orally transmitted cultural facts. These are hardly reducible – in both shape and content – to sharply and easily recognizable items such as rituals, customs, and narratives. Therefore, we may safely hypothesize that their incidence at a given moment in time, for a certain community, represents far more than the sole transmission from a previous segment of time, subdued to rigidity within tradition; a snare of relations that makes both ceremonials (individually or collectively performed) and narratives (individually and collectively produced) be strongly a matter of active creativity, just as they continue to be a matter of "adherence to script" (see target article, sect. 2.5). Field results we were able to collect from within what we call Romanian folkloric culture of today, vividly show a continuum among folkloric genres of enacted tradition-transmitted knowledge (Benga 2005): to quote but one example, the complex choreutic therapy performed by the ritual dance of *Căluş* is explicitly linked to abundant local narrated mythology about the specific trance-like disease called *luatul din iele*, and about the mythic culprits – a category of fairies. Yet, new forms of coercion have lately replaced the old motivations, in the form of competition for stage virtuosity on the occasion of socialist-time flavored festivals. The ethnologist is himself compelled to treat these with just as much seriousness as he does treat the confessions of old peasants – because what he witnesses today is precisely one of several forms of survival of the old ceremonial/ritual dancing: in other words, a genuine form of cultural transmission.

This is why we favor, as much more fertile, the concept of "salient memories" in analyzing the transmission of tradition (Boyer 1990, pp. 8–20), over the somehow restrictive, although method fueling, framework that delineates religious behavior in cognitive terms (Boyer 1993, pp. 4–18; cf. target article, sects. 8.2, 8.3). For, whatever learning process our brains might be prepared for, that fact alone shall not provide a religion to the bearer (Boyer 2001a, p. 13) – which brings us nicely back to the subtle relation between the "what" and the "how" of transmission, be it, successively, more orally, or more ritually, salient.

Ritualized behavior in animals and humans: Time, space, and attention

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Abstract: A study of the organization of obsessive-compulsive disorder (OCD) rituals in time and space illuminates a postulated mechanism on shifting focus in action parsing, from mid-ranged actions to finer movements (gestures). Performance of OCD rituals also involves high concentration rather than the automated, less attended performance of rituals in normal and stereotyped behaviors in animals and humans.

The target article suggests that two systems may account for the occurrence of ritualized behavior. One system is of "inferred threats to fitness," the second is of "action-parsing." Manifestation of movement parsing is overt and the actions that comprise rituals are visible and measurable by virtue of animal behavior studies that have scrutinized ritualized behavior, developing conceptual frameworks and analytic tools that are also applicable in studying ritualized behavior in patients with obsessive-compulsive disorder (OCD). Indeed, recent utilization of such an approach in studying OCD rituals (Eilam et al. 2006) revealed facets that coincide with the question raised by Boyer & Lienard (B&L). Specifically, the outstanding question is not only as posed in the target article, "*why* ritualized behavior," but also *where* and *how* does ritualistic behavior occur. "Where" refers to the typical coupling between rituals and specific locations or objects; "how" refers to the high concentration involved in compulsive performance.

In the target article, action parsing is described at three levels that correspond to those offered by Zacks and colleagues (Zacks & Tversky 2001; Zacks et al. 2001b) as: (1) simple gestures; (2) behavioral episodes; and (3) script. B&L hypothesize that an excessive focus on the level of simple gestures is what happens in cultural and individual rituals, in contrast to spontaneous focusing on the mid-ranged behavioral episodes in normal behavior. Indeed, this is precisely what was revealed when tools derived from studying the quinpirole-treated rat model of OCD (Ben-Pazi et al. 2001; Szechtman et al. 1998) were applied in studying rituals in OCD patients (Eilam et al. 2006). Parsing categories became obvious when described in the context of the location or object at which they were performed, especially since OCD rituals carry a remarkable spatial component with a strong affinity between compulsion and specific location or object (Eilam et al. 2006). Specifically, the space in which a ritual (=behavioral episode) is carried out may be viewed as the set of sites or objects at which actions (=movements or gestures) are performed. Behavior can then be scored by notating the movements at each location/object. This is illustrated in Table 1, describing the OCD ritual of car-locking.

First, the patient's ritual was divided into two distinct domains in which it was executed: acts performed inside the car (Table 1), and those performed outside the car (not shown here). Then, the locations at which the patient displayed acts were identified as the ignition key, light switch, and so on (top rows in Table 1). Finally, the set of acts in each of these locations was scored in terms of a verbal description of the acts. The resulting description shown in the table provides the sequence of acts, highlighting the repetitive performance in the OCD patient compared with a control individual who was asked to execute the same action (bottom of Table 1). The entire sequence of the control individual took 11 seconds, compared with 63 seconds taken by the OCD patient. The excessive duration of the OCD ritual was thus generated by the repetitive manner of the compulsive ritual, which becomes apparent when the number of acts (=gestures) is summed for each location, resulting in 30 acts $(6 + 4 + 5 + 13 + 2)$ for the OCD patient, compared with four

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Table 1. *Car-locking ritual in OCD patient (A) and control individual (B)*

LOCATION/OBJECT				
Ignition key	Light switch	Steering wheel	Gear stick	Other actions
A. Ocd Patient				
Switch engine off				
Take out the key	{Switch on and off} × 3			
Insert the key				
Switch on and off		Hold it	Lock it	
			{Move it forth and back} × 4	
			Press it down	
			{Move it forth and back} × 2	
		Rotate left	Press it down	
			{Move it forth and back} × 2	Collect handbag
		Rotate right		
Switch on and off				
Take out the key		Rotate right		
		Rotate left		
	Switch on and off		Move it forth and back	
			Press it down	Get out of the car
Total acts:				
6	*4*	*5*	*13*	*2*
B. Control Individual				
Switch engine off				
Take out the key			Lock it	Get out of the car
Total acts:				
2	*0*	*0*	*1*	*1*

acts (2 + 0 + 0 + 1 + 1) for the control individual who performed the same task of car-locking (=script). Moreover, a comparison of acts (gestures) at the various locations (episodes) in 14 OCD rituals revealed that there were 1–3 locations at which acts were repeated significantly more than any of the control movements, resulting in the repetitive manner of OCD rituals (= many repetitions of the same few movements). Thus, as suggested in the target article, OCD rituals consist of excessive focus on simple gestures (movements). Our current data (Eilam et al. 2006) add to this a spatiotemporal component: gestures are coupled with specific locations, and gesture repetition accounts for the extended ritual duration.

A central contention of the target article relates to the high concentration involved in displaying ritualized behavior. Indeed, the vigor, precision, and high concentration of OCD patients when displaying their rituals is striking to a bystander. B&L suggest that a swamp of working memory and an urge for precise performance account for the high concentration, resulting in the ironic outcome of higher anxiety in patients with more rituals. Our study adds to this the finding that high concentration is the discriminator of compulsive rituals from other rituals in animal and human behavior (Serruya & Eilam 1996). Repetitive, stereotyped, or well-practiced performance in animals and humans has been suggested as a mechanism for minimizing the involvement of information-processing systems that are required for motor performance, enabling the direction of attention elsewhere (Fentress 1976). For example, when driving along an unfamiliar road we are required to concentrate more compared with driving along a familiar road, where we are more relaxed and may direct attention elsewhere. In animals, familiar paths enable directing attention to other aspects of the environment, such as the presence of potential predators (Serruya & Eilam 1996). Thus, unlike compulsive rituals, other rituals involve lowered attention.

Nonetheless, the link between attention and performing rituals is bidirectional and rituals may be constructed in order to concentrate and avoid goal-demotion, as, for example, the intensive religious rituals that enhance concentration during rigorous prayer, or sportsmen rituals that facilitate concentration in performance and disassociation from spectators. In all, although some of B&L's contentions, such as the "threat to fitness" may remain hypothetical in being hard to assess or quantify, the data collected during our observations on OCD patients strongly support several of B&L's measurable hypotheses.

Contextual features of problem-solving and social learning give rise to spurious associations, the raw materials for the evolution of rituals

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Abstract: If rituals persist in part because of their memory-taxing attributes, from whence do they arise? I suggest that magical practices form the core of rituals, and that many such practices derive from learned pseudo-causal associations. Spurious associations are likely to be acquired during problem-solving under conditions of ambiguity and danger, and are often a consequence of imitative social learning.

Boyer & Lienard's (B&L's) model describes the underpinnings of a Sperberian attractor (Sperber 1996, Ch. 5) in the cultural

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