

Acknowledgments

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Comments

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Psychological Responses to Fluctuating Environments

Much research has focused on the social systems and institutions that develop in response to unpredictable fluctuations in resources. For example, societies might buffer against short-fall by storing or diversifying resources or by sharing them within and between communities (Winterhalder 2007). By contrast, Quinlan et al. focus on individual-level psychological responses to fluctuating resources.

Quinlan et al. propose that exposure to unpredictable fluctuations in resources increases impulsivity. The logic of the hypothesis is that when environmental conditions are different than they were before, individuals experience a discrepancy between their current mental models of the world and their incoming sensory input. Individuals seek to resolve this discrepancy (not necessarily consciously) by collecting information about the current conditions. Spawning novel behaviors facilitates this discovery process: current conditions will differentially reinforce behaviors, enabling individuals to select the high-performing ones. Impulsivity, according to Quinlan et al., is the psychological generator of novel behaviors: it allows individuals to depart from their present mental models and learn about current conditions. This hypothesis is, to our knowledge, original.

Quinlan et al. test their hypothesis in a study of the Sidama people of Ethiopia. Some Sidama groups earn their living by traditional enset agropastoralism and others by transitional

maize farming. Enset production is low risk and low yield, and it recovers slowly after crop loss. Maize production is high risk and high yield, and it recovers quickly after crop loss. Quinlan et al. examine whether the association between impulsivity (two types: careful control and acts without thinking) and environmental risk (two types: economic shocks and social shocks) differs between these subsistence regimes. Their results are complex but overall suggest that the impulsivity levels of maize farmers, who experience greater fluctuations in resources compared with enset farmers, are more responsive to environmental risk. This result seems to be consistent with the impulsivity as exploration hypothesis.

Exploration in Response to Fluctuation

One assumption of Quinlan et al.'s argument is that it is adaptive to spawn novel behaviors and select high-performing ones in fluctuating environments. Whether this is true depends on several factors (Frank 1997). For example, it might not be adaptive to try out behaviors if the costs of maladaptive behavior are extremely high, as they might be in the case of learning about dangerous predators (Barrett, Peterson, and Frankenhuys 2016). However, in many conditions, reinforcement learning does provide a versatile mode of adaptation, as evidenced by mathematical modeling (Sutton and Barto 1998) as well as its ubiquity in the natural world (Snell-Rood 2012). Empirically, it would be interesting to examine whether in fluctuating environments, humans are indeed more likely to explore novel behaviors. A future study could investigate this question by comparing the range of the behaviors that Sidama maize and enset farmers use for the production of their crops and by tracking whether the frequency of novel behaviors among maize farmers increases after changes in environmental conditions more than among enset farmers.

Impulsivity as Exploration of New Cultural Frames

A separate question is whether impulsivity is the right process for generating novel behaviors. Quinlan et al. do not define impulsivity but rather describe it as a cluster of psychological tendencies that includes a lack of premeditation, sensation seeking, little self-regulation, and discounting of future over immediate rewards. Most psychologists agree that there are different subtypes of impulsivity, although opinions differ over which subtypes exist. One distinction is that between temporal impulsivity (a preference for immediate rewards) and reflection impulsivity (acting without gathering or evaluating information; Caswell et al. 2015).

Because temporal impulsivity entails action aimed at immediate rewards, it will also involve a focus on the present over the future (Fujita 2011). A challenge to the linking of temporal impulsivity with exploration is the robust set of findings from psychology that attention toward temporal proximity is associated with attention toward spatial proximity: if one is focused on the now, one is also likely focused on the here, a

state un conducive to exploration of elsewhere (Trope and Liberman 2010). Thus, any exploration resulting from impulsive behaviors would be local.

A challenge to the linking of reflection impulsivity with exploration is that acting without gathering information seems incompatible with impulsivity as information seeking. One might reconcile these notions, however, with the observation that reflection impulsivity concerns (little) information gathering before acting, and Quinlan et al.'s notion concerns information gathering after acting, on the basis of the consequences of one's actions. If so, the authors might expand their proposed behavioral response to environmental fluctuation from that of "don't think, act" to "act first, then watch to see what happens." A second concern about reconciling reflection impulsivity with cultural exploration is that impulsive behaviors do not necessarily involve rejection of a cultural pattern: in fact, some impulsive behaviors involve mindlessly going along with a cultural ritual or norm (such as a dance or an eating habit), for the sake of immediate rewards; conversely, culturally anomalous behaviors (such as refraining from procreation) may result from reflective, self-controlled information processing.

Impulsivity as an Adaptive Focus on the Present

We suggest that impulsivity be construed in line with the approach of life-history theory, namely, as an adaptive regulatory shift toward the present in response to shocks (whether social or crop related) received in unpredictable environments (Belsky, Steinberg, and Draper 1991; Ellis et al. 2009; Frankenhuys, Panchanathan, and Nettle 2016), the latter arguably characterizing the life of the maize farmer. A version of this explanation would fit well with Quinlan et al.'s evidence of greater regulatory shifts in response to environmental shocks in Sidama maize than enset farmers—evidence that makes a solid contribution to a growing literature on the evolution of plasticity in readiness for the fluctuations of life.

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This article presents the findings of an extensive study of decision-making in response to shocks among Sidama farmers in southwestern Ethiopia. This research draws on a variety of theoretical approaches, including social-ecological systems, niche construction, cognitive science, psychometrics, and cultural ecology. The authors compare two types of impulsivity, defined as behavioral responses that lack premeditation and that can help deal with environmental, social, and economic shocks: "We suggest a pathway whereby unstable environments result in psychological responses—including impulsiveness—as a means to generating adaptive action."

Nearly all agrarian societies must face adjustments to their farming regimes because of climate change and socioeconomic challenges, including increased drought (sometimes combined with torrential rainfall) and fluctuations in the market economy affecting both costs and prices. The Ethiopian Sidama have an ancient adaptation to their tropical highland environment through their farming of enset (false banana), a hardy and drought-resistant food crop. But as the authors show, its slow growth and long food preparation have led to the adoption of maize farming by certain Sidama communities. Maize has been present in Africa since the seventeenth century and provides the main source of calories through its high productivity and capacity for storage of grain. Yet maize is a risky crop, thirsty in normal times and particularly vulnerable to drought.

The authors pose a very interesting question: how does the psychological process of impulsivity work in a long-term agrarian society that must reckon with environmental shocks in terms of choosing between the stable, traditional enset regime and unstable, transitional maize regime? The authors ask, "What psychological processes facilitate culture change, and when are they activated?" In gathering their evidence, the authors try to reduce Western bias by situating behaviors in their cultural context, utilizing a team including Ethiopian anthropologists employing a variety of methods, including psychosocial measurements, economic surveys, qualitative interviews, and focus groups among 372 individuals living in a variety of settings. In this way the authors build a comprehensive inventory of risk aversion strategies based on political, cultural, economic, and environmental factors, and they identify impulsivity as an adaptive strategy in risky environments.

By integrating concepts of cognitive science with environmental studies and particularly ecological systems theory, the authors have applied an imaginative and useful basis to compare economic strategies. The authors write, "Cognitive science imagines mechanisms from which agency may emerge . . . and social-ecological systems theory searches for agency in analyses relevant to human ecological behavior. . . . Both are aware that surprise is important. . . . Agency and surprise are intimately intertwined, and we contend that impulsivity promotes agency in the face of big surprises."

This is a handsome piece of work, one that hypothesis-testing anthropologists could put to use in other contexts. It would be interesting to expand this study of impulsivity to livestock production, which the authors note is important to the Sidama. Pastoralism also requires strategizing and impulsive decision-making, such as when to cull the herd or develop specialized herds of small stock and large stock, strategies found among more fully livestock-dependent pastoralists, such as the Borena in southern Ethiopia. In conclusion, I find this an original and innovative study that combines ecological, psychological, economic, and political factors important in understanding human behavior coping with risk and shocks, including drought, war, and global market forces.