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## What integrated interdisciplinary and translational research may tell us about addiction

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In his article (1), Kalant raises important points regarding how addiction is conceptualized and researched. This topic seems particularly timely given current preparations for the next editions of the International Classification of Diseases and Diagnostic and Statistical Manual (DSM). At the article's onset, Kalant provides a definition for addiction: "compulsive use of the drug despite the occurrence of adverse consequences." Although this definition was widely agreed upon in prior iterations of the DSM including the current DSM-IV-TR (2), several DSM-V research workgroups (including those relating to substance use disorders and obsessive-compulsive spectrum disorders) have recently discussed at length the extent to which non-substance behaviors or disorders (e.g., related to gambling) should be considered addictions (3).

Kalant cites the importance to studies of addiction of the decision to self-administer drug (or by extension engage in the potentially addictive behavior) by individuals who become addicted. Decision-making represents an important and arguably central component of addiction (4), and performance of individuals with addictions on neurocognitive tasks assessing decision-making has been associated with treatment outcome (5) and real-life measures such as the ability to maintain employment (6). Precisely how decision-making relates to addictions, however, is less clear. For example, individual differences in decision-making prior to substance exposure could lead to initial engagement in substance use and substance use may generate sub-optimal decision-making. Animal models seem particularly well suited to investigate such questions, and pre-clinical studies indicate that not only does substance-naïve impulsive decision-making predict substance self-administration (7,8), but also that substance intake, likely in a developmentally sensitive fashion, influences decision-making (9).

Decision-making and related processes (e.g., impulsivity) represent complex, multi-faceted constructs (10), with their expression influenced by genetic and environmental factors in a dynamic and complicated fashion. Multiple individual differences, including those relating to gender, emotional reactivity, stress responsiveness, among others, represent important considerations with respect to addictions and frequently co-occurring disorders, and an improved understanding of how individual differences relate to decision-making and

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addiction will likely be facilitated by an integrative translational research approach involving multiple disciplines (11). Such approaches ideally might involve studying behaviors (e.g., through analogous tasks in pre-clinical and clinical settings) and using assessments (e.g., relating to brain imaging or genetics) across species such that findings from each study might be directly linked with one another while at the same time affording unique insight through the utilization of “species-specific” techniques (e.g., through self-report, diagnostic, and real-life measures in human studies and genetic manipulation and neurochemical measurements from brain tissues in pre-clinical studies) (12). I currently have the privilege of participating in an interdisciplinary research consortium on stress, self-control and addiction (<http://stress.yale.edu/> and <http://stress.yale.edu/projects.html>). The consortium includes ten coordinated and integrated investigations that involve rats, non-human primates and humans and use molecular/cellular, genetic, brain imaging, behavioral, clinical and epidemiological approaches. While there exist organizational and logistical challenges in conducting interdisciplinary team science, such an approach holds significant promise for understanding complex neuropsychiatric conditions like addiction that are currently frequently refractory to existing treatments (13). Even if such studies do not identify the cause of addiction (14), they have tremendous potential for generating significant advances in prevention and treatment strategies and reducing the suffering and societal burden currently associated with addictions.

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