

Criteria for conceptualizing behavioral addiction should be informed by the underlying behavioral mechanism.

Richard J. Tunney & Richard J.E. James  
University of Nottingham

### **Concise Statement**

The criteria used to determine a behavioral addiction should be based on an understanding of the underlying psychological mechanisms. This should include an analysis of whether the behavior itself has psychological features that might externally determine the individual's behavior.

### **Keywords**

Behavioral addiction, gambling, associative learning, preoccupation, extinction, perseveration

### **Statement of competing interests**

The authors declare that they have no competing interests.

Kardefelt-Winther et al (1) make a number of important points with respect to the criteria for defining behavioral addiction. We welcome their cautionary note, and agree that the old recipe is both logically fallacious and risks labeling normal behavior as pathological. In this commentary we make the case that any new recipe or criteria for behavioral addiction must include an analysis of the behavior itself within a framework informed by the principles of associative learning.

The current zeitgeist for creating new forms of behavioral addiction, or rather new things to be addicted to, conflates enthusiasm and passion with pathology. As the authors' point out, engaging in a behavior to the extent that other people judge it to be excessive places an arbitrary threshold on what constitutes a normal level of behavior, rather than on meeting objective criteria for addiction. Similarly, we agree that the mere correlation of a behavior with factors that are also known to be correlated with substance addiction, is a logical error. We agree that this risks pathologizing common behaviors but also risks trivializing behaviours that may be shown to cause significant harm. What constitutes a normal level of behavior for an athlete, collector or hobbyist, may not be a normal level of behavior for the partial observer. Indeed the often cited claim that 10,000 hours of practice are required to become an expert in any field, requires a level of dedication that to the observer might be considered excessive (2, 3). But if that were the case then all experts, hobbyists, and athletes may be behavioral addicts. As the authors' point out, functional impairment is a necessary criterion for dependence, but may not be sufficient. Often these impairments may be functional in the life of the individual concerned, but even then many people will pursue their activities to beyond the point at which it affects their relationships and economic security. Our analyses based on the British Gambling Prevalence Survey show that pre-occupation with a behaviour, specifically gambling, does not discriminate between recreational gamblers and those who meet clinical threshold (4). Instead we suggest that an appropriate recipe for behavioral addiction should be based on the psychological principles underlying associative learning rather than the frequency of the behaviour. This is a general point concerning research

methodology and the conception of a behavior as 'addictive', that speaks to the weaknesses of first stage in the 'old recipe'. In our view this stage ought to be based on an analysis of whether the behavior itself has psychological features that might externally determine the individual's behavior. This might take the form of asking, does the behavior have an identifiable external reinforcer that acts on a cognitive or behavioral process, and does the behavior show phenomena typical of pathology such as persistence in extinction such as when the external reinforcing property of the behavior has been removed.

For example, gambling meets all of the features for a behavioral addiction using the old recipe. It also shows clear features that the underlying psychological process is associative in nature. For example, money is a clear external reinforcer that results in a conditioned instrumental response, namely gambling. In the problem gambler the response to the conditioned stimulus is different to that seen in recreational gamblers (5). Nonetheless we suggest that this is best understood using a common underlying psychological mechanism, but that the difference between the problem and the recreational gambler may be one of a parameter shift governing the associative strength between the behavior and its reward, or the valuation of the reward. It is this parameter shift that might manifest on other measures as impulsivity or low mood. Parameter shifts in behavioral mechanisms are known to be related to the amount of visual attention directed toward conditioned rewards (6). These are commonly seen in substance addictions, and we should expect to see similar abnormal attention in behavioral addictions, but not behaviors that people have a normal relationship with.

Addictive behaviors are also difficult to extinguish (7, 8). We would expect to see other features common in gambling and substance addictions such as a persistence in the behavior after the reinforcing properties of the behavior have been removed (9). For example, the pattern of rewards in some games can lead some gamblers to continue to gamble long after they have stopped winning (10). Similarly, alcohol dependent people continue to drink long after they cease to enjoy drinking. Resistance to extinction should be a key criterion in any behavioral addiction. Typically, people who do not enjoy exercise are unlikely to continue to do so after it has ceased to be pleasurable or beneficial. But the individual who exercises to excess in the absence of any obvious reward might merit further study. A key feature of clinical dependence is that the persistence of the behavior despite increasing costs indicative of the hyper-valuation of the reward. This essentially economic model could explain the persistence of the behavior in extinction because as the subjective expected value of the reward is higher in dependent than recreational use, it requires a lengthier period without reward to become extinguished (11, 12). One can examine the causes of this parameter shift, and these may be psychological, sociological or genetic in origin, but the persistence of the behavior results in a pathological behavior and dependence related harms (13).

Many reported behavioural addictions only superficially consider associative and operant principles of behavior, but they rarely consider the reinforcement schedule of the behavior and its reward, or indeed what the reward might be. We regard this as a fundamental point from which to analyze and potentially categorize a behavior as a candidate for behavioural addiction (14).

## References

1. Kardefelt-Winther D, Heeren A, Schimmenti A, van Rooij A., Maurage P, Carras M, et al. How can we conceptualize behavioural addiction without pathologizing common behaviours? *Addiction*. 2017;xx:xx-xx.
2. Ericsson KA, Krampe RT, Tesch-Römer C. The role of deliberate practice in the acquisition of expert performance. *Psy Rev*. 1993;100:363-406.
3. Gladwell M. *Outliers*. New York: Little, Brown and Company; 2008.
4. James RJE, O'Malley C, Tunney RJ. Loss of control as a discriminating factor between different latent classes of disordered gambling severity. *Journal of Gambling Studies*. 2016;32:1155-73.

5. Orgaz C, Estévez, A., & Matute, H. Pathological gamblers are more vulnerable to the illusion of control in a standard associative learning task. *Frontiers in Psychology*. 2013;4.
6. Field M, Werthmann J, Franken I, Hofmann W, Hogarth L, Roefs A. The role of attentional bias in obesity and addiction. *Health Psychology*. 2016;35:767-80.
7. Bouton ME. Why behavior change is difficult to sustain. *Preventative medicine*. 2014;68:29-36.
8. Bouton ME, Winterbauer NE, Vurbic D. Context and extinction: Mechanisms of relapse in drug-self-administration. In: Haselgrove M, Hogarth L, editors. *Clinical Applications of Learning Theory*. Hove: Psychology Press; 2012. p. 103-34.
9. Horsley RR, Osborne M, Norman C, Wells T. High- frequency gamblers show increased resistance to extinction following partial reinforcement. *Behavioural Brain Research*. 2012;229:438–42.
10. James RJE, O'Malley C, Tunney RJ. Why are some games more addictive than others: The effects of timing and payoff on perseverance in a slot machine game. *Frontiers in Psychology*. 2016;7.
11. Hogarth L, Chase HW. Vulnerabilities underlying human drug deendence: Goal valuation versus habit learning. In: Haselgrove M, Hogarth L, editors. *Clinical Applications of Learning Theory*. Hove: Psychology Press; 2012. p. 75-101.
12. Vanderschuren LJ, Everitt BJ. Drug seeking becomes compulsive after prolonged cocaine self-administration. *Science*. 2004;305:1017-9.
13. Langham E, Thorne H, Browne M, Donaldson P, Rose J, Rockloff M. Understanding gambling related harm: A proposed definition, conceptual framework, and taxonomy of harms. . *BMC public health*. 2016;16.
14. James RJE, Tunney RJ. The need for a behavioral analysis of behavioral addictions. *Clinical Psychology Review*. 2017;52:69-76.