

The Need for Multi-Participant Alcohol Administration Studies

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Abstract: Laboratory alcohol administration studies have largely neglected the social context in which drinking typically occurs. To advance our understanding of alcohol use and its associated harms, we need more multi-participant studies that examine alcohol's effects in social settings and how social contexts influence alcohol use.

Since the 1930s, researchers have conducted alcohol administration studies to better understand individual differences in alcohol's effects on emotions, behavior, and cognition that may explain underlying risk to develop alcohol use disorders (AUD) (e.g., 1,2). Since the vast majority of alcohol use occurs in social settings (e.g., with friends/family, with unfamiliar others in bars/at parties) (3–5), we wondered how often laboratory alcohol administration studies included a social context. To answer this, we conducted a systematic review of laboratory alcohol administration studies published through 2023, searching three databases (PsycINFO, PubMed, Web of Science) for studies in which human participants consumed a fixed dose of alcohol. In total, 5,690 records were screened for inclusion (see Figure 1). Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed. Two independent judges coded each article for inclusion/exclusion and whether the laboratory drinking setting was solitary or social (see pre-registration for additional details <https://osf.io/njvzd>).

Notably, as shown in Figure 1, of the 989 published alcohol administration studies we identified, 90.8% of them had participants consume alcohol alone in a solitary drinking setting. Less than 10% of studies featured a social context in which at least some of the participants interacted with at least one other participant or confederate during or after drinking alcohol. Importantly, in contrast to how alcohol is typically studied in the lab, outside of the lab, drinking most often occurs in the company of others. This is true for individuals across the lifespan (e.g., adolescents to older adults) and across the spectrum of alcohol use (e.g., light drinking to heavy and hazardous drinking) (3–5). For instance, 86% of drinking occasions for a nationally representative sample of over 60K British adults were in a social context (9). Further, in nationally representative samples of US high school seniors, 75.5% of past-year alcohol use

occurred “at a party,” (5) and three-fourths of seniors cited “to have a good time with friends” as the primary motive for their alcohol use (10). Even heavy drinking adults experiencing problems related to their alcohol consumption report drinking most often in social settings. For instance, in a large ($N=511$) sample of US male veteran hazardous drinkers (mean age=56 years), 73% of their past-week drinking occurred in social settings (11). Indeed, even for the minority of individuals who report ever drinking alone, the majority of their drinking also occurs with others (3,12). As such, drinking alone is a very unusual way for individuals to experience alcohol.

With respect to the 10% of laboratory studies that do incorporate social context, while 91 multi-participant alcohol administration studies may seem substantial, the vast majority of these studies had methodological limitations that make drawing firm conclusions difficult. Many of these studies were published prior to 1990, with more than half (55%) of all studies published two decades or more ago. Although the concept of statistical power has been recognized for much longer, it was not until Cohen's seminal work on power analysis was widely disseminated in the early 1990s (6) that consideration of sample size and adequate power became standard practice in research design. As such, with a median sample size of 54 participants and a mode of 40, the majority of these 91 multi-participant alcohol administration studies were underpowered to detect the small to moderate effect sizes established for alcohol (vs. control beverages) across multiple outcomes including, craving, positive affect, and subsequent consumption (see 7 for a meta-analysis).

In addition, both conceptually and statistically, most of these multi-participant alcohol administration studies treated participants as collections of individuals without regard for the reciprocal impact that interacting participants have on one another. Proper analysis of data from such studies requires statistical methods that account for the interdependence of behavior among

participants, such as linear mixed models or multilevel modeling (8). However, with very few (and recent) exceptions, nearly all multi-participant alcohol administration studies have focused on individual behaviors and have incorrectly ignored the nested structure of the data when conducting statistical analyses, potentially leading to biased estimates and invalid inferences. As such, despite much time and many resources devoted to this line of inquiry across nearly a century, we still lack a clear understanding of alcohol's effects in social settings and how social contexts influence alcohol use. This is a significant gap in our understanding of alcohol's typical effects, and it has implications for understanding both heavy alcohol use and the development of AUD.

Not only are there serious concerns with the ecological validity of solitary lab drinking settings, but these types of contexts do not permit the examination of alcohol's socially reinforcing effects thought to be critical to our understanding of AUD risk, including alcohol's potent ability to enhance feelings of social bonding and reduce feelings of social tension/discomfort (13,14). Furthermore, individuals report more reinforcing effects of alcohol and consume more alcohol while drinking with others vs. when drinking alone (15,16). Notably, this increased consumption in social contexts is not merely a matter of drinking more but also of experiencing alcohol in a way that may lead to more severe outcomes, such as driving while intoxicated, engaging in risky sexual behavior, and participating in alcohol-related violence (17). The degree of harm associated with alcohol use has also been found to increase with the size of the drinking group, particularly in public drinking establishments like bars and nightclubs (18,19). A full understanding of alcohol-related harm and AUD risk necessitates that our lab studies more closely align with how drinking occurs outside of the lab.

Although it is time-consuming and expensive to conduct well-powered multi-participant alcohol administration studies, the relatively few studies conducted to date show great promise in better understanding mechanisms of risk for problematic drinking. For instance, unlike prior studies testing participants in isolation, large multi-participant alcohol administration studies have demonstrated robust support for alcohol's effects on emotions and social reward, assessed across self-report and behavioral observations, in both social drinkers ($N=720$) (14) and heavy at-risk drinkers ($N=393$) (13). Importantly, group-level analyses accounting for the interdependence among group members in these studies uncovered social processes that could underlie an increased risk for alcohol-related problems. These processes included heightened coordination of smiling and speech patterns indicative of social bonding, as well as facial expressions suggesting reduced social tension or negative affect (13,14). Further, while a range of contextual factors can exert key effects on alcohol responses, social elements of context often emerge as most salient. Work by several research groups (13,14,18,20,21) indicates that, even in the absence of elaborate simulated real-world setups or laboratory-based "bars," the mere presence of other individuals is sufficient to elicit alcohol effects in the laboratory that mimic those reported by participants in the real-world. Taken together, these findings underscore the potential for multi-participant alcohol administration studies to yield valuable data regarding etiological mechanisms underlying AUD.

In sum, although alcohol is a social drug and believed to affect interpersonal processes in ways that might contribute to the development and maintenance of AUD, very little experimental research has explored alcohol's effects in social settings. To advance our understanding of alcohol use and its associated harms, we must prioritize research designs that reflect the social

nature of drinking. Multi-participant alcohol administration studies are critically needed to more effectively address the public health challenges posed by alcohol.

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