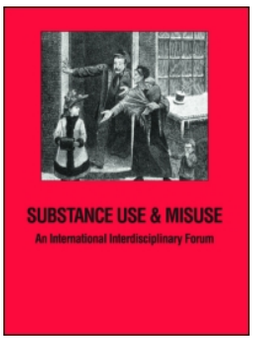

Substance Use & Misuse

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/isum20

A Proposal for a Taxonomy of Pre-Loading

Lee R. J. Hughes & Grant J. Devilly

To cite this article: Lee R. J. Hughes & Grant J. Devilly (2021): A Proposal for a Taxonomy of Pre-Loading, Substance Use & Misuse, DOI: 10.1080/10826084.2020.1869261

To link to this article: https://doi.org/10.1080/10826084.2020.1869261

Published online: 25 Jan 2021.

SUBSTANCE USE & MISUSE
https://doi.org/10.1080/10826084.2020.1869261

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

A Proposal for a Taxonomy of Pre-Loading

Lee R. J. Hughes[a,b] and Grant J. Devilly[a,b]

[a]School of Applied Psychology, Griffith University, Mount Gravatt, Australia; [b]Griffith Criminology Institute, Mount Gravatt, Australia

ABSTRACT

Background: Pre-loading of alcohol and other drugs has become a prevalent start to nights out in many countries. Studies into pre-loading have been using different operational definitions and descriptions, leading to confusion and debate in the research literature. *Purpose/Objective:* We wish to propose a full taxonomy so that research into preloading, of any substances, can be specific and standardized. *Methods:* We address this problem by analyzing (1) terminology used throughout the literature, (2) the evolving nature of this phenomenon, and (3) the operational components comprising this substance use practice. Additionally, we provide a context and rationale for how we view pre-loading in relation to the broader event-level session. *Results:* Our results propose a full operational definition and taxonomy of pre-loading to be used, and built upon, by researchers. We also provide a visual representation of pre-loading within an event-level session and provide a method to facilitate consistency across cultures. *Conclusions:* We propose that this system will lead to greater specificity and higher reliability in the interpretation of research results.

KEYWORDS

Pre-loading; pre-gaming; illicit drugs; alcohol; classification.

Harm resulting from the misuse of alcohol and other drugs inside Australian nighttime entertainment districts (NEDs) continues to generate responses from Government and expert research groups leading to an increase in media commentary, academic output, and policy amendments (Barton & Husk, 2014). Pre-loading is one significant predictor contributing to the burden of harm inside NEDs (e.g. Borsari et al., 2007; Devilly, Greber et al., 2019; Devilly, Hides et al., 2019; Devilly et al., 2017; Foster & Ferguson, 2014). Although pre-loading has received a considerable amount of attention over the past decade, we agree with other researchers (e.g. Devilly, 2018; Zamboanga & Olthuis, 2016) that the scope of pre-loading is not entirely understood and is evolving as a practice. Further, with different researchers using the term to mean different things, as outlined below, the term is currently confusing and nonspecific (cf. Devilly, 2018).

An example of this confusion, and a demonstration of the need for coherence and consistency in a pre-loading definition, is the exchange between Devilly (2018) and Miller et al. (2017) on this topic. In this exchange, Miller et al. questioned Devilly et al's. (2017) operational definition of pre-loading as their methodology comprised participants that had consumed alcohol at a location other than a domestic residence (i.e. at a suburban pub or hotel lobby) prior to entering a licensed venue. As discussed by Devilly (2018), however, the point raised by Miller et al. entices confusion surrounding the operational scope of what constitutes pre-loading as Miller and colleagues included in their previous studies participants that drank at sports bars before entering licensed venues as an example of pre-loading. Whilst it remains unclear why one would include pre-loading at a sports club but not a suburban pub, this exchange highlights the need for a classification model in which researchers' pre-loading practices can be specified.

Through this paper we seek to contribute to the discussion raised by Zamboanga and Olthuis (2016) on the topic of operationalizing pre-loading. In doing so we will discuss recent research highlighting the evolving nature of pre-loading and will use this information to develop our own definition. Our aim is to encourage discussion, promote consistency and raise awareness to concerns surrounding the use of terminology, shed light on how pre-loading conceptually fits within the broader event-level session, and provide a new operational taxonomy of pre-loading. We are not proposing that pre-loading be viewed intrinsically as a mental health disorder but, rather, we are proposing a taxonomy to increase specificity and consistency in research. Further, while we are aware that there are many different types of event-level drinking analyses that can be applied to the study of substance use (e.g. Harford, 1983), we are specifically focusing on pre-loading in the current paper (minor commentary on this to provide context and rationale for how we view pre-loading, other areas are highlighted as points for on-going discussion).

A priori considerations

In our early studies into alcohol use in nighttime entertainment districts (e.g. Devilly et al., 2017; Devilly, Greber et al., 2019) we needed to synthesis and review the pre-loading literature. The complexity of operationalizing this construct quickly became apparent, and one factor contributing to this was the abundance of synonymous terms used to reference this practice (e.g. pre-gaming, front-loading, tail-gating, and

CONTACT Grant Devilly grant@devilly.org School of Applied Psychology, Griffith University, Mt Gravatt, QLD 4122, Australia.

pre-partying, among others). However, this problem is unavoidable given that different interest groups (e.g. the general public, government authorities, and academics) from different geographical regions refer to this practice using different terminology. Consistent with this, other terms tend to imply a rigid and exclusive association to alcohol use. Some of these terms make specific reference to the consumption of alcohol in the title (e.g. pre-drinking, home-drinking, and warm-up drinking), but others do not. However, we take the perspective that a general and nonrestrictive term best reflects the breadth and evolving nature of this substance use practice – we use the term pre-loading. Although the term pre-loading may appear to lack specificity, it functions as an umbrella term that conceptually comprises both drug and/or alcohol use as subcomponents of a greater overarching practice. Another issue is ecological validity when asking questions, as outlined in more detail further below. In the current research we used the term pre-loading rather than pre-partying because in Australia people may see 'pre-partying' as an activity which does not necessarily involve the ingestion of alcohol or other drugs. However, when asking the questions to research participants we do understand the need to use a term which holds cultural and ecological validity for the sample under investigation and are not mandating any specific words.

Navigating substance specific terminology

Whilst we are not averse to the use of substance-specific terminology, we argue that specific attention should be directed toward clearly specifying what substances are being examined as part of this practice. Absence of this fosters ambiguity, which may then elicit confusion when examining the results of a study and the conclusions drawn. For this reason, caution surrounding the use such of terminology is warranted. For example, in cross-sectional field-based investigations of event-level substance use a term such as 'pre-drinking' would obviate drug use also being investigated. Another implication of this could be that pertinent information relevant to furthering our understanding of this practice could be overlooked (e.g. the prevalence/severity of harm specifically associated with both drug and alcohol pre-loading). To navigate this problem, we agree with the approach taken by O'Neil et al. (2016). After reflecting on various terminology and the occurrence of Cannabis use at pre-loading events (DeJong et al., 2010), O'Neil et al. emphasized that the specific focus of their study was on the 'drinking' component of this practice. Hence, they used the term pre-drinking to signify this.

Cultural considerations & re-framing consistency

In contrast to all other nonrestrictive terms, the term pre-loading is known and used by the Australian population. It has also shown to be a popular and long-standing term used among researchers operating out of Oceania (e.g. MacLean & Callinan, 2013; McCreanor et al., 2016; O'Rourke et al., 2016) and European countries (e.g. Boyle et al., 2009; Elgàn et al., 2019; McClatchley et al., 2014). Conversely, the use of other nonrestrictive terms may hold greater ecological merit dependent on the context and/or geographical location. For instance, the terms pre-gaming and pre-partying are commonly used by interest groups in the United States of America/South America (LaBrie et al., 2012; Moser et al., 2014; Pedersen & LaBrie, 2007; Pilatti & Read, 2018). Researchers from these locations may prefer to use these terms instead of pre-loading to mitigate confusion in their research methodologies and foster culturally consistent terminology among participants/their target audience. In line with this, the preferred selection of terminology has also shown to vary within a particular region. For example:

- Devilly et al. (2017) used the term pre-loading whereas Miller et al. (2017) used the term pre-drinking in Australia;
- Riordan et al. (2018) used the term pre-gaming whereas McCreanor et al. (2016) used the term pre-loading in their New Zealand based studies;
- Howard et al. (2019) used the term pre-partying whereas Barton and Husk (2014) used the term pre-loading in the United Kingdom; and
- Reed et al. (2011) used the term pre-partying/pre-drinking whereas Zamboanga and Olthuis (2016) preferred the use of pre-gaming in their North American studies.

To overcome these challenges, we suggest that researchers specify a 'primary' term (i.e. the culturally appropriate term predominantly used in reference to this practice) with accompanying 'secondary' terms (i.e. those terms that are commonly used terms, but less culturally relevant to the studies audience/location). 'Secondary' terms are often referenced in parentheses and typically at the beginning of a paper, subsequent to specifying the 'primary' term.

Differentiating the forrest from the trees

Our choice for opting to use the term pre-loading was also derived through careful consideration of the versatility of its morphological elements (i.e. the prefix 'pre' and the base 'loading'), the use of these elements in relation to the broader literature base, and their cultural applicability. There is a slow growing body of research drawing attention to the relevance and versatility of the term's prefixes (e.g. Forsyth, 2010; O'Rourke et al., 2016). This stems from its conceptual association to other practices at the event-level (e.g. side-loading and back-loading). The most commonly used prefix throughout the literature is 'pre' and to a lesser extent 'front' (Forsyth, 2010; O'Rourke et al., 2016). We chose to use the prefix 'pre' given its wide-spread popularity, use in conjunction with 'side'[1] and 'back'[2], and to maintain consistency when paired with its base 'loading' within the Australian literature base (O'Rourke et al., 2016).

[1]Side-loading refers to the use of a substance/s that has been smuggled into a specified target-event and/ or whilst transitioning between licenced premises (O'Rourke et al., 2016).

[2]Back-loading refers to the use of a substance/s after having transitioned out of a specified target-event (Forsyth, 2010).

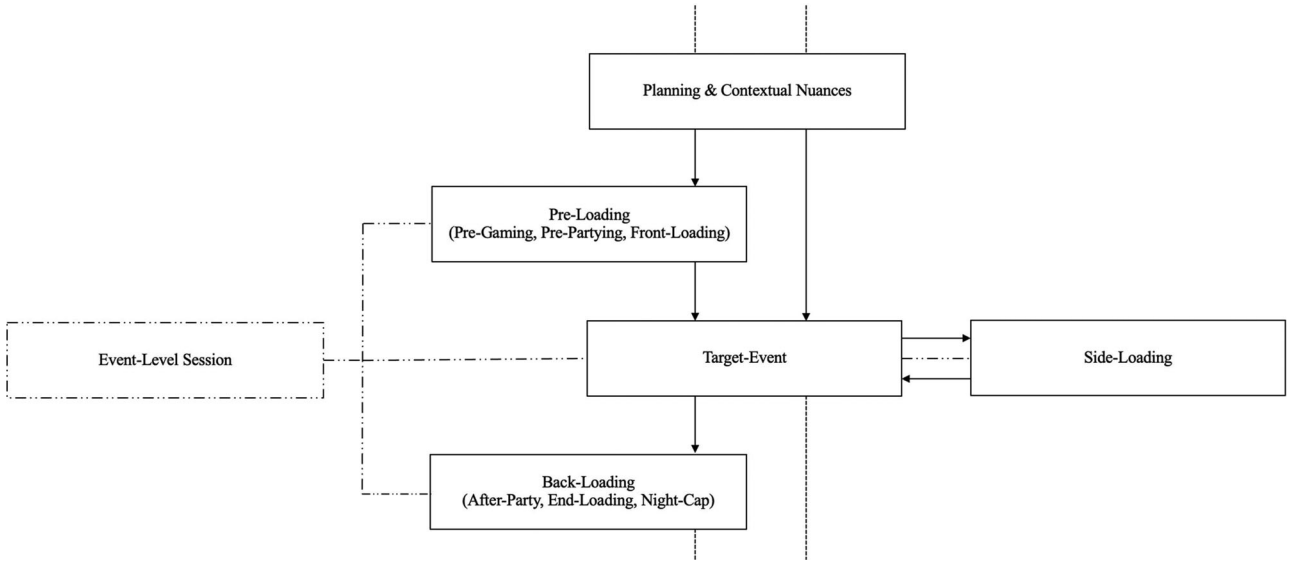

Figure 1. A visual representation of 'pre-loading', 'side-loading', target-event, and 'back-loading'.
Note: Each practice pertains to the broader session at an event-level – as indicated on the two-dash line. The dotted lines preceding 'planning and contextual nuances' are indicative of time and reflective of personal/cultural factors that may influence and motivate people's substance use practices. The solid arrowed lines reflect the trajectories of substance use practices an individual could engage in throughout the session. The dotted lines proceeding the 'target-event' phase and 'back-loading' phase reflect the end of the session. We have also listed common terminology used at each component to mitigate confusion and facilitate consistency within the literature base.

On describing the emergence of the pre-loading phenomenon, Barton and Husk (2012) suggest that party culture has evolved, marking a significant shift away from the traditional 'pub-club' pattern to a 'home-pub-club' or 'home-club' (O'Rourke et al., 2016) pattern of substance use. Similarly, findings from Forsyth (2010) and O'Rourke et al. (2016) highlight that pre-loading is just one component of a broader substance use repertoire that can include practices such as side-loading and back-loading. We believe that party culture/practices are evolving and have applied common terminology to reflect this – see Figure 1 for a visual representation of each practice in relation to the overarching event-level session. In this model we also incorporate a component pertaining to planning and context, as these are important to understanding the motives and cultural nuances associated with people's substance use practices (Barton & Husk, 2014; Forsyth, 2010). In sum, our rationale for selecting to use the term pre-loading came after much deliberation of its morphological components, its ecological merit within Australia, wide-spread use throughout the literature base, and how it can be applied in reference to conceptualizing the broader event-level session.

The evolving nature of pre-loading

In a recent study investigating peoples' pre-loading behaviors before and after legislative changes[3] in Queensland, Australia (Devilly, Hides et al., 2019), it was revealed that there is a growing subculture of individuals who admitted to having pre-loaded before entry to the NED. This pre-loading included drugs (i.e. 2015 = 2.72%, 2016 = 8.21%, and 2017 = 9.57%), as well as alcohol (from 72.81% registering a Breath Approximated Blood Alcohol Concentration level [BrAC] of greater than zero in 2015, to 83.26% in 2017). It was also found that since the introduction of these reforms people have increased the frequency of their pre-loading behaviors, were entering NEDs later, and were more inebriated when they arrived. This coincides with other research which has demonstrated that people are requiring more resource intensive aid earlier in the night due to the growing alcohol and drug pre-loading culture (Devilly & Srbinovski, 2019). The implications from these findings suggest that the scope of peoples' pre-loading practices has evolved past our current definitions. Although Devilly, Hides et al's. (2019) study is not the first study to allude to the use of drugs before people transition into another event (e.g. Miller et al., 2005, 2009, 2013; Nordfjaern et al., 2016), it is the first that clearly and deliberately investigates the use of drugs as a pre-loading event.

Why investigate drug pre-loading further?

Consistent findings throughout the literature have signified dangers associated with alcohol pre-loading. These harms include: increased signs of abuse and dependence; engagement in greater antisocial and other high-risk behaviors; susceptibility to victimization from physical and sexual assault; and experiencing more negative outcomes than those that did not preload (e.g. Borsari et al., 2007; Chaney et al., 2019; Devilly et al., 2017; Foster & Ferguson, 2014; Hughes et al., 2008; LaBrie et al., 2011). However, the harms resulting from drug pre-loading are yet to be quantified.

Retrospective accounts taken from drug users, once they have transitioned into the NED, have found that they are more likely to present significantly higher BrAC readings than non-drug users, engage in greater risk-taking behaviors (i.e. drink drive and consume larger quantities of alcohol over a longer duration), and are at greater risk of experiencing harms in and around licensed venues (Curtis et al., 2016; Miller et al.,

[3]This policy introduced several strategies that restricted the sale and service of alcohol towards the end of the night, ceased off-sale trading licenses at 10 p.m., and, later, introduced ID Scanning.

2013; Miller, Curtis, et al., 2015; Miller, Droste, et al., 2015; Pennay et al., 2017). Polysubstance use[4] has shown to further exacerbate experiencing these substance related harms, as well as risks associated with toxicity and overdose, mental health complications, and physical morbidity (Connor et al., 2014; Frei, 2010). As both alcohol pre-loading and drug use have shown to be strong predictors of experiencing harm inside NEDs, it is evident that drug use is a significant and important variable to consider in future pre-loading research.

Analysis of problem

The operational components of pre-loading

Consistent with Zamboanga and Olthuis (2016) discussion on the topic of defining pre-loading (they refer to this practice as pre-gaming), we too have found that past descriptions of this practice all share one core theme: pre-loading involves the use of a substance, or combination of substances, before going to a specified target-event (Devilly, 2018). However, some descriptions often note other features to provide clarity and context to this practice. These features can be thought of as specifiers. Specifiers that have been used in past research include, but are not limited to, the following:

i. Culture and demographics: age group (Barton & Husk, 2014), student and/or vocational status (Borsari et al., 2007; Zamboanga & Olthuis, 2016), socioeconomic status (Østergaard & Andrade, 2014), geographical location (Labhart et al., 2017);
ii. Contextual factors: whether it occurs alone or with groups of friends (Devilly et al., 2017), degree of supervision from authority figures (Wells et al., 2009), engagement in drinking games (Zamboanga & Tomaso, 2014), and pre-loading duration (Read et al., 2010);
iii. Event location/s: at home, a friend's house, a college dormitory, hotel/motel/hostel, suburban sports club/pub/bar, or an open public space such as a park, car park, or on public transport (Devilly, 2018; Devilly et al., 2017; Kuntsche & Labhart, 2013);
iv. Transition location: concert/festival, party, licensed venue inside town NEDs (Devilly et al., 2017; LaBrie et al., 2011), or sporting event (Merlo et al., 2011);
v. Substance use behavior: quantity used (Østergaard & Andrade, 2014), mixing substances (e.g., with energy drinks[5]; Devilly, 2018), and speed of consumption (Rutledge et al., 2014);
vi. Motivation: to achieve a desired level of intoxication before transitioning on to a location where other drugs/alcohol may or may not be consumed (LaBrie et al., 2011), to save money, or to foster a sense of control and reduce social anxiety (Barton & Husk, 2014), among several other substance related reasons (Rutledge et al., 2014). Alternatively, motives may not be primarily substance related (e.g., to socialize; MacLean & Callinan, 2013; Devilly et al., 2017) and may be influenced by cultural context (e.g., overcoming barriers to consumption in regions where the legal drinking age is 21 [North America] vs. much earlier [Europe, Australia, Canada, and New Zealand]/variations in social norms; see Labhart et al., 2017; Labhart & Kuntsche, 2017).

In the development of their definition, Zamboanga and Olthuis (2016) considered some of these features and built upon past work to capture the evolving nature of pre-loading. Although their definition was specific to alcohol pre-loading, we support their approach in developing a clear working definition of pre-loading. Recently, Devilly (2018) discussed the issue of pre-loading at home versus a suburban pub when transitioning to a NED and demonstrated the similarity in inebriation levels between the two locations. A specifier of location would obviate the need for this discussion.

Another benefit of supplementary specifiers is that they permit researchers to determine with greater precision what factors exacerbate the severity of intoxication at an individual level. In line with this, we suggest the need to consider markers of severity of inebriation (alcohol or other drugs/chemicals) to be another operational element of pre-loading that warrants specification. Level of intoxication (e.g. Blood Alcohol Concentration level or approximated *via* breath testing; micrograms per liter [μg/L] for drug concentrations) is one objective measure of inebriation severity that has been used in field-based research to gauge the breadth and depth of peoples' alcohol pre-loading practices (see Sorbello et al., 2018, on the reliability and validity of this approach). However, objective measures of intoxication do not always coincide with severity of impairment due to varying individual differences (e.g. differences between peoples' body mass indices, peoples' tolerance to substance use, and/or the frame between using a substance to testing/arrival to the event; Droste et al., 2018). This approach becomes even more complex and difficult to quantify in those that preload with drugs.

An alternative/supplementary approach is to examine markers of impairment severity. Impairment severity is measured by the number of criteria endorsed from an individual's own report, the report of knowledgeable others, and/or clinician observations of symptoms determined to be causing clinically significant impairment (American Psychiatric Association, 2013). Some examples of symptoms of drug/alcohol impairment may include: impaired reaction time; lowered inhibition; unsteady gait; slurred speech; confusion; mood fluctuations; impaired balance and motor control; stupor; and errors in reasoning, judgment, and perception (cf. The Diagnostic and Statistical Manual of Mental Disorders 5th edition for further descriptions of problematic behavioral/psychological changes that occur between alcohol and different classes of drugs; American Psychiatric Association, 2013).

[4]Polysubstance use refers to the consumption of more than one substance, simultaneously or at different times, over a session of substance use (Connor et al., 2014).

[5]An energy drink is one that contains a high percentage of sugar, caffeine, and/ or another stimulant (e.g., 'Red Bull', 'V', or pre-workout exercise supplements), which have been designed to help consumers overcome fatigue by providing them with a sudden boost of energy. This definition does not extend to include soft drinks containing caffeine (e.g., cola).

Table 1. Proposed core descriptions and specifiers for pre-loading (also referred to as pre-gaming, pre-partying, front-loading – specify other) research.

A. Core description: Pre-loading involves the use of a substance, which acts on the central or peripheral nervous system, before going to a specified event or other social gathering (i.e. the target-event).
B. Subtype: The use of at least one or more of the following substances over the course of the current pre-loading session:
1. Alcohol.
2. Illicit/misuse of drugs[a].
3. Mixed[b] – list all.
C. Pre-loading Location/s:
1. Private residence (e.g., at home, a friend's house, or a college dormitory).
2. Private closed space (e.g., hotel/motel/hostel or suburban sports club/pub/bar).
3. Public open space (e.g., a park, on public transport, or in the car park).
4. Multiple – list all.

Target specifiers: List those pertinent to the investigation:
1. Culture and demographics (e.g., age group, student and/or vocational status, and/or socioeconomic status, and ethnicity).
2. Contextual factors (e.g., whether it occurs alone or with groups of friends, degree of supervision from authority figures, engagement in drinking games, and/or pre-loading duration).
3. Transition location (e.g., concert/festival, party, licensed venue inside town entertainment districts, and/or sporting event).
4. Substance use behavior (e.g., quantity, mixing substances with energy drinks[c], and/or speed of consumption).
5. Motivation (e.g., to achieve a desired level of intoxication before transitioning on to a location where more substance may or may not be consumed, to save money, feel more relaxed, to socialize and/or specify culturally specific motives).

Severity specifiers:
1. Level of intoxication
i. Not assessed.
ii. Assessed - Objective (e.g., blood alcohol concentration level or approximated via breath testing[d]; micrograms per liter [μg/L] for drug concentrations).
iii. Assessed – Subjective (e.g., estimated standard units of alcohol from reported number of drinks; self-reported drug intake).
2. Impairment severity[e]:
i. Not assessed
ii. Assessed - None: No prominent symptoms present.
iii. Assessed - Mild: Presence of two – three prominent symptoms.
iv. Assessed - Moderate: Presence of four – five prominent symptoms.
v. Assessed - Severe: Presence of six or more prominent symptoms.

Notes.
[a]Drug use refers to the consumption of substances that are either illicit or are being misused (i.e. the substance was manufactured, distributed, and/or consumed at quantities for recreational purposes and not at quantities to treat a medical condition under the supervision of a health care professional).
[b]Polysubstance use refers to the consumption of more than one substance, simultaneously or at different times, over a session of substance use.
[c]An energy drink is one that contains a high percentage of sugar, caffeine, and/or another stimulant (e.g. 'Red Bull', 'V', or pre-workout exercise supplements), which have been designed to help consumers overcome fatigue by providing them with a sudden boost of energy. This definition does not extend to include soft drinks containing caffeine (e.g. cola).
[d]As a frame of reference, the legal drink driving limit in Australia is less than .05 BAC g/dL.
[e]We refer to observation of markers of impairment severity – measured by the number of criteria endorsed from an individual's own report, the report of knowledgeable others, and/or clinician observations of symptoms determined to be causing clinically significant impairment (cf. The Diagnostic and Statistical Manual of Mental Disorders 5th edition as a point of reference for markers of impairment severity).

Suggested solution

Operational definition of pre-loading

In order to capture the evolving nature of this practice within the NED, we operationalize pre-loading as:

- The use of alcohol and/or other substances, either individually or in groups, at a private residence or closed space (e.g., at home, a friend's house, or hotel/motel/hostel) and/or public space (e.g., a park, on public transport, suburban sports club/bar/pub), before going to a target-event.

In developing this definition, we incorporated the core theme of pre-loading, captured the evolving nature of peoples' substance use practices, broadly specified some contextual parameters, and specified the transitioning location.

Operational criteria of pre-loading

Considering the research discussed thus far, we have consolidated this information to develop a criterion-based model of pre-loading that can be used to assist researchers, as outlined in Table 1.

Practical application

The purpose of this research is to open a dialogue on being more consistent and specific in pre-loading research. The key strengths to the suggested approach are that the application of this definition: streamlines researcher definitions, increases the specificity of research and, hence leads to more nuanced studies, easier replication, and increased reliability. This model can be applied to all contexts in which pre-loading occurs and regardless of what terminology is used.

As an example, for using this taxonomy, we have applied it to Devilly et al's. (2017) *Smart Start* study. In this case, we would operationalize their study of pre-loading as:

- Pre-loading of alcohol, in public and private (residences and closed) spaces: Targeting demographic and cultural factors, within a NED transition location; assessing substance use behavior (energy drink mixing), and motivations for pre-loading; assessing severity (objective) by obtaining BrAC; no assessment of impairment.

Clinical application

Whilst we are not proposing this as a type of diagnosis, the use of this model could be used as a descriptor (a state of

intoxication/inebriation) within clinical settings. We anticipate the utility of this would foster and provide a common language for clinicians to use when assessing the nature, type, and severity of this risky substance use practice. Clustering the operational components/symptoms of pre-loading into an understandable group would assist clinicians and researchers in providing a concise description of the essential aspects of a patient/client/participant's condition. Providing operational clarity and knowing what factors may be contributing to the problem associated with pre-loading is a crucial aspect of conducting an assessment, and a necessary step toward developing effective treatments to resolve those problems. Moreover, its use as a descriptor in clinical application may provide guidance on possible co-existing problems or conditions that should be evaluated (e.g. substance use addiction). Although a notable danger of this may extend to pathologizing the pre-loading phenomenon, engaging in this risky practice has shown to be the strongest predictor of end of night harm – more so than demographics, body mass index, and personality (Devilly, Greber et al., 2019).

Recommendations for future development

Throughout this paper, the focus of our attention was specifically directed on examining and operationalizing the evolving nature of pre-loading practices. In doing so, we have also drawn attention to other substance use practices that occur around primary target-event (i.e. side- and back-loading) and conceptualized these as subcomponents of an overarching event-level session of substance use. Through examining the operational and methodological challenges associated with pre-loading, we feel that the same approach could be applied to classifying each of these practices – either independently or within the larger context of the session at the event-level. We feel clear exploration of all of these practices is warranted, particularly considering that the probability of experiencing harm increases the more 'loading' type practices in which a person engages (O'Rourke et al., 2016). Further examination of these areas is likely to shed greater light on the motives and strategic nuances of these practices, as well as the risks and harms involved (Forsyth, 2010; Guedes De Agostini Sossio, 2020; O'Rourke et al., 2016). The utility of such research would greatly inform harm minimization/prevention efforts targeting risky substance use at each specific phase of the event-level session.

Considering how these terms have been operationalized in past studies, we provide a starting point for further discussion on this by identifying the core themes associated with side- and back-loading. Using nonrestrictive terminology, we detail these as follows:

- Side-loading' refers to the use of a substance purchased from outside the primary target-event after having transitioned to (e.g., discretely consuming drugs inside a festival or smuggling straight spirits to mix with purchased soft drinks) and/or whilst transitioning between licensed premises (e.g., consuming alcohol purchased from off-license sales between exiting a night club and entering another; O'Rourke et al., 2016).
- Back-loading refers to the use of a substance/s after having transitioned out of a specified target-event (e.g., consuming alcohol after having returned home from a night out and/or using a depressed drug to counteract the unwanted effects of a stimulant drug; Connor et al., 2014; Forsyth, 2010; O'Rourke et al., 2016).

Conclusion

Pre-loading is a worldwide growing phenomenon that is sensitive to environmental factors (e.g. tax, cost, cigarette smoking practices, and increased rules and regulations inside licensed venues) and a strong predictor of experiencing harm. Throughout this investigation we have raised awareness to the challenges of terminology selection and drawn attention to recent research that suggests peoples' pre-loading practices have evolved past the scope of our current operational definitions. As this is the case, we have developed and proposed a criterion-based model of pre-loading that emphasizes sensitivity and specificity. By broadening the operational scope of the substances with which people pre-load and specifying the contextual parameters in which the construct is being examined, we predict that this will provide new avenues for discussion and research. Moreover, we hope that future research will extend upon the proposed taxonomy with consideration of the broader practices associated at the event-level (i.e. side- and back-loading). Findings of such research would be of benefit to those working in the field of harm prevention, emergency and street-based services (e.g. night-watch and recovery spaces), policy development, and staffing for venues. In effect, we argue that what and how much people ingest before a target-event has real and important relevance for those attending, policing and researching the event, and that legislation and treatment strategies need to be considerate of this pre-loading.

Authors' contributions

Hughes and Devilly conceptualized the idea together. Hughes & Devilly wrote the paper together.

Conflicts of interest/competing interest

None. In particular, the authors have not received any funding during this research from local or state governments, political organizations, lobby groups, temperance societies or 'health based registered charities', or companies involved in the supply or sale of alcohol.

License to publish

Exclusive license to publish this article is given.

Role of funding source

This research was not funded. Devilly has received past funding from the National Drug Strategy Law Enforcement Funding Committee. Alcolizer Technology has provided consumables for testing and calibrated breathalyzers in past studies and Mark Monaghan and Rapiscan Systems have loaned an Itemizer 3 Ion Scanner and donated consumables and servicing.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Association Publishing.

Barton, A., & Husk, K. (2012). Controlling pre-loaders: Alcohol related violence in an English night time economy. *Drugs and Alcohol Today*, *12*(2), 89–97. https://doi.org/10.1108/17459261211235119

Barton, A., & Husk, K. (2014). "I don't really like the pub […]": Reflections on young people and pre-loading alcohol. *Drugs and Alcohol Today*, *14*(2), 58–66. https://doi.org/10.1108/DAT-12-2013-0055

Borsari, B., Boyle, K. E., Hustad, J. T. P., Barnett, N. P., O'Leary Tevyaw, T., & Kahler, C. W. (2007). Drinking before drinking: Pregaming and drinking games in mandated students. *Addictive Behaviors*, *32*(11), 2694–2705. https://doi.org/10.1016/j.addbeh.2007.05.003

Boyle, A., Wee, N., Harris, R., Tompkins, A., Soper, M., & Porter, C. (2009). Alcohol-related emergency department attendances, preloading and where are they drinking? cross-sectional survey. *Emergency Medicine Journal*, *26*(Suppl 1), 27–27. https://doi.org/10.1136/emj.2009.082099a

Chaney, B. H., Martin, R. J., Barry, A. E., Lee, J. G. L., Cremeens-Matthews, J., & Stellefson, M. L. (2019). Pregaming: A field-based investigation of alcohol quantities consumed prior to visiting a bar and restaurant district. *Substance Use & Misuse*, *54*(6), 1017–1023. https://doi.org/10.1080/10826084.2018.1558252

Connor, J. P., Gullo, M. J., White, A., & Kelly, A. B. (2014). Polysubstance use: Diagnostic challenges, patterns of use and health. *Current Opinion in Psychiatry*, *27*(4), 269–275. https://doi.org/10.1097/YCO.0000000000000069

Curtis, A., Coomber, K., Hyder, S., Droste, N., Pennay, A., Jenkinson, R., Mayshak, R., & Miller, P. G. (2016). Prevalence and correlates of drink driving within patrons of Australian night-time entertainment precincts. *Accident; Analysis and Prevention*, *95*(Pt A), 187–191. https://doi.org/10.1016/j.aap.2016.07.018

DeJong, W., DeRicco, B., & Schneider, S. K. (2010). Pregaming: An exploratory study of strategic drinking by college students in Pennsylvania. *Journal of American College Health*, *58*(4), 307–316. https://doi.org/10.1080/07448480903380300

Devilly, G. J. (2018). "All the King's horses and all the King's men … ": What is broken should not always be put back together again … . *The International Journal on Drug Policy*, *51*, 105–110. https://doi.org/10.1016/j.drugpo.2017.11.020

Devilly, G. J., & Srbinovski, A. (2019). Crisis support services in night-time entertainment districts: Changes in demand following changes in alcohol legislation. *International Journal of Drug Policy*, *65*, 56–64. https://doi.org/10.1016/j.drugpo.2018.12.007

Devilly, G. J., Allen, C., & Brown, K. (2017). SmartStart: Results of a large point of entry study into preloading alcohol and associated behaviours. *The International Journal on Drug Policy*, *43*, 130–139. https://doi.org/10.1016/j.drugpo.2017.02.013

Devilly, G. J., Greber, M., Brown, K., & Allen, C. (2019). Drinking to go out or going out to drink? A longitudinal study of alcohol in night-time entertainment districts. *Drug and Alcohol Dependence*, *205*, 107603. https://doi.org/10.1016/j.drugalcdep.2019.107603

Devilly, G. J., Hides, L., & Kavanagh, D. J. (2019). A big night out getting bigger: Alcohol consumption, arrests and crowd numbers, before and after legislative change. *PLOS One*, *14*(6), e0218161. https://doi.org/10.1371/journal.pone.0218161

Droste, N., Miller, P. G., Kaestle, C. E., Curtis, A., Hyder, S., Coomber, K., Pennay, A., Chikritzhs, T., Lam, T., & Gilmore, W. (2018). Comparing levels of blood alcohol concentration and indicators of impairment in nightlife patrons: Blood alcohol concentration and impairment. *Drug and Alcohol Review*, *37*, S348–S356. https://doi.org/10.1111/dar.12639

Elgán, T., Durbeej, N., & Gripenberg, J. (2019). Breath alcohol concentration, hazardous drinking and preloading among Swedish university students. *Nordic Studies on Alcohol and Drugs, 36*, 2, 145507251986354. https://doi.org/10.1177/1455072519863545.

Forsyth, A. J. M. (2010). Front, side, and back-loading: Patrons' rationales for consuming alcohol purchased off-premises before, during, or after attending nightclubs. *Journal of Substance Use*, *15*(1), 31–41. https://doi.org/10.3109/14659890902966463

Foster, J., & Ferguson, C. (2014). Alcohol 'pre-loading': A review of the literature. *Alcohol and Alcoholism (Oxford, Oxfordshire)*, *49*(2), 213–226. https://doi.org/10.1093/alcalc/agt135

Frei, M. (2010). Party drugs - use and harm reduction. *Australian Family Physician*, *39*(8), 548–552. http://www.racgp.org.au/download/documents/AFP/2010/August/201008frei_partydrugs.pdf

Guedes De Agostini Sossio, M. (2020). *A mixed methods study exploring Brazilian and United Kingdom University students' pre-drinking behaviour and alcohol use during nights out* [Doctoral dissertation]. Liverpool John Moores University.

Harford, T. C. (1983). A contextual analysis of drinking events. *The International Journal of the Addictions*, *18*(6), 825–834. https://doi.org/10.3109/10826088309033050

Howard, A. R., Albery, I. P., Frings, D., Spada, M. M., & Moss, A. C. (2019). Pre-partying amongst students in the UK: Measuring motivations and consumption levels across different educational contexts. *Substance Use & Misuse*, *54*(9), 1519–1529. https://doi.org/10.1080/10826084.2019.1590414

Hughes, K., Anderson, Z., Morleo, M., & Bellis, M. A. (2008). Alcohol, nightlife and violence: The relative contributions of drinking before and during nights out to negative health and criminal justice outcomes. *Addiction (Abingdon, England)*, *103*(1), 60–65. https://doi.org/10.1111/j.1360-0443.2007.02030.x

Kuntsche, E., & Labhart, F. (2013). Drinking motives moderate the impact of pre-drinking on heavy drinking on a given evening and related adverse consequences-an event-level study: Drinking motives moderate pre-drinking impact. *Addiction*, *108*(10), 1747–1755. https://doi.org/10.1111/add.12253

Labhart, F., & Kuntsche, E. N. (2017). Development and validation of the predrinking motives questionnaire. *Journal of Applied Social Psychology*, *47*(3), 136–147. https://doi.org/10.1111/jasp.12419

Labhart, F., Ferris, J., Winstock, A., & Kuntsche, E. N. (2017). The country-level effects of drinking, heavy drinking and drink prices on pre-drinking: An international comparison of 25 countries. *Drug and Alcohol Review*, *36*(6), 742–750. https://doi.org/10.1111/dar.12525

LaBrie, J. W., Hummer, J. F., Pedersen, E. R., Lac, A., & Chithambo, T. (2012). Measuring college students' motives behind prepartying drinking: Development and validation of the prepartying motivations inventory. *Addictive Behaviors*, *37*(8), 962–969. https://doi.org/10.1016/j.addbeh.2012.04.003

LaBrie, J. W., Hummer, J., Kenney, S., Lac, A., & Pedersen, E. (2011). Identifying factors that increase the likelihood for alcohol-induced blackouts in the prepartying context. *Substance Use & Misuse*, *46*(8), 992–1002. https://doi.org/10.3109/10826084.2010.542229

MacLean, S., & Callinan, S. (2013). "Fourteen dollars for one beer!" Pre-drinking is associated with high-risk drinking among Victorian young adults. *Australian and New Zealand Journal of Public Health*, *37*(6), 579–585. https://doi.org/10.1111/1753-6405.12138

McClatchley, K., Shorter, G. W., & Chalmers, J. (2014). Deconstructing alcohol use on a night out in England: Promotions, preloading and consumption. *Drug and Alcohol Review*, *33*(4), 367–375. https://doi.org/10.1111/dar.12150

McCreanor, T., Lyons, A., Moewaka Barnes, H., Hutton, F., Goodwin, I., & Griffin, C. (2016). Drink a 12 box before you go': Pre-loading among young people in Aotearoa New Zealand. *Kōtuitui: New Zealand Journal of Social Sciences Online*, *11*(1), 36–46. https://doi.org/10.1080/1177083X.2015.1037314

Merlo, L. J., Ahmedani, B. K., Barondess, D. A., Bohnert, K. M., & Gold, M. S. (2011). Alcohol consumption associated with collegiate American football pre-game festivities. *Drug and Alcohol Dependence*, *116*(1–3), 242–245. https://doi.org/10.1016/j.drugalcdep.2010.12.013

Miller, B. A., Byrnes, H., Branner, A., Voas, R., & Johnson, M. (2013). Assessment of club patrons' alcohol and drug use: The use of biological markers. *American Journal of Preventive Medicine*, *45*(5), 637–643. https://doi.org/10.1016/j.amepre.2013.06.014

Miller, B. A., Furr-Holden, C. D., Voas, R. B., & Bright, K. (2005). Emerging adults' substance use and risky behaviors in club settings. *Journal of Drug Issues*, *35*(2), 357–378. https://doi.org/10.1177/002204260503500207

Miller, B. A., Furr-Holden, D., Johnson, M. B., Holder, H., Voas, R., & Keagy, C. (2009). Biological markers of drug use in the club setting. *Journal of Studies on Alcohol and Drugs*, *70*(2), 261–268. https://doi.org/10.15288/jsad.2009.70.261

Miller, P. G., Chikritzhs, T., Droste, N., Pennay, A., & Tomsen, S. (2017). The need for accuracy and validity in research on nightlife and drinking: A commentary on Devilly et al. and recommendations for future research. *The International Journal on Drug Policy*, *50*, 36–40. https://doi.org/10.1016/j.drugpo.2017.09.001

Miller, P. G., Curtis, A., Jenkinson, R., Droste, N., Bowe, S. J., & Pennay, A. (2015). Drug use in Australian nightlife settings: Estimation of prevalence and validity of self-report. *Addiction (Abingdon, England)*, *110*(11), 1803–1810. https://doi.org/10.1111/add.13060

Miller, P. G., Droste, N., Martino, F., Palmer, D., Tindall, J., Gillham, K., & Wiggers, J. (2015). Illicit drug use and experience of harm in the night-time economy. *Journal of Substance Use*, *20*(4), 274–281. https://doi.org/10.3109/14659891.2014.911974

Miller, P. G., Ferris, J., Coomber, K., Zahnow, R., Carah, N., Jiang, H., Kypri, K., Chikritzhs, T., Clough, A., Livingston, M., de Andrade, D., Room, R., Callinan, S., Curtis, A., Mayshak, R., Droste, N., Lloyd, B., Matthews, S., Taylor, N., … Najman, J. (2017). Queensland Alcohol-related violence and Night Time Economy Monitoring project (QUANTEM): A study protocol. *BMC Public Health*, *17*(1), 789. https://doi.org/10.1186/s12889-017-4811-9

Moser, K., Pearson, M. R., Hustad, J. T. P., & Borsari, B. (2014). Drinking games, tailgating, and pregaming: Precollege predictors of risky college drinking. *The American Journal of Drug and Alcohol Abuse*, *40*(5), 367–373. https://doi.org/10.3109/00952990.2014.936443

Nordfjaern, T., Edland-Gryt, M., Bretteville-Jensen, A. L., Buvik, K., & Gripenberg, J. (2016). Recreational drug use in the Oslo nightlife setting: Study protocol for a cross-sectional time series using biological markers, self-reported and qualitative data. *BMJ Open*, *6*(4), e009306. https://doi.org/10.1136/bmjopen-2015-009306

O'Neil, A. I., Lafreniere, K. D., & Jackson, D. L. (2016). Pre-drinking motives in Canadian undergraduate students: confirmatory factor analysis of the Prepartying Motivations Inventory and examination of new themes. *Addictive behaviors, 60*, 42–47. https://doi.org/10.1016/j.addbeh.2016.03.024

O'Rourke, S., Ferris, J., & Devaney, M. (2016). Beyond pre-loading: Understanding the associations between pre-, side- and back-loading drinking behavior and risky drinking. *Addictive Behaviors*, *53*, 146–154. https://doi.org/10.1016/j.addbeh.2015.07.008

Østergaard, J., & Andrade, S. B. (2014). Who pre-drinks before a night out and why? Socioeconomic status and motives behind young people's pre-drinking in the United Kingdom. *Journal of Substance Use*, *19*(3), 229–238. https://doi.org/10.3109/14659891.2013.784368

Pedersen, E. R., & LaBrie, J. (2007). Partying before the party: Examining prepartying behavior among college students. *Journal of American College Health*, *56*(3), 237–245. https://doi.org/10.3200/jach.56.3.237-246

Pennay, A., Jenkinson, R., Quinn, B., Droste, N., Peacock, A., Lubman, D., & Miller, P. G. (2017). Investigating differences between drugs used in the Australian night-time economy: Demographics, substance use, and harm. *Substance Use & Misuse*, *52*(1), 71–81. https://doi.org/10.1080/10826084.2016.1214153

Pilatti, A., & Read, J. P. (2018). Development and psychometric evaluation of a new measure to assess pregaming motives in Spanish-speaking young adults. *Addictive Behaviors*, *81*, 134–142. https://doi.org/10.1016/j.addbeh.2018.01.019

Read, J. P., Merrill, J. E., & Bytschkow, K. (2010). Before the party starts: Risk factors and reasons for "pregaming" in college students. *Journal of American College Health*, *58*(5), 461–472. https://doi.org/10.1080/07448480903540523

Reed, M. B., Clapp, J. D., Weber, M., Trim, R., Lange, J., & Shillington, A. M. (2011). Predictors of partying prior to bar attendance and subsequent BrAC. *Addictive Behaviors*, *36*(12), 1341–1343. https://doi.org/10.1016/j.addbeh.2011.07.029

Riordan, B. C., Conner, T. S., Flett, J. A. M., Droste, N., Cody, L., Brookie, K. L., Riordan, J. K., & Scarf, D. (2018). An intercept study to measure the extent to which New Zealand university students pre-game. *Australian and New Zealand Journal of Public Health*, *42*(1), 30–34. https://doi.org/10.1111/1753-6405.12754

Rutledge, P. C., McCarthy, B. J., & Lendyak, R. M. (2014). Let's get this party started: The effects of descriptive and injunctive norms on preparty behavior in college students. *Substance Use & Misuse*, *49*(1–2), 166–175. https://doi.org/10.3109/10826084.2013.824473

Sorbello, J. G., Devilly, G. J., Allen, C., Hughes, L. R. J., & Brown, K. (2018). Fuel-cell breathalyser use for field research on alcohol intoxication: An independent psychometric evaluation. *PeerJ*, *6*(3), e4418. https://doi.org/10.7717/peerj.4418

Wells, S., Graham, K., & Purcell, J. (2009). Policy implications of the widespread practice of 'pre-drinking' or 'pre-gaming' before going to public drinking establishments: Are current prevention strategies backfiring? *Addiction (Abingdon, England)*, *104*(1), 4–9. https://doi.org/10.1111/j.1360-0443.2008.02393.x

Zamboanga, B. L., & Tomaso, C. C. (2014). Introduction to the special issue on college drinking games. *The American Journal of Drug and Alcohol Abuse*, *40*(5), 349–352. https://doi.org/10.3109/00952990.2014.949728

Zamboanga, B., & Olthuis, J. (2016). What is pregaming and how prevalent is it among US college students? An introduction to the special issue on pregaming. *Substance Use & Misuse*, *51*(8), 953–960. https://doi.org/10.1080/10826084.2016.1187524