

Substance Use & Misuse



ISSN: (Print) (Online) Journal homepage: www.informahealthcare.com/journals/isum20

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To cite this article: Grant J. Devilly, Petra Wilkinson, Corey Allen & Timothy Piatkowski (19 Apr 2024): Unmasking Distorted Reflections: Exploring Body Image, Alcohol, and Drug Use in Nighttime Entertainment Districts, Substance Use & Misuse, DOI: 10.1080/10826084.2024.2320377

To link to this article: https://doi.org/10.1080/10826084.2024.2320377

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Published online: 19 Apr 2024.

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Unmasking Distorted Reflections: Exploring Body Image, Alcohol, and Drug Use in Nighttime Entertainment Districts

Grant J. Devilly^{a,b} (b), Petra Wilkinson^a, Corey Allen^{b,c} and Timothy Piatkowski^a

^aSchool of Applied Psychology, Griffith University, Brisbane, Queensland, Australia; ^bGriffith Criminology Institute, Griffith University, Brisbane, Queensland, Australia; ^cQueensland Police Service, Inner West Patrol Group, Brisbane, Queensland, Australia

ABSTRACT

Background: Violence within nighttime entertainment districts (NEDs) has been blamed on problematic masculinity and has predominantly been attributed to excessive alcohol intake and steroid use in men. In this report we conducted two studies to: (1) ascertain whether researchers could act as third-party raters of body weight and muscle mass in NED patrons; and (2) to examine the relationship between body self-image, inebriation, alcohol preloading behaviors and drug use in the NEDs. *Methods:* Study 1 employed an observational approach to establish inter-rater reliability for ratings of muscle mass and weight. In Study 2 data (n=2,745) were collected through breathalyzing and questionnaires to examine individuals' self-image and drinking and drug-taking behaviors. *Results:* Participants' self-ratings of muscle and weight significantly differed from researchers' ratings, with males perceiving themselves as less muscular and females perceiving themselves as heavier. Perceived weight and muscle size did not relate to alcohol levels, but an interaction was found for female steroid users who perceived body image, with a desire for muscularity among both males and females. These results underscore the complex interplay between self-perception, societal ideals, and drug use in young NED patrons.

KEYWORDS

Alcohol use; gender differences; hyper masculinity & femininity; preloading; steroids

Introduction

Alcohol-related harms pose a significant public health challenge. These harms are influenced by a combination of individual, social, and environmental factors (Freisthler & Gruenewald, 2013; Hughes et al., 2011). While individual factors like intoxication increase the risk within specific situations, the primary determinant of experiencing alcohol-related harms, such as violence, lies in the social and locational context (de Andrade et al., 2019). Licensed venues, such as bars and nightclubs, are regarded as high-risk settings due to their facilitation of the convergence between potential offenders and victims (Hughes et al., 2008), supported by environmental conditions that promote anonymity and permissive or ambiguous social norms regarding intoxication and aggression (MacLean & Moore, 2014). These venues, particularly in Nighttime Entertainment Districts (NEDs) where multiple establishments are clustered, tend to attract young males who exhibit heightened vulnerability to both engaging in violent offenses and becoming victims of assault (Pridemore & Grubesic, 2013), findings which have been replicated internationally, particularly in Western cultures (Boyle & Walker, 2016, Graham & Wells, 2003; Pedersen et al., 2016; Sönmez et al., 2013; Van Havere et al., 2009). Notably, there are increased harms observed in groups characterized by specific risk factors, such as pre-drinking and illicit drug use (Peacock et al., 2016). Thus, extant work has suggested that the connection between alcohol and violence is primarily shaped by situational factors and cultural norms related to intoxicated behavior (Pedersen et al., 2016), rather than solely by the psychopharmacological properties of alcohol.

In response to multiple reports of violent attacks in 2014, Queensland lawmakers implemented the Safe Night Out Legislation Amendment Bill, commonly known as the 'One-Punch' or 'Coward Punch' Law and in 2016 introduced the Tackling Alcohol Fueled Violence Bill. Media coverage of specific attacks, focused on the attackers' perceived muscularity and implied anabolic-androgenic steroid (AAS) use (Hansen, 2014; Pentherbery, 2014). The effects of alcohol and illicit drug use were, therefore, often attributed to stereotypes associated with its users, particularly when consumed by young men. AAS use acquired symbolic significance as a drug that was seen as indicative of problematic masculinity (James & Wynn, 2022). The media portraval fueled a moral panic, leading to political action due to the perceived link between violence, muscularity, and alcohol and illicit drug consumption. This investigation aimed to examine the connections

CONTACT Grant Devilly g g.devilly@griffith.edu.au 🗗 School of Applied Psychology—Mt Gravatt Campus, Griffith University, Mt Gravatt, Brisbane, Qld 4122.

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between alcohol, drug use, and body image among individuals in Brisbane's NEDs following the implementation of the Safe Night Out legislation. This investigation aimed to explore the relationships within this cohort, considering the rhetoric surrounding hyper-muscularity and drug use.

Assemblages of alcohol, body image ideals, and drug use

Jayne and colleagues, in their examination of alcohol consumption, present an alternative conceptual framework. Within this perspective, drinking and drunkenness are seen as a complex interplay involving multiple factors, including embodied identities (age, ethnicity, gender, sexuality), emotional and physiological states, neurological responses to alcohol, social dynamics, personal interactions, atmospheric elements (sounds, smells, moods, feelings), material characteristics of drinks and containers, and the physical arrangement of venues or public spaces (Jayne et al., 2010, 2012; Jayne & Valentine, 2023). This perspective acknowledges the intricate interaction between alcohol and these diverse elements in shaping drinking experiences and associated outcomes, challenging the prevailing assumption that alcohol alone serves as the primary causal factor for harmful behaviors such as violence (Jayne & Valentine, 2023). Given that drunkenness is a 'psychoactive sociality' that emerges from an 'assemblage of embodied, emotional, affective and material human and non-human interactions' (Jayne et al., 2010, p. 549) the actors and environments involved within this phenomenon cannot be so easily separated from each other. Indeed, assemblage frameworks propose that harm should be considered as an attribute of the entire assemblage, rather than being attributed solely to individual components within it, such as the drug or the drug user (Duff, 2016), a framework which has been extended to AAS use recently (Piatkowski et al., 2023).

Similar to the normalization of recreational drug use among youth populations (Duff, 2005), we argue that the widespread acceptance and normalization of idealized muscular and fit body image standards for young Australian's (Piatkowski et al., 2022; Robinson et al., 2017) have created additional sociocultural pressures that contribute to the use of various illicit substances. Moreover, the social norms prevalent among young Australians, where socializing in NEDs involves alcohol and illicit drug consumption (Pennay & Moore, 2010; Pennay, 2012; Piatkowski et al., 2020), have further complicated the matter. Previous studies have revealed that body image ideals differ between men and women, with men aspiring to a muscular ideal (Bergeron & Tylka, 2007) while women strive for thinness (Harper & Tiggemann, 2008) although these ideals appear to be converging more recently (Donovan et al., 2020; Piatkowski et al., 2023). Sociocultural pressures contribute to the internalization of these ideals (Knauss et al., 2007), leading to dissatisfaction with both muscularity and body fat when individuals' bodies deviate from the ideal (Piatkowski et al., 2021; Stratton et al., 2015). Men's focus on attaining a fit physique often involves weightlifting and dietary practices for esthetic and performance purposes (Piatkowski et al., 2022), while the use of anabolic-androgenic

steroids (AAS) is growing in prevalence among recreational weightlifters rather than elite athletes (Goldman et al., 2019). Indeed, AAS use is associated with various risk factors such as risky sexual behaviors, and alcohol and polysubstance use (Piatkowski et al., 2021; Van de Ven et al., 2018) as well as other criminal behaviors (Piatkowski et al., 2023). As a result, the intrinsic focus on muscles and activities aimed at enhancing muscle development has been identified as being linked to, and capable of, predicting patterns of binge drinking and drug use (Field et al., 2014). Preloading, a common behavior observed during binge drinking sessions among young adults, is associated with higher alcohol consumption, elevated breath approximated blood alcohol concentration (BrAC), and increased levels of intoxication (Devilly et al., 2017). However, studies present conflicting findings regarding gender differences, with some indicating similar preloading patterns and BrAC levels between males and females, while others highlight males consuming significantly more alcohol (see Devilly, 2023).

The present investigation

Following the implementation of the Safe Night Out legislation which accompanied the rhetoric of hyper-muscularity and drug use in Brisbane's NED, the present investigation sought to dissect the relationships between alcohol, drugs, and the body image of this cohort. The aim of this investigation was, firstly, to assess the reliability of observer ratings for weight and muscle tone. Once that was ascertained, we sought to examine the relationship between self-image and alcohol preloading behaviors as well as drug use in the NEDs of Brisbane. Lastly, the investigation aimed to explore the body image of individuals entering these districts.

We hypothesized that the concordance rates for researchers' perception of weight and muscle would yield better than chance effects. Second, compared to researcher ratings of participants, there would be a distortion or inaccuracy of perceived muscle and body weight when individuals' rate themselves. Specifically, it was predicted that men would more likely have inaccurate views of their own perceived muscle size, rating themselves smaller than they appear to be. For women it was predicted that ratings of their weight were more likely to be inaccurate and tend to rate themselves as heavier than they appear to be. Third, perceived weight and muscle size would also interact with BrAC levels and alcohol consumed, indicating that the higher the alcohol content, the less they would agree with observer ratings on their weight and muscle. Lastly, it was predicted that males and females who use AAS would have negative body image concerns for muscle. Specifically, they would have a distorted self-image in which they perceived themselves to be less muscular than they are perceived by others.

Method

Overview of studies

This investigation draws on data from two sequential studies, with the second study building on the first. Study 1 Table 1. Frequencies of estimated age by each researcher.

Age categories							
16-20 21-25 26-30 31-35 36-40 40+							
Researcher 1	53	90	31	31	3	7	
Researcher 2	9	81	67	26	7	10	
Researcher 3	20	109	48	10	8	5	

utilized an observational method which involved experimenters independently rating observed participants on perceived 'weight' and 'muscle' bulk to obtain inter-rater reliability data in order to conduct Study 2. For Study 1, due to limited availability and safety considerations, a sample size of 99 participants per rater was necessary to detect a medium effect size correlation (r=0.3) using Likert-type scaling as continuous data, with a 95% confidence interval and a power level of 0.8. Study 2 involved gathering data, through questionnaires, about an individual's general demographics, perceived muscle and weight size, and drinking and drug taking behaviors. In Study 2, the sample size was partly determined by participant availability, and to detect small differences (Cohen's d=0.2; Cohen, 1992) between groups (e.g., genders, preloaders vs non-preloaders), a minimum of 393 participants per condition was required to achieve an 80% power level, an alpha level of 0.05, and two-sided tests. Ethical approval for these studies were granted by the University Human Research Ethics Committee (Approval number: 2015/704).

Study 1

Participants

A total of 200 individuals were observed outside popular meeting and nightlife areas in Brisbane City, namely, The Valley Metro train station (n=62), the Victory Hotel (n=100) and Oh Hello! Nightclub (n=38). The sample of observed individuals comprised of 48.5% Males (n=97) and 51.5% Females (n=103). Age ranges, as estimated by the raters of the observed participants, are shown in Table 1.

Materials

Data was collected and recorded on three Apple Mini Ipads through the program QuickTapSurvey (TabbleDabble, 2014). The questionnaires required the researchers to rate the observed individuals estimated gender, age, and perceived muscle mass and body weight. Three researchers were involved in the observation and recording of data. This included the two authors (GD and PW) and a senior researcher for the broader research study. All 3 researchers also collected data in Study 2.

Age range

To investigate systematic bias rather than error due to overly specific age categories, the age groups (16-20, 21-25, 26-30, 31-35, 36-40, and 40+) were collapsed into three categories (16-25, 26-35, 36-40+). This decision was based on

evidence suggesting that individuals under 25 are considered youth and physical maturation typically occurs by age 17, with myelination continuing into the 30s for some individuals (Berk, 2014).

Weight rating

Reflective of work from Wing et al. (1979), for the assessment of weight, raters answered a 5-point Likert-type scale, which ranged from severely under-weight, under-weight, average, over-weight and severely over-weight. When analyzing the data the five-point Likert-type scales used for weight were collapsed down into three-point scales (under, average, over), as there was not much variability between the two extreme categories (severely under/severely over). This scale was used to assess the relative reliability of researchers perceived ratings of weight through an observational method. In regard to observer ratings, previous research by Wing et al. (1979) looked at observer ratings of weight on a five-point scale in comparison to objective measures using BMI. Correlations for observer ratings ranged from 0.75 to 0.85 with a mean of 0.80, and an average agreement rate of 72 per cent (Wing et al., 1979).

Muscle rating

In assessing perceived muscle mass, and similar to weight, the raters were required to answer a 5-point Likert-type scale. The scale ranged from severely under-muscled, under-muscled, average, over-muscled and severely over-muscled. When analyzing the data the five-point Likert-type scales used for muscle were collapsed down into three-point scales (under, average, over), as there was not much variability between the two extreme categories (severely under/severely over). Previous observational ratings of muscle have yielded agreement rates of between 0.69 and 0.97, with a mean agreement per cent rate of 57% (Wing et al., 1979).

Procedure

Study 1 involved an observational method of data collection outside the mentioned nightlife venues in Brisbane on a Saturday night between the hours of 8 pm and 1 am in early March, 2014. Prior to collecting data researchers were involved in pre-training activities in assisting calibration of inter-rater reliability. This involved an informal discussion between the research team, in the hour and a half prior to data collection, utilizing the NED for 'real life' examples. During this period researchers looked at markers for estimation of muscle and weight—including face, neck, ankles, biceps, thighs, and forearms—and practiced on people passing by as examples. Researchers were required to estimate and record the randomly chosen (every fourth person or the first person in the fourth group to pass the raters) individual's gender, age, and what weight and muscle size they appeared to be. When completing the questionnaire raters were blind to each other's ratings in order to ensure the data remained reliable and valid.

Data analyses

Study 1 involved computing absolute agreement rates between each of the observers in order to assess inter-rater reliability. Therefore, data was analyzed using Krippendorf's Alpha Reliability Estimate and Fliess's Kappa. Krippendorff's alpha is a statistical measure used to assess the reliability of agreement among observers in analyzing data, indicating the level of reliability between multiple observers, measures, and sample sizes by calculating disagreements instead of correcting agreements; it produces a coefficient, of which values above 0.800 are considered acceptable (Hayes & Krippendorf, 2007; Krippendorff, 2010, 2011). Fleiss' Kappa is a statistical measure used to assess true agreement rates among three or more raters assigning categorical ratings, considering agreement beyond chance (Sim & Wright, 2005; Hallgren, 2012); it yields a coefficient ranging from 0 (complete chance agreement) to 1 (perfect agreement), with interpretations categorized as slight, fair, moderate, substantial, or almost perfect based on specific ranges (Viera & Garrett, 2005). Additionally, in analyzing the data the five-point Likert-type scales used for both weight and muscle were collapsed down into three-point scales (under, average, over), as there was not much variability between the two extreme categories

(severely under/severely over). All analyses were conducted on SPSS V22.0 (IBM, 2016) and Statistica V13 (Tibco Software, 2018).

Results

The frequencies of agreement between the researchers based on gender of the observed participants were excellent. There was significant agreement between each researcher on gender, with both Krippendorf's Alpha and Fliess' Kappa yielding almost perfect agreement (α =0.96, κ =0.96). Agreement on age (as delimited by the six categories in Table 1) was then computed, resulting in low agreement between the three researchers on both Krippendorf's Alpha (α =0.22) and Fliess' Kappa (κ =0.22). Analyses were then conducted on the collapsed age groups, resulting in improved agreement rates for Fliess's Kappa (κ =0.45) and Krippendorf's Alpha (α =0.45).

Tables 2 and 3 show the frequencies of agreement between the raters on observations of weight size and muscle size. Results are displayed for both perceived weight and muscle size in Table 4. The results showed an acceptable agreement for weight ratings (α =0.62), however, agreement on participant muscle size was low (α =0.34). Additionally, Fliess's Kappa was computed for an overall score on inter-rater reliability, in conjunction with reliability rates for each weight and muscle group. Overall, Fliess' Kappa yielded substantial agreement on perceived weight size (κ =0.62) and fair agreement for perceived muscle size (κ =0.33). When each category was analyzed individually, both the over-weight (κ = 0.79) and the over-muscled group (κ =0.66) yielded substantial agreement. Researchers' agreement on both under (κ =0.55) and average weight (κ =0.58) resulted in a

			Researcher 3				
Researcher 1	Researcher 2	Under weight	Average	Over weight	Row totals		
Under Weight	Under Weight	14	7	0	21		
5	Average	4	1	0	5		
	Over Weight	0	0	1	1		
Average	Under Weight	4	14	0	18		
5	Average	4	104	9	117		
	Over Weight	0	2	6	8		
Over Weight	Under Weight	0	0	0	0		
5	Average	0	1	4	5		
	Over Weight	0	0	25	25		
Column Total	5	26	129	45	200		

	Table	3.	Frequencies	of	researcher	ratings	of	muscle.
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Table 2. Frequencies of researcher ratings of weight.

Researcher 1	Researcher 2	Under muscled	Average	Over muscled	Row totals
Under muscled	Under muscled	12	0	0	12
	Average	1	3	0	4
	Over muscled	0	0	0	0
Average	Under muscled	23	11	0	34
	Average	34	105	5	144
	Over muscled	0	0	1	1
Over Muscled	Under muscled	0	0	0	0
	Average	0	0	1	1
	Over muscled	0	0	4	4
Column Total		70	119	11	200

Table 4. Researcher agreement statistics for perceived muscle and weight of observed participants.

	Perceived b	ody image			
Analysis	Weight	Muscle	Age – 6 groups	Age – 3 groups	Gender
Krippendorff's Alpha Fleiss' Kappa	.62	.34	.22	.45	.96
Under	.55*	.30*			
Average	.58*	.31*			
Over	.79*	.66*			
Overall Kappa	.62*	.33*	.22*	.45*	.96*

*p<0.001.

moderate agreement but agreement on both under muscled (κ =0.30) and average muscle (κ =31) yielded only fair agreement.

Preliminary discussion

Study 1 aimed to assess the inter-rater reliability among researchers regarding ratings of perceived muscle and weight. The findings revealed a significant level of agreement for both variables, exceeding chance expectations and supporting the first hypothesis. Notably, researchers demonstrated higher agreement on perceived weight compared to muscle, potentially due to challenges in assessing muscle tone when participants were clothed. Furthermore, substantial agreement was observed for ratings indicating overweight or excessive muscle mass, while disagreement primarily occurred within the under and average categories, particularly in the muscle category. Although researchers exhibited slight agreement on age, collapsing the categories improved agreement rates, indicating a reduced likelihood of systematic error. Gender, on the other hand, showed almost perfect agreement. While the assessment of age and gender was not central to Study 2, these findings were valuable in exploring potential systematic bias among the raters as a whole. Further, the discrepancies observed in the researcher's observations regarding age, weight, and muscle mass, while minor, might be attributed to challenges in assessing weight and muscularity when participants were clothed, and they could signify the need for more comprehensive pre-training to enhance inter-rater reliability. That said, Brisbane is a sub-tropical city and data collection ran from 21st August (winter/spring: 15°c at 10 pm) to 27th February (summer: 24°c at 10 pm) and people were not heavily clothed. Overall, the outcomes of Study 1 provided convincing evidence to proceed, with caution, to Study 2, particularly concerning muscle ratings in the average and lower categories.

Study 2

Participants

A total of 3,202 participants were recruited outside popular entertainment and nightlife districts across Brisbane City, Surfer's Paradise, and Mackay—all in Queensland, Australia. This data collection comprised a larger data collection effort reported elsewhere (Devilly et al., 2017), however, for this study data collected only in Brisbane was used for subsequent analyses due to recent findings from Devilly (2022). In the Brisbane NED specifically, individuals are reducing their alcohol spending during their shorter time in the NED, however, continue to leave the venue with the same level of intoxication as they did before the legislation, primarily because of preloading. It has also been found (Devilly et al., 2017) that general intoxication increases as one moves further north (e.g., Gladstone, Mackay) or to holiday destinations (e.g., Surfer's Paradise). Thus, the sample (n=2,745) comprised of 53.7% males (n=1,474), Mean age = 22.86 years, SD = 5.39) and 46.1% females (n = 1,271, Mean age = 21.41, SD = 4.40) with an overall age range of 16 to 59 years (M=22.19, SD=5.01, 94% of participants were aged 30 years or under). Inclusion criteria required that potential participants be over the age of 15 years and must have just arrived into the NED in Brisbane or previously attended licensed venues in suburban regions, with the intention of further pursuing the night. Preloading, as defined in this study, encompasses a spectrum of behaviors where individuals consume alcohol at locations other than the main entertainment district (NED) and then proceed to the NED. While the term preloading often conveys the idea of home-based or public venue alcohol consumption, it is pertinent to acknowledge that sports bars and suburban licensed venues also serve as preloading environments. In these suburban venues, individuals can access cheaper drinks and experience a more relaxed setting conducive to preloading, akin to their behavior in a home or a public setting (Devilly et al., 2019a). These different settings, home, and suburban venues, share ecological similarities in the context of preloading behaviors, justifying their inclusion in the study to capture a comprehensive understanding of this practice. The issue of the inclusion of suburban bars and sports bars by different research groups has led to a proposed taxonomy of preloading (Hughes & Devilly, 2021). Utilizing this taxonomy, the current study preloading description would be: 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 (steroid use), and weight and muscle self-body image and observer rated body weight and muscle; assessing severity of preloading (objective) by obtaining BrAC; no assessment of impairment. Participants who had already entered venues in Brisbane were not included, but were given a breathalyzer reading and feedback if they wanted this information.

Materials

Materials used in data collection involved three Ipads to administer the questionnaire through the program QuickTap Survery (TabbleDabble, 2014). The Alcolizer- LE5 breathalyzer was used in acquiring breath approximated blood alcohol content (BrAC) readings of participants. This instrument is highly reliable and valid and has been described in detail elsewhere (Sorbello et al., 2018).

Participant identifier cards were developed for the study, which contained a unique and non-identifiable ID number assigned to each participant. This enabled participants to remain anonymous in the study for confidentiality reasons. The cards also provided the present study's website (http:// www.smartstartqld.com.au) enabling participants to seek more information about the study. This also permitted participants to retract participation in the study at a later stage (for example, after reading the participant information sheet on the website) by contacting the researchers and quoting the unique ID number.

In the collection of the data two questionnaires were developed and used, a questionnaire with 40 questions and a short questionnaire with four questions. The long questionnaire involved questions regarding general demographics, drinking and drug taking behaviors over the course of the night and participant own estimation of their BrAC levels. Questions also asked both the researchers' and participants' opinion of the participant's body regarding muscle size and weight. There were additional questions regarding negative consequences of drinking behaviors and experiences with police, which were beyond the scope of the current report. The short questionnaire involved four questions regarding the participant's age, how many alcoholic drinks they had consumed, their own estimation of their BrAC levels, and a question regarding participants' AAS use on a 5-point Likert scale from Never to Always.

Weight rating

In attempting to gauge an individual's assessment of their body image by weight, a self-report method was utilized. Both the researchers and participants were required to record the participants' weight on a 5-point Likert-type scale, which was used in Study 1. Previous research on self-report measures of weight shows high Spearman rank correlations between self-reported and measured weight (r > 0.09, p < 0.0001; Spencer et al., 2001). Strong correlations (p < 0.05) were also found between measuring accuracy of self-reported body mass index (BMI; r = 0.96), and weight (r=0.98; Gunnare et al., 2013). However, self-reporting is not a perfect measure, as it has been shown that participants are likely to underestimate their weight in research (Gunnare et al., 2013; Gorber et al., 2007). The current study focuses on comparing perceived body weight of participants with raters' (researchers) observations of weight. Thus, an exact measure of weight was not needed for this particular study. In conjunction with this an actual measurement of body weight was not feasible for obvious environmental reasons.

Muscle rating

The same 5-point Likert-type scale used in Study 1 was used for this study to assess perceived muscle size of the participant. Both the participants and researchers were required to answer the scale in regard to the participants' muscle size.

Researchers

In the collection phase of the data, six researchers were involved in the recruitment of participants and administration of the questionnaire. These included the three raters from Study 1, and three other research assistants. Brisbane city police officers were also present in the collection of data and assisted in the recruitment of participants. However, the police did not participate in administering the questionnaire and the recording of breathalyzers results. Devilly (2018) has shown that police presence does not affect the type of participant to agree to enter the study.

Procedure

Data was collected between August 21, 2014 and February 27, 2015 on Thursday, Friday and Saturday nights between the times of 9pm and 1am in Brisbane City. Locations included the City Metro Station, Victory Hotel and The Royal Exchange located in Brisbane CBD, and the Fortitude Valley Metro Station, and the nightclubs Oh Hello! and The Family in Fortitude Valley. These venues are either entry gates to the NEDs or archetypal pubs and clubs that were very popular at the time of the study. Research teams comprised of at least 2 researchers and 2 police officers per night of data collection. Researchers and Police approached every fourth person, or first person in every fourth group, outside the mentioned popular entertainment venues. In the instance where groups took part, two members completed the long questionnaire while the rest of the group completed the short questionnaire.

Upon recruitment, participants were advised on the goals of the overarching study, partially-informed consent was obtained and participants were provided with an ID card. Participants were instructed that their inclusion in the study would remain confidential. Before administering either questionnaire to the participant, researchers were prompted to complete two questions. This involved making a judgment on the participant's weight and muscle size (both were entered without the participant's knowledge). The questionnaire was then administered to the participant.

Data analysis

The data set was examined for errors. In examining BrAC levels for data entry errors, any participant with a BrAC reading above 0.26 was removed from the data set, as this was known to be an error (the largest recording reported by the researchers in this study was a BrAC of 0.258). In

cleaning the data, any number of standard drinks entered above 30 was removed from the data set as these were considered likely to be untrue and the result of data entry errors or purposive false entries. This involved removing 11 participant estimates (mean estimate of those removed = 173drinks) and 15 people who could not remember how many drinks they had consumed to give any estimate.

The variables were inspected using descriptive analysis and all variables appeared to be correct within their ranges. Data was inspected for 'missingness' and no variables appeared to have 'missingness' above 5%, however, cases with missing variables were deleted for each analysis. The data was screened for extreme-Z scores (±3.29), which resulted in the identification of 7 univariate outliers, these were examined for influence on significance level and, yielding no effect to interpretation, these so-called outliers were retained (Tabachnick & Fidell, 2007). A further 32 univariate outliers were identified as having extreme Z-scores and, upon inspection of their influence, 6 were removed. Zero multivariate outliers were identified at the p=0.001 level (Tabachnick & Fidell, 2007). Distributions of the variables were examined, showing no drastic deviation from normality apart from BrAC level that included participants with a BrAC of zero (see Devilly, 2018). However, as this study is based on examining preloading this variable remained untransformed, as it was not a focus of the study. If used, non-parametric alternatives were utilized. Homogeneity of variance was assumed for all the dependant variables.

Results

Table 5 compares age and gender of participants collected on a Saturday night from two studies and assesses the representativeness of Study 1 in relation to Study 2. Gender distribution in Study 1 and Study 2 is recorded to be similar, suggesting that the first study accurately represents the population in the second. Although there is variability in age categories between researchers, and in comparison to Study 2, the overall pattern indicates a majority of participants aged 30 or younger, which becomes more evident when age groups are collapsed into three categories.

Descriptive statistics of participants drinking behaviors and AAS use is displayed in Table 6. A Mann-Whitney U test revealed that BrAC levels, including those who did not preload, were significantly higher for males (Md=0.06), n = 780) compared to females (Md = 0.05, n = 743), U=257547, z=-3.77, p<0.001, r = .10. A t-test was conducted to explore the differences of BrAC among preloaders, revealing a significant difference, t (1257) = 2.10, p = 0.04, r = 0.004, with males having a significantly higher BrAC compared to females (shown in Table 4). A second t-test was then conducted to assess differences in standard drinks consumed by gender, revealing a significant difference in standard drinks consumed, t (1370.2) = 12.21, p < 0.001, r = 0.009, again with males consuming significantly more standard drinks compared to females (outcome shown in Table 4).

Table 5. Comparison of sample from Study 1 and Study 2 data collection on a Friday night.

		Researcher ratings % (n)			
Age and gender	Rater 1	Rater 2	Rater 3	Average	Study 2 average
16–20	26.5% (53)	4.5% (9)	10% (20)	13.67% (27.3)	55.01% (511)
21–25	45% (90)	40.5% (81)	54.5% (109)	46.67% (60)	32.19% (299)
26-30	15.5% (31)	33.5% (67)	24% (48)	24.33% (48.67)	8.61% (80)
31–35	8% (16)	13% (26)	5% (10)	8.67% (17.33)	2.19% (21)
36–40	1.5% (3)	3.5% (7)	4% (8)	3% (6)	0.86% (8)
40+	3.5% (7)	5% (10)	2.5% (5)	3.67% (22)	1.08% (10)
Male	48.5% (97)	49% (98)	48.5% (97)	48.67% (97.33)	49.73% (462)
Female	51.5% (103)	51% (102)	51.5% (103)	51.33% (102.67)	50.27% (467)
Age 3 categories					
16–25	71.5% (143)	45% (90)	64.5% (129)	60.3% (120.67)	87.2% (810)
26–35	23.5% (47)	46.5% (93)	29% (58)	33% (66)	10.8% (101)
36-40+	9.6% (10)	8.5% (17)	6.5% (13)	8.2% (40)	1.94% (18)

Table 6. Descriptive statist	ics of	participants	drinking	and drug	behaviors.
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Drinking/drug statistics		Male %(n)	Female % (<i>n</i>)	Overall M(SD)	Overall % (n)
Preloaded		51.3% (786)	48.7% (747)		
Plan to Continue Consuming Alcohol		51.4% (789)	48.6% (747)		
		M(SD)	M(SD)		
BrAC (AII)		.058(.05)	.045(.05)	.057(.046)	
BrAC (Preloaders)		.071(.04)	.066(.04)	.069(.042)	
Standard Drinks Consumed		6.30(3.88)	4.23(2.53)		
Anabolic-androgenic Steroid Usage	Never				92.5% (1463)
	Rarely				2.2% (34)
	Sometimes				1.6% (24)
	Often				.5% (7)
	Always				.5% (8)
Motives	To socialize				47.8% (641)
	Save money				40.37% (541)
	Intoxication				3.8% (51)
	Increase confidence				1.50% (20)
	Feel Relaxed/Comfortable				6.49% (87)

Note: Motives that were only selected once were used in analyses (n = 1340).

Analysis of weight and muscle

A two-way Analysis of Variance (ANOVA) was conducted to compare the interaction effects of researcher perceived muscle size and weight on gender. A significant effect emerged from the interaction between the three variables, F(2, 2359) = 40.471, p < 0.001, Wilk's $\Lambda = 0.97 \eta_p^2 = .03$. Post Hoc analyses using Honest Significant Difference (HSD) for unequal N were significant for both weight (p < 0.001) and muscle (p < 0.001) between men and women. Results revealed that researchers tended to rate average on weight and slightly above average for muscle in males. For females, researchers rated average for weight and just below average for muscle. This outcome is demonstrated in Figure 1.

A two-way ANOVA analysis on participant perceived weight and muscle by gender was conducted to compare participants' perceived body image. Results revealed a significant interaction between perceived weight and muscle size by gender F(2, 2359) = 41.23, p < 0.001, Wilk's $\Lambda = 0.97 \eta_p^2 = .03$. Post hoc analysis using Unequal N HSD revealed significance for both weight (p=0.001) and muscle (p=0.001). These results display a slight interaction whereby females rated their weight as being slightly above average and rated their muscle size just below average. Males' ratings of their perceived weight and muscle size were both slightly below average. This interaction is demonstrated in Figure 2.

In analyzing the differences between researcher and participant ratings of muscle and weight by gender, a two-way ANOVA was also conducted. Analysis revealed a significant interaction between gender and the differences in ratings for both independent variables F(2, 2359) = 25.52, p < 0.001, Wilk's $\Lambda = 0.98$, $\eta_p^2 = .02$. Post Hoc analyses using Unequal N HSD were significant for both differences in weight (p=0.05) and muscle (p=0.05). This interaction is shown in Figure 3, whereby researchers tended to rate females' weight lower and muscle higher compared to female participants ratings of themselves. For males, researchers ratings on both muscle and weight tended to be higher compared to the participants' ratings of themselves.



Figure 1. Researcher ratings of participant perceived muscle and weight by gender. Error bars represent 95% confidence intervals.



Figure 2. Participant ratings of perceived muscle and weight size by gender. Error bars represent 95% confidence intervals.



Figure 3. Difference in researcher and participant ratings of perceived weight and muscle size by gender. Error bars represent 95% confidence intervals.

Alcohol and drug effects

A two-way between groups analysis of variance was conducted to explore the impact of gender and participants' own perceived body weight on BrAC levels amongst preloaders. The interaction effects between gender and perceived weight was not statistically significant, F(2, 1249) =1.71, $\eta_p^2 = 0.005$, p = .15. The main effect for gender was also found to be nonsignificant F(1, 1249) = 0.30, p = .58. There was also no significant main effects found for perceived weight, $F(2, 1249) = 2.22, \eta_p^2 = 0.007, p = .07.$ Subsequently a second analysis was performed with the replacement of participant perceived muscle size instead of weight in a two-way between groups ANOVA exploring the effect of gender and muscle size on BrAC levels. Interaction effects between perceived muscle size and gender were not statistically significant, F(2, 1249) = 0.24, $\eta_p^2 < 0.001$, p =.91. Upon reviewing the main effects neither perceived muscle size nor gender were found to be statistically significant in the analysis, F(2, 1249) = 0.68, $\eta_p^2 = 0.002$, p = 0.61, F(1, p) = 0.611249) = 1.34, η_p^2 = 0.001, p = 0.25 respectively.



Figure 4. Difference in researcher and participant ratings of muscle by steroid usage. Error bars represent 95% confidence intervals.

In order to investigate the effect of participants' AAS use on ratings of muscle size by gender, a two-way ANOVA was conducted. A significant interaction was found between AAS use and gender, F(4, 2155) = 3, p=0.02, $\eta_p^2 = .01$. Post hoc analyses using Tukey's Unequal N Honest Significant Difference showed that females who use AAS, often or always, are more likely to rate themselves as less muscled compared to researcher ratings. However, males who use AAS 'often' or 'always' were more likely to rate themselves as more muscled compared to researcher ratings. This interaction is shown in Figure 4.

Discussion

This investigation aimed to understand the relationship between individuals' perceived body image and its interaction with drug use and preloading drinking behaviors in the context of NEDs in Brisbane. The research comprised two distinct but sequential studies. The first study focused on assessing the inter-rater reliability of researchers' ratings of perceived body image, specifically regarding weight and muscle tone. The second part of the research aimed to explore the perceived self-image of the sampled individuals and examine any potential associations with AAS and alcohol use. The findings from this investigation revealed the presence of a self-image distortion within the sample, with both males and females exhibiting a desire for muscularity and thinness. Perceived body image was found to be significantly associated with AAS use, while no substantial relationship was observed with alcohol consumption.

The validity and reliability of the research methods were confirmed through a level of agreement among the three researchers in Study 1, supporting the first hypothesis. The second hypothesis was also supported as participants' self-ratings of muscle and weight differed significantly from researchers' ratings. Specifically, male participants rated themselves slightly less muscular, while females rated themselves heavier in weight. However, our third hypothesis was not supported as there was no interaction between participants' perceived weight and muscle size with BrAC levels. Regarding the fourth hypothesis, an interaction was found for female AAS users, who perceived themselves as less muscular compared to researchers' ratings, supporting the hypothesis. Intriguingly, for male AAS users, contrary to the hypothesis, this group were more likely to rate themselves as more muscular than researchers' ratings. Lastly, the data revealed that approximately half of the NED population engaged in preloading before nightlife activities in pubs and clubs.

Navigating the inner City: Preloading, drug use, and perceived body image

The findings of this study suggest that preloading is prevalent among the majority of participants, consistent with previous research (e.g., Devilly et al., 2019b; MacLean & Callinan, 2013). It appears that preloading has become a somewhat ritualized social activity before entry to Brisbane's major nightclub districts, potentially in response to changes in legislation and policy, as well as the perceived inadequacy of nightlife settings for initiating drinking (Caudwell & Hagger, 2014; Forsyth, 2010; James & Wynn, 2022; Wells et al., 2009). Preloading is seen as a way to enhance the enjoyment of the night out and overcome potential discomfort in club environments. Gender differences were observed, with males consuming more drinks and having higher BrAC levels than females, although the effect sizes were small, supporting prior studies from other research groups who also report only small gender differences among preloaders (e.g., Peacock et al., 2016; Pedersen et al., 2009). The propensity for males to engage in higher alcohol consumption provides some substantiation to the rhetoric around their raucous behavior (MacLean & Moore, 2014). However, the discomforts and pleasures encountered by individuals in the inner city are a result of the combination of alcohol, embodiment, affect, and place, (Duff, 2016) rather than solely attributable to any single factor such as alcohol or the young adult population. These experiences are shaped by the interactions and arrangements of these elements, highlighting the interconnectedness and complexity of the NED environment. Therefore, there are other components of this complex environment worth mentioning.

The data indicate a discrepancy between participants' perceived body image and researchers' ratings. Female participants tended to perceive themselves as more overweight and less muscular compared to observer ratings, aligning with existing literature on body image dissatisfaction in women (Donovan et al., 2020; Robinson et al., 2017). Similarly, male participants rated themselves as less muscular and lighter in weight than researchers' ratings (Arbour & Ginis, 2006; Bergeron & Tylka, 2007). Contrary to expectations, no interaction was found between alcohol use and body image, suggesting that the widespread prevalence of preloading behaviors in the sample may have 'washed-out' the effects of alcohol on perceived body image. We do note, however, that a far smaller percentage of the overall sample were using AAS, however, this percentage was not dissimilar to global prevalence rates (3.3%) reported by Sagoe et al. (2014).

Nevertheless, the use of non-prescribed AAS showed an interaction with perceived body image, particularly muscle. Male AAS users perceived themselves as more muscular compared to researchers' ratings, contrary to previous research indicating a preoccupation with being too small among AAS users (Parent & Moradi, 2011; Pope et al., 2017). Female AAS users, on the other hand, perceived themselves as less muscular than observer ratings, supporting previous findings (Havnes et al., 2021; Piatkowski et al., 2023; Scarth et al., 2022). These results support the previously identified cognitive dissonance (Festinger, 1957) and self-discrepancy (Vartanian, 2012) which exists among perceived muscle mass for AAS users (Gibbs & Piatkowski, 2023).

The use of AAS by males may be motivated by a desire to bridge the perceived gap between their actual and ideal body shapes (Hildebrandt et al., 2010), thereby reducing body image dissatisfaction (Ridgeway & Tylka, 2005). This process can lead to a self-perception of increased muscularity compared to external perceptions (Ravn & Coffey, 2016), aligning with cognitive dissonance theory (Festinger, 1957). Conversely, female AAS users tend to have a contrasting perceived body image, perceiving themselves as less muscular than objective assessments suggest. This discrepancy aligns with existing research indicating that female bodybuilders often have a desire to further increase muscle mass and may idealize a leaner and more muscular physique, leading to dissatisfaction with their current muscle size and perceiving themselves as smaller than others perceive them to be (McGrath & Chananie-Hill, 2009; Shilling & Bunsell, 2009). Overall, the data provides insights into the relationship between perceived body image and drug use. However, the results also highlight the complex interplay between self-perception, societal ideals, and drug use, demonstrating the need for further research among NED cohorts to gain a comprehensive understanding of body image issues. An area of empirical investigation that merits attention is the potential for exaggerated perceptions and misconceptions among young individuals who concurrently engage in gym attendance and AAS usage. It is plausible that this specific demographic may overestimate the synergistic effects resulting from the combination of gym workouts and AAS, or erroneously assume that AAS can substitute certain facets of the gym experience, leading to reduced gym attendance. Consequently, empirical research is warranted to empirically examine these phenomena.

Nevertheless, the research contributes valuable insights into the complex interplay between perceived body image, drug use, and preloading drinking behaviors among individuals in the NED environment. Based on these findings there are some salient recommendations for future harm reduction interventions relevant for NEDs. Firstly, developing and implementing educational programs targeting young adults in the NED environment would promote awareness of the potential harms associated with body image dissatisfaction and drug use. These interventions could emphasize the importance of seeking support for body image concerns and provide information about the risks of alcohol and AAS use. These educational programs could sit alongside public messaging campaigns which provide and encourage support networks and resources for those experiencing body image dissatisfaction, especially among AAS users. These types of programs could encourage open discussions about body image concerns and promote positive body image and self-acceptance.

Limitations

An issue of concern in this investigation pertained to the scales used to assess perceived body image, alcohol consumption, and AAS use, as they were not derived from rigorous psychometric methods. Sijtsma (2006) argues that a lack of theoretical basis in research and test construction can weaken statistical power and introduce measurement noise. The outcomes of this study may have relied more on the choice of statistical models used in analysis rather than robust theoretical foundations (Sijtsma, 2006). However, considering the context of this study, which involved an alcohol-fueled environment, administering lengthy psychometric measures to participants was not feasible. Another important consideration in this investigation, which requires careful interpretation of the results, pertains to the use of researchers' subjective judgment as the criterion for measuring body image, rather than utilizing an objective measure such as the Body Mass Index (BMI). It is important to acknowledge that relying on human judgment as a standard is not flawless and can be subject to human errors and biases. Moreover, the use of BMI as a measurement tool has limitations, particularly when assessing individuals with a fit ideal or those with significant muscle tone. BMI is also inadequate in capturing the nuances of each person's unique body shape (Rothman, 2008). Furthermore, due to practical constraints within the study environment, measuring participants' height and weight was not feasible, making BMI calculations reliant on self-reported data, which is often unreliable (Rothman, 2008). Lastly, a limitation of this study is that the data were collected several years ago, and while it is possible that they still represent the population of interest, legislative changes enacted since then may have altered the findings if more recent data were available.

Further research should explore the underlying motivations and justifications for AAS use among individuals in the NED context, paying particular attention to potential gender differences. Indeed, research has documented the propensity for men (Piatkowski et al., 2021; Van de Ven et al., 2018) and women (Havnes et al., 2021; Piatkowski et al., 2023) who use AAS to engage in alcohol and polysubstance use. However, investigations are yet to explore the interaction of these licit and illicit drugs in the context of NEDs and the implications of their use in the broader sociocultural context of night life. This could be achieved by analyzing data from sources such as police records and hospital admissions to better understand the broader social and health implications of these relationships.

Conclusions

This study aligns with previous research on body image, showing distorted self-images among males and females.

Females perceive themselves as overweight, while males see themselves as under-muscled and underweight compared to others' perceptions. Surprisingly, alcohol was unrelated to perceived body image in this study, likely due to its ubiquitous presence in the sample. However, AAS use was linked to perceived muscle size. Male users saw themselves as more muscular, while females perceived themselves as less muscular. These findings suggest that women may hold negative self-perceptions based on societal body image ideals. Additionally, the study found most individuals engaging in preloading before nights out in Brisbane's nightlife districts. This research adds to the body image and drinking behavior literature, highlighting the prevalence of alcohol use, AAS use, and negative body self-image among young Australians attending nightlife venues.

Acknowledgements

We would like to thank Katy Brown and Inspector Corey Allen for their help in procuring the data.

Disclosure statement

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

The lead author affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned have been explained.

Ethics statement

Approved by Griffith University Human Research Ethics Committee 2015/704.

Funding

\$39,800 National Drug Strategy Law Enforcement Funding Committee (Last Drinks Project). Alcolizer Technology provided consumables for testing and calibrated the breathalyzers.

ORCID

Grant J. Devilly (D) http://orcid.org/0000-0001-6740-186X

Data availability statement

All data will be made available to other researchers.

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