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Introduction – brain and addiction

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Addiction is the compulsive engagement with an activity despite recognition of undesirable consequences. Although seemingly straightforward, discussions of addiction are often controversial, touching on people's beliefs about the nature of responsibility and what constitutes healthy or unhealthy behavior. In this debate, positions have ranged from Thomas Szasz's arguments for addiction being invalid as a medical concept (Szasz, 1960), to more recent trends in clinical practice where a wide range of behaviors are diagnosed as 'process addictions'. Increasingly, clinicians have focused on the fact that both addictive substances and compulsive behaviors involve common neurophysiological pathways for reward and reinforcement. As these topics are deeply important from both clinical and basic science perspectives, this special issue of *Socioaffective Neuroscience & Psychology* features discussions of the neural basis of addiction.

Prause and colleagues (2013) in their study measured electroencephalographic correlates of responses to visual erotica in individuals who self-report problems in regulating their consumption of such images. The P300, a waveform that has been observed to track salience (albeit not valence), was found to negatively correlate with a measure of sexual desire for sex with a partner, but not other measures of hypersexuality and compulsivity. According to the authors, degree of sexual desire may be sufficient for explaining problematic erotica consumption. Moreover, they suggest that the use of addiction-related labels may be counterproductive in clinical practice.

An alternative perspective is offered in the study by Hilton (2013). Drawing upon evidence from animal studies of consummatory behavior and neural receptor dynamics, he argues that compulsive sexual behaviors likely share neurological underpinnings with other addictive behaviors, in particular focusing on the mesolimbic dopaminergic reward system and the cellular effects of Delta FosB in facilitating long-term plastic changes. Toward the end of this article, the author expresses concern that excessive use of Internet pornography may have deleterious consequences on people's sexual functioning.

These two articles present conflicting points of view, which according to Hilton, represent a case of incompatible Kuhnian paradigms (Kuhn, 1962), where distinct theoretical approaches produce ineffective communication and failed discourse. Indeed, it is likely that these articles will be most convincing to those who were already convinced. Critics of Prause will emphasize methodological limitations (which can be found in all studies), and critics of Hilton will emphasize the need for further translational data to bridge human and non-human models (which is always the case with animal literatures).

As with many long-standing debates, opposing views may be simultaneously correct, albeit with respect to different topics. Given that the neural correlates are so similar for responses to sexual stimuli and for cues depicting other types of rewards (Georgiadis & Kringelbach, 2012), it is quite possible that some individuals might develop addictive dynamics. On a cellular level, these similarities may be due to a common involvement of molecular mechanisms involving dopamine and Delta FosB. However compelling these converging lines of evidence may be, maintained skepticism is also understandable. Neural correlates for lasting reinforcement may be observed, but their precise significance on the behavioral level remains uncertain. The neurophysiological level of analysis may be informative, but other aspects of addiction may be best described in terms of cognitive processes, behavior, phenomenology, and even psychodynamic analyses (Estellon & Mouras, 2012).

As Brevers and Noël (2013) describe in their article, multiple systems interact in influencing addiction propensity. First, they discuss structural factors that contribute to the development and persistence of addictive behavior patterns. Then, they review evidence for atypical cognition and related neural systems, showing how addictive dynamics can be facilitated by hyperactive impulsivity, hypoactive reflectivity, as well as the relationship between interoception, craving, and self-regulation. Finally, they discuss the implications of these models for treatment recommendations. This in-depth and multilevel account of pathological gambling provides a valuable case study for understanding addictions in general. Indeed, precisely the sort of research is needed in order to make progress in determining whether it is appropriate to consider compulsive sexual behaviors in terms of an addiction model.

Although different levels of analysis may be more or less appropriate for understanding different phenomena, synergistically greater insights may be obtained when different perspectives are considered simultaneously. This special issue on addiction has been organized for just this

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purpose and to provoke further discussion. We hope that the authors (as well as novel contributors) will utilize this forum to respond to submissions and provide further commentaries on these deeply important topics.

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