Addiction & the Humanities Vol. 3(4) – Addiction and Technology–From Sex to Drugs: Considering Evolution and Addiction

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With his book The Origin of the Species, Charles Darwin offered two fundamental scientific postulates: the first suggests that all living things on earth are descendents of earlier species (i.e., evolution); and, the second suggests that natural selection is the architect of evolution. Natural selection drives evolution through adaptations to environmental challenges. Organisms that develop beneficial adaptations, increasing the likelihood that they will survive, are more likely to pass on these adaptive genes to their offspring than organisms that fail to develop beneficial adaptations. Consequently, over time, the organisms that fail to adapt and survive contribute fewer genes and become less prominent in a species. Although scientists and others often think about evolution with respect to physical changes among a species, the theory of evolution also can provide a unique perspective about behavioral processes that emerge within a species, such as addiction. In this week's Addiction and the Humanities, we consider the application of evolutionary theory to addiction by examining evolution and addiction in terms of species, individuals, and science.

I. Evolution of Addiction: The Species

Many phenomena make the existence of addiction possible. Two quirks of evolution deserve special mention. First, the brain's reward system (See WAGER's 8(30);8(31);8 (33)), which functions to reinforce important behaviors like eating, drinking, sleeping, and engaging in sex, is vulnerable to corruption. Many drugs of abuse mimic naturally occurring neurotransmitters that activate the brain's reward system (Hall, 2002) – coopting it for purposes not part of the original design. This ability to mimic natural neurotransmitters, in a mainly effortless but reliable way, can contribute to ongoing drug taking. Panksepp, Knutson, and Burgdorf (2002) assert that this is why we consider psychoactive drugs to "commandeer" normal functions of the reward system. (Hembolt, 1902)

Second, most addiction involves ingesting, in some way, plant related substances. The existence of these substances probably emerged, however, not to promote other species to consume plants, but to prevent predatory species from consuming plants. Nesse (2002) points out that developing mind-altering substances might be a method of defense and way to ensure their safety because plants cannot run away. Ironically, the natural toxins, which deter some predators from consuming these plants, have served as temptations for humans who discovered and find attractive their psychoactive properties. The evolutionary development of the reward system and the evolutionary development of defense toxins in plants were likely independent; however, the interaction of these consequents of evolution creates the opportunity for addiction.

II. Evolution of Addiction: The Individual

Evolutionary adaptations have made addiction possible for humans as a species, and similar processes contribute to the development of addiction within individuals. Consider the syndrome view of addiction (Shaffer et al., 2004). According to this model, people have different sets of risk factors: neurobiological, psychological, and social. The more risks factors, the greater an individual's chance of developing addiction. However, being at-risk is not sufficient for the development of addiction. An individual also must gain exposure to an object of addiction and interact with that object before addiction can develop. Further, an individual's interaction with a particular object must stimulate a desirable change in subjective experience (e.g., relief of discomfort, or creation of pleasure). That is, for addiction to develop, people must experience repeated interactions with the object and those interactions must produce a recurring desirable subjective shift. After a repeated history of desirable experience, addiction can emerge.

Most anything can become an object of addiction; however, those things that more reliably and robustly generate desirable subjective shifts are more likely to become objects of addiction. Leaps in technology have yielded new potential objects of addiction, such as synthetic and "designer drugs", drug combinations, and tools that increase the potency of drug administration (e.g., hypodermic needles). Most recently, people have identified computers, the Internet, and slot machines as potential objects of addiction. Supporting this belief, research suggests that some non-chemical objects of addiction (e.g., money) can activate the same regions of the brain as psychoactive drug objects of addiction that co-

opt the reward system (e.g., cocaine) (Breiter, Aharon, Kahneman, Dale, & Shizgal, 2001). Such findings suggest that novel technology creates new opportunities for addiction, as technology often changes more rapidly than evolutionary adaptations.

III. Evolution of Addiction: Science

The observation that many different objects can be involved in addiction, even those that do not artificially co-opt the reward system (e.g., gambling), has contributed to an evolution of theories of addiction. Consistent with Kuhn's (1970) representation of scientific advance as a shift in paradigms, addiction science has evolved as new research forced its guiding models to adapt. Early conceptions of addiction were morality-based or object-based (i.e., objects, such as drugs, cause addiction). More recently, scientists have considered addiction in a more encompassing way. New research suggests that the objects of addiction are less important to the process of addiction than initially imagined (Shaffer et al., 2004). For example, evidence has shown a shared genetic vulnerability for pathological gambling and alcohol dependence (Slutske et al., 2000). Similarly, twin studies have identified common genetic and environmental risk factors for different objects of addiction (Kendler, Jacobson, Prescott, & Neale, 2003). Earlier conceptualizations of addiction could not account for such evidence; consequently, a new model of addiction that adapts and integrates such new research emerged.

IV. Concluding Thoughts

Perhaps, while examining the beak length of various bird species, it was not Darwin's intent to investigate addiction. Nonetheless, Darwinian evolution provides a useful lens for understanding addiction within species, individuals, and science. For example, evolution allows us to consider that although addiction appears to be purely destructive, for some people, under certain circumstances, it might serve some adaptive function. Although it is uncertain whether addiction advances the goal of propagating the species, it can satisfy an individual's goal to get from one day to the next in a stressful world. If we view evolution as a tool, perhaps it can advance our understanding of where we have come, as a species, as individuals, and as a field. This might help us better prepare for our future.

What do you think? Comments can be addressed to Erinn Walsh.

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