Erratum to: Developing Neurobiological Endophenotypes that Reflect Failure to Control Alcohol Consumption and Dependence

Hollis C. Karoly · Sarah L. Hagerty · Kent E. Hutchison

Published online: 18 March 2014
© Springer International Publishing AG 2014

**Erratum to: Curr Addict Rep, March 2014, 1:10–18
DOI 10.1007/s40429-013-0007-2**

Note the modification in the body of the article—“negative effect” is changed to “negative affect.” The manuscript should read as follows:

Relatedly, the three-stage model [56] suggests that addiction develops in three stages:

- binge/intoxication
- withdrawal/negative affect
- preoccupation/anticipation

This progression is accompanied by neurobiological adaptations that promote the addicted state. Recently, Karoly and colleagues [52] have extended the three-stage theoretical model to demonstrate the shifting imbalance between reward and control networks across each stage of the addiction cycle; as an individual progresses from recreational use to an addicted (dependent) neural state. Briefly, the extended model states

that during stage 1 (i.e., binge/intoxication), the reward network seems to be dysregulated with repeated drug use, such that responses to drug-related rewards increase, whereas the incentive value of natural reinforcers decreases [4, 27, 74, 88]. Repeated drug use is associated with an increase in connectivity between regions involved in negative affect and withdrawal [13, 68, 75, 99]. These changes lead to a downstream strengthening of reward areas in response to drug related cues, and concurrent weakening of control regions [45, 108], which serve to perpetuate compulsive substance use, characteristic of the preoccupation/anticipation stage. An example of an endophenotype derived from the three-stage model might involve targeting neurobiological adaptations characteristic of the withdrawal/negative affect stage, and might measure brain activation in response to visual alcohol cues among heavy drinkers undergoing acute or protracted withdrawal [52].

Additional work should implement cue-elicited craving paradigms among individuals experiencing acute or protracted alcohol withdrawal, to examine the role of craving and reward-responsivity during the withdrawal/negative affect stage.

The online version of the original article can be found at <http://dx.doi.org/10.1007/s40429-013-0007-2>.

H. C. Karoly (✉) · S. L. Hagerty · K. E. Hutchison
Department of Psychology and Neuroscience, University of
Colorado at Boulder, 345 UCB, Boulder, CO 80309-0345, USA
e-mail: hollis.karoly@colorado.edu

S. L. Hagerty
e-mail: sarah.hagerty@colorado.edu

K. E. Hutchison
e-mail: kent.hutchison@colorado.edu