

## **Drugs' rapid payoffs distort evaluation of their instrumental uses<sup>1</sup>**

Commentary on Müller, C. P., & Schumann, G. (2011). Drugs as instruments: A new framework for non-addictive psychoactive drug use. *Behavioral and Brain Sciences*, 34(6), 293-310

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### **Abstract:**

Science has needed a dispassionate valuation of psychoactive drugs, but a motivational analysis should be conducted with respect to long-term reward rather than reproductive fitness. Because of hyperbolic overvaluation of short-term rewards, an individual's valuation depends on the time she forms it and the times she will revisit it, sometimes making her best long-term interest lie in total abstinence.

### **Text**

What seems most remarkable about Müller & Schumann's (M&S's) article is that it needed to be written at all. Uses of psychoactive drugs to improve social interaction, facilitate sexual behavior, counteract fatigue, alleviate stress, self-medicate psychiatric symptoms, expand consciousness, and just plain get high are amply familiar. To say that these are all instrumental uses is merely to say that they are behavioral operants; this we knew. And yet M&S do point out a need – to examine whether there are circumstances in which these uses may convey benefits that outweigh their obvious dangers. Such discussions could also be commonplace, except for the way that people's personal rules for self-control suborn their beliefs. Rules to avoid particular activities take on extra force if they are experienced as beliefs – for example, that those activities intrinsically will corrupt or contaminate you (Ainslie 2001, pp. 106–12). People in modern civilization have accordingly cultivated the belief that use of psychoactive drugs regularly leads to addiction (Hammersley & Reid 2002). Science has been under pressure to support this social manipulation of belief. Witness the outcry that followed publication of a Rand study on the sixth or so of recovering alcoholics who successfully return to controlled drinking (Roizen 1987). Hence, M&S's dispassionate catalog of how psychoactive drugs are useful is actually a bold step, although they mention the social pressure on science only briefly (sect. 6.2).

Unfortunately, M&S frame their discussion in terms of evolutionary adaptive fitness and mechanisms of memory formation, neither of which is to the point. We do not choose drugs because they increase adaptive fitness; nor should we. In an age when most children survive and reproduce, that would be a powerful argument against the birth control pill. The evolved trait that is relevant to drug use is sensitivity to reward (or reinforcement, or utility), a proxy for adaptive fitness that allows individual behaviors, rather than whole organisms, to be selected. The central feature of psychotropic drug use is its dominance by the disproportionate effectiveness of imminent rewards. The hyperbolic shape by which prospective reward is discounted in all vertebrates that have been studied leads to a tendency to overvalue imminent rewards, a trait that is not maladaptive in animals for which future planning is accomplished by obedience to instincts – for example, to hoard, migrate, or build dams (Ainslie 2001, pp. 27–47). This shape is common to most forms of sensory perception (Gibbon 1977) and is probably too basic to have been altered in response to the comparatively recent evolution of superior intelligence, despite the problems it has created for evaluating rewards at disparate delays. As to what rewards us, human populations who have lived near naturally occurring psychoactive substances such as alcohol, poppy resin, and coca leaves may have undergone some inborn change of taste for these agents, but the concentrated forms that lead to widespread abuse have been common for no more than four centuries (starting with rum and gin in the seventeenth century; Austin 1978). Hence, evolutionary biology cannot assure us that any psychoactive agent increases adaptive fitness. Likewise, although some of the learning mechanisms that M&S enumerate may lead to automatism where there is no motivational conflict, any robust pattern of consumption or abstention is based on reward (Heyman 2009).

Many people find some psychoactive agents beneficial even in the long view. That is, looking forward over more than the immediate future, we are glad of their availability; and looking backward, we are glad we consumed them. These are the cases that M&S raise for reasoned evaluation in the face of a disapproving social ethic. Hence, the question for evaluation should be how well we can separate the cases we will be glad of from those in which our preference will have proved temporary. M&S suggest that people should be taught to limit their use by “systematic analysis of the personal instrumentalization pattern” (sect. 7; italics removed); but in the light of our ingrained tendency to overvalue imminent rewards, this advice is glib.

If we want to undertake the controlled use of psychoactive substances, our problem is evident in M&S’s own text: “Euphoria ... is probably the greatest desire in human life” (sect. 4.2.7, para. 1), and “euphoria requires a considerably higher dose than the use of the drug effects for other instrumentalization goals” (sect. 4.2.7, para. 5). We will indeed need to know our “personal instrumentalization pattern,” but a simple cost-effectiveness analysis will not suffice. We must plan strategically – game theoretically – for how our evaluation of a psychoactive substance will change as a function of time, not only because of the hyperbolic way we discount its influence, but also because of how the aroused appetite may intensify this change. Our planning will be hindered by imperfect self-knowledge, especially when we keep from rehearsing our options so as not to arouse appetite; this avoidance may lead random reminders to evoke sudden craving for the substance (this case of recursive self-prediction described in Ainslie 2010). We will need to know how our own preferences are apt to change as a function of when the substance will be available and of how much we have already consumed. For example,

if we plan to stop at a lower level than euphoria, we need to take into account our likely reappraisal of this plan when we feel a lesser drug effect and take steps to forestall it.

Further complications: Euphoria per se may not lead to regret but do harm only to the extent that the urge to repeat it crowds out more sustainable sources of reward. A costly recurring urge may arise not only from euphoria, but also from a lesser instrumental level, for example, when a performer or driver feels like having drinks before starting out. And when repeated consumption is compatible with a normal lifestyle but otherwise costly, as with smoking, the intrusiveness of withdrawal symptoms becomes the dominant incentive to consume.

Many self-control methods have been described, most recently a person's interpretation of these urges as incentives in a repeated prisoner's dilemma (e.g., Hofmeyr et al. 2010). But it is hard for people to know in advance how well they will do, and after habituation has occurred, even their long-range preferences may have changed. Science does need to examine the instrumental utility of drugs, but a game-theoretic analysis with this many unknowns will often arrive at the same solution as the superstitious fear of addiction that M&S criticize: that the only bright line between abstinence and addiction is the line between abstinence and any consumption at all.

#### **Note**

**1.** This commentary is the result of work supported with resources and the use of facilities at the Department of Veterans Affairs Medical Center, Coatesville, PA. It is considered a work of the U.S. government and as such is not subject to copyright within the United States.

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