Virtual Bar, Real Alcohol: Using VR to Understand Biopsychosocial Influences on Drinking Topography

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The microstructure of drinking events, known as drinking topography (DT), has a significant impact alcohol pharmacokinetics and, by extension, biobehavioral risk associated with alcohol use. Ecological momentary assessment studies suggest that higher rate of intake is associated with greater likelihood of negative consequences, including blackout, hangover, and nausea. However, it is very difficult to assess DT during real-life drinking episodes and the lack of experimental control over drinking context precludes strong causal inference regarding biopsychosocial influences on DT. To address these concerns, we developed the Integrated Topography and Consumption Tracking in Virtual Reality (INTACT-VR) platform. INTACT-VR is an open-source system that allows high-resolution measurement of the interval and volume of individual sips during self-paced drinking episodes within standardized VR environments. Importantly, data from our laboratory indicates DT within the INTACT-VR environment is highly consistent with that in physical simulated bar labs (ICC $\geq$ .83), increasing confidence that results of studies using INTACT-VR may be generalizable to real life drinking episodes. Manipulating characteristics of the VR environment enables direct investigation of how drinking context alters DT. For example, using INTACT-VR, we found that increasing the drinking rate of a virtual confederate within participants' sight line significantly decreased sip intervals ($p<.001$) and increased sip volume ($p=.006$). In another study, results indicated that LGBTQ individuals drank more slowly in a "neutral" bar than one with visual cues (e.g., flags, posters, etc.) explicitly indicating they were welcome ($p<.01$). This difference was greater among individuals reporting greater harassment, rejection, and discrimination related to being LGBTQ ($p=.029$). INTACT-VR can also be used to examine the effect of manipulations outside of VR on DT while keeping the environment constant. For instance, we found that application of painful heat during a drinking episode significantly increased drinking rate, especially among men ($p=<.001$) and participants with greater negative urgency (i.e., tendency to act impulsively to relieve a negative mood state; $p=.003$). Overall, evidence suggests INTACT-VR provides a sensitive, flexible, and cost-effective means of characterizing biopsychosocial influences on how, vs. simply how much, people drink. Better understanding these influences may provide new insights regarding potential interventions to reduce the speed of drinking and reduce alcohol-related harms.