Use of Technology to Manage Stimulus Cues and Reduce Drug Relapse: A STEAM-H (Science, Technology, Engineering, Arts & Math-Health) Initiative

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It is well-documented that individuals who go back into their communities after inpatient drug treatment experience high relapse rates in the first three to six months (i.e., 40-60 % will relapse, McLellan et al, 2000). One significant reason why this occurs is that individuals are immediately exposed to environmental stimuli related to their prior drug use (e.g. people, places, or things that are reminders of drug use). These cues increase drug urge intensity and heighten drug use risk (Horrell et al, 2010; Preston & Epstein, 2011). Although aspects of the environment – people, places and things – can be controlled to an extent, for example, by avoiding old drug using friends, transitioning directly to a recovery house, etc., drug-related cue exposure will naturally and inevitably occur at some point as patients return to their pre-treatment community spaces (Marhe, Waters, Wetering & Franken, 2013; Sinha, 20120; Wiers & Stacy, 2006).

Although there is a significant body of literature on the relationships among drug cue exposure, craving and drug use behavior, there is scant empirical attention to the neurobiology of recovery, and how *recovery-related sensory cues* (music & imagery) might be used in treatment and after discharge to enhance emotional regulation and reduce drug relapse. Developing technological wearable devices, like ear buds, special glasses or a watch, that help patients monitor their biobehavioral state and that strategically deliver real-time personalized patient-specific recovery cues to manage drug stimulus reactivity, may reduce the risk of relapse post-treatment.

Such a device could be programmed with a patient's specific neurophysiological drug cue reactivity threshold, and would deliver the preferred recovery-oriented music and imagery intervention through the device at the time of threshold activation to recalibrate the emotional system in favor of better behavioral decision-making (i.e., reduced drug use). If this proves effective, there is strong potential in applying such device design to other populations where executive functioning capacity is limited or impaired. For example, such a product could be used with older adult populations who have Alzheimer's or related dementias to reduce behavioral agitation, or with military populations who have TBI or PTSD.