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ORIGINAL PAPER

Alcohol use, mental well-being, self-esteem and general self-efficacy among final-year university students

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Abstract
Purpose We aimed to quantify associations between drinking and mental well-being, self-esteem and general self-efficacy among New Zealand university students approaching graduation.
Methods A web-based survey was conducted across all eight New Zealand universities in 2011. Participants were enrolled in their final year of a bachelor degree or a higher qualification and were aged 25 years and under ($n = 5082$, response level 65 %). Measures included the Alcohol Use Disorders Identification Test-Consumption, Warwick–Edinburgh Mental Well-being Scale, and items from the Rosenberg Self-esteem Scale and General Self-efficacy Scale. Linear regression models were used to estimate associations between the psychological measures and (1) drinking patterns for all participants (abstention/moderate/hazardous); and (2) consumption indicators for non-abstaining participants (frequency/quantity/heavy drinking frequency), adjusting for a range of individual, social and personality characteristics, separately for men and women.
Results Lower mental well-being was associated with a moderate or hazardous drinking pattern for men, and a hazardous pattern for women, compared to abstaining participants. Higher self-esteem was associated with any level of heavy drinking frequency for men, while the heaviest drinking women had a pattern of lower self-esteem. There was a general pattern of higher general self-efficacy for men and women who drank alcohol.
Conclusions We observed that higher levels of drinking were associated with small, yet statistically significant, differences in psychological outcomes for men and women. Our findings are of uncertain clinical significance; however, they underscore the importance of investigating a fuller range of social and personality factors that may confound the association of drinking and psychological outcomes.

Keywords Alcohol · Mental well-being · Self-esteem · General self-efficacy · Students

Introduction

Despite the well-recognized personal, interpersonal and social adverse consequences associated with high alcohol consumption among university students [1–3], in New Zealand, where the legal age to purchase alcohol is 18 years old, a high proportion of students persistently report drinking at hazardous levels [2, 4, 5]. A 2009 national survey of undergraduate students aged 25 years and younger found that over 70 % of the sample drank heavily (four or more drinks for women, six or more drinks for men in a single occasion) in the preceding 4 weeks, and that 70 % of men and 60 % of women had Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) scores of five or greater [6], indicating possible hazardous drinking.

At the personal level, there is considerable evidence that alcohol abuse and dependence disorders are associated with a variety of clinically defined mental health problems,

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such as depression and anxiety, among young people [7–12]. However, given the large proportion of university students reporting high levels of consumption, it could be argued that this population receives some benefit from their drinking. This raises the question of what potential social and personal advantages university students may derive from drinking. At the group level, alcohol plays an important role as a social facilitator [13–15], and young people often report substantial social and interpersonal benefits from drinking, particularly in cultures where high alcohol consumption is considered normative behavior [16, 17]. Researchers have also reported potential benefits of drinking for general personal well-being, especially among moderate drinkers [17, 18]. Purported benefits include greater life satisfaction, happiness, subjective well-being or perceived health; enhanced mood or positive affect; stress reduction; increased sociability and social integration; and improved cognitive function and work-related outcomes [17].

In studies among community samples, the alleged benefits to well-being appear to accrue mainly among moderate drinkers. Several studies have reported higher levels of life satisfaction or subjective well-being among moderate drinkers compared to both abstainers and hazardous drinkers [17–20]. In contrast to these findings, a study of undergraduate university students reported that, after controlling for alcohol-related adverse consequences, several consumption indicators, including greater drinking frequency, drinking quantity, intoxication frequency and heavy drinking frequency predicted higher subjective well-being [14]. Other research has described different patterns for male and female university students, with higher reported life satisfaction among abstaining women compared to women who drank heavily, and higher levels of social satisfaction among men who reported frequent heavy drinking [21]. More recently, a study among undergraduate students using the recently developed Warwick–Edinburgh Mental Well-being Scale [22] reported no association between alcohol consumption and positive mental well-being [23].

Any potential associations between drinking and longer-term outcomes such as life satisfaction or subjective well-being are also likely influenced by levels of social support and personality characteristics. Research suggests that a strong social support network is associated with improved mental health, subjective well-being and functioning [24], and that university students who do not drink heavily experience less support from their peers [15]. Personality may also be a potential confounder, with extraversion and sociability linked to both alcohol use [25] and well-being [26]. However, previous studies have not generally taken these factors into account.

In addition to the lack of clarity surrounding the association between alcohol consumption and life satisfaction or subjective well-being among university students, there remains uncertainty concerning the relationship between drinking and self-esteem in young people. Most studies with young people have reported negative associations, with higher levels of drinking associated with lower self-esteem [27–31], although the direction of causation remains unclear. High consumption has been proposed as a coping mechanism for negative affect, anxiety or stress, perceived social rejection or poor performance [28, 32–34]. The anticipated relaxation effect of alcohol has also been suggested as being particularly salient for people with existing low self-esteem [34]. Conversely, studies have also found associations between higher levels of drinking and high self-esteem among young people [27, 28, 35]. People with high self-esteem may be more likely to find themselves in social situations where drinking is viewed positively, and may also be more likely to use alcohol to enhance positive experiences or interpersonal interactions [28, 32]. A lack of an association between drinking and self-esteem has also been reported [36].

Finally, a number of studies with young people have looked at the role of situational self-efficacy in drinking behavior, specifically drinking refusal self-efficacy [37–39]. Overall, greater confidence to refuse a drink is associated with lower alcohol consumption. However, to our knowledge there have been no studies assessing the association between general self-efficacy and drinking among university students.

We used a cross-sectional survey of New Zealand university students aged 25 years and under who were approaching graduation to explore possible associations for mental well-being, self-esteem and general self-efficacy with (1) the overall drinking patterns for all participants (abstention, moderate, hazardous); and (2) specific consumption indicators for non-abstaining participants (typical frequency, typical quantity per occasion, heavy drinking frequency), separately for men and women. In addition, we have taken into account a number of social support, social capital and personality characteristics that have not been assessed in previous studies.

Methods

Data were collected during the first wave (Baseline) of the Graduate Longitudinal Study New Zealand (GLSNZ), a new cohort study investigating the employment, health and social outcomes of university graduates. The GLSNZ baseline survey comprised over 400 questions, including socio-demographic factors; university expectations, experiences and satisfaction; employment plans and career

aspirations; academic beliefs and attitudes; current financial circumstances; physical health, disability and functional impairment; health risk behaviors; psychological measures; personality characteristics; social support and social integration; and local and international community participation. The survey is fully described in the GLSNZ Extended Baseline Report [40].

Participants and procedures

Participants were final-year students from each of New Zealand's eight universities who were in a program of study that would have allowed them to graduate with a Bachelor's degree or a higher qualification after successful completion of their studies during 2011. The sampling procedure has been described in detail elsewhere [40]. However, in brief, within subject areas, each university provided a specified number of randomly selected final-year students according to age groups (five-year age bands, starting from age 15), sex, self-reported ethnicity [New Zealand European, Māori, Samoan, Cook Islands Māori, Tongan, Niuean, Chinese, Indian, Other (e.g., Dutch, Japanese, Tokelauan)], enrolment status (full-time, part-time), study mode (intramural, extramural), degree level (undergraduate, postgraduate) and fee status (domestic, international). All international PhD students were included, as were all students from the smallest university. Sampling weights were constructed based on the actual number of potentially graduating students in each category (international PhD or other) for each campus in 2011. These data were provided by each university in 2012 after the finalized student numbers were available. The survey was conducted between July and December 2011. Eligible students were contacted by letter and email, and given a unique study code and password to log on to the secure survey website. Non-responders and non-completers were sent multiple reminder emails, and were contacted up to four times by trained call center staff. Overall, 65 % ($n = 8719/13{,}343$) of the students who were invited agreed to participate and completed the survey. The present analysis was restricted to all of the participants who were aged 25 years and under ($n = 5082/7809$, response level 65 %). We restricted the age range to utilize validated AUDIT-C score cut-points to identify moderate and hazardous drinking patterns [41]. These cut-points were validated using a sample of American university students aged 18–25 years old. Furthermore, we wished to reduce the heterogeneity in the sample as 'mature students' may have widely different life experiences before and during university study compared with students who matriculated soon after completing high school. These different life experiences may subsequently impact on an individual's drinking behavior and psychological outcomes. The study was approved by the New Zealand Multi-region Ethics Committee (MEC/11/EXP/049) and all participants gave informed consent before participating in the study.

Measures

Alcohol consumption

The survey used the AUDIT-C [42], which measures typical drinking frequency, typical drinking quantity per occasion and heavy drinking frequency ($\geq$6 drinks per occasion). Pictures and examples (e.g. 'a jug of beer equals three drinks') of typical drinks (in New Zealand, one standard drink is equivalent to 10 g of pure ethanol) accompanied the questions. We included a greater number of response options for each item than the original instrument to allow for more fine-grained analyses of participants' drinking patterns. The modified response options were able to be collapsed into the original categories (see Online Resource). The AUDIT-C scoring system was used to calculate total drinking scores (minimum zero, maximum 12), with higher scores indicative of a more hazardous drinking pattern. Participants who reported never drinking alcohol were classified as abstainers. They were not asked the typical quantity and heavy drinking frequency questions, and were assigned an AUDIT-C score of zero. We used the calculated AUDIT-C scores to identify overall drinking patterns and categorized participants as abstainers, moderate drinkers (men: AUDIT-C 1–6, women: AUDIT-C 1–4) and hazardous drinkers (men: AUDIT-C $\geq$7, women: AUDIT-C $\geq$5). The cut-points used to identify hazardous drinkers were based on recommended thresholds from research validating the AUDIT-C among American university students aged 18–25 years [41]. We further categorized the non-abstaining participants according to their typical drinking frequency (occasional, monthly to less than weekly, weekly or more often), typical quantity ($\leq$5 standard drinks, 6–10, 11+) and heavy drinking frequency (never, occasional, monthly to less than weekly, weekly or more often).

Psychological measures

The Warwick–Edinburgh Mental Well-being Scale (WEMWBS), a 14-item positively worded instrument assessing subjective well-being and psychological functioning, was used to measure well-being in the 2 weeks before the survey [22] (see Online Resource). Items were answered on a five-point scale and responses summed (minimum possible score 14; maximum possible score 70). The WEMWBS was validated in both community adult and student samples from the United Kingdom [43]. In our

sample, the internal consistency was good (Cronbach's α 0.90).

Self-esteem was measured using the five positively worded items from the ten-item Rosenberg Self-esteem Scale (four-point scale; minimum possible score five, maximum possible score 20) [44] (see Online Resource). Only positively worded items were included due to the desire to maximize completion of the survey and cohort retention. The full scale was validated in American high school students and is widely used in research and clinical practice. The factor structure of the scale is largely unidimensional across cultures [45, 46]. Cronbach's α was 0.78 in our sample.

General self-efficacy was measured using items from the ten-item General Self-efficacy Scale [47] (see Online Resource). Five items, specifically those with the highest internal consistency after pilot testing on third-year University of Otago students, were included in the survey (four-point scale; minimum possible score five, maximum possible score 20). Cross-cultural research suggests that general self-efficacy is a universal construct [48]. The internal consistency was very high in our sample (Cronbach's α 0.96).

Individual, social and personality factors

We included a range of additional variables in the analyses, which are theoretically or plausibly associated with drinking and/or the psychological measures. These variables were included as either (1) potential confounders, or (2) to reduce otherwise unexplained variation in the outcomes, thereby increasing the power to detect associations with the drinking measures. This information was provided by the universities and the participants, and included age, sex, degree level (undergraduate, postgraduate), fee status (domestic, international), social support, social capital and personality characteristics. Social support was assessed using the Multidimensional Scale of Perceived Social Support, a 12-item instrument designed to reflect three factor groups relating to the source of the support (family, friends, and significant other/best friend) (seven-point scale, sum of all scores calculated; minimum possible score 12, maximum possible score 84) [49, 50]. Social capital was assessed using 15 items from a 36-item instrument measuring engagement in community-related behaviors (four-point scale, mean of all scores calculated; minimum possible score 1, maximum possible score 4) [51]. Personality characteristics of extraversion, agreeableness, conscientiousness, neuroticism, and openness were measured using the Big Five Inventory, a 44-item instrument using a five-point scale. Each personality dimension is coded as a subscale, with the mean of the items within each subscale calculated after relevant items have been reverse coded [52].

Analysis

Descriptive statistics, incorporating sampling weights, were calculated for each participant characteristic of interest. Separate linear regression models were used to quantify the unadjusted associations of mental well-being (WEMWBS), self-esteem and general self-efficacy scores with (1) the overall drinking patterns for all participants (abstention, moderate, hazardous); and (2) the specific consumption measures for non-abstaining participants (typical frequency, typical quantity per occasion, heavy drinking frequency), for men and women separately. Adjusted linear regression models were then investigated to determine whether associations changed after adjusting for a range of other factors, including both binary (degree level, fee status) and continuous (age, social support, social capital, personality) variables. We calculated clustered (by campus) standard errors to allow for intra-campus correlation of the data, and examined standard linear regression diagnostics. Pairwise comparisons between levels of categorical independent variables were only performed where the Wald test was statistically significant for that variable. The main analyses were stratified by sex. To determine if sex was an effect modifier of the alcohol variables of interest, models using the full dataset and containing individual interactions between each of these variables and sex were also examined. Stata version 13.1 (StataCorp, College Station, TX) was used for all analyses and two-sided $p < 0.05$ was considered statistically significant in all cases.

Results

Participant characteristics

The baseline characteristics of the 5082 students aged 25 years and under who completed the survey are shown in Table 1 (unweighted proportion of women 63.2 %). There were minor differences in the mean psychological scores between men and women (all $p \leq 0.001$). Women reported greater social support compared to men ($p < 0.001$), and there were small differences between women and men in the median scores of the other social and personality factors (all $p < 0.05$). Relatively few students ($n = 461$, weighted proportion 9.6 %) reported abstaining from alcohol. Although men were more likely than women to report the highest consumption level for all of the individual drinking measures (all $p < 0.001$), women were more likely to be classified as hazardous drinkers based on the AUDIT-C cut-points suggested in the validation study conducted with American students [41] ($p < 0.001$).

Table 1 Characteristics of the participants, aged 25 years and under who were approaching graduation from a New Zealand university in 2011, for men and women

	Men ($n = 1869$)	Women ($n = 3213$)
Individual factors		
Age, mean (SD)	22.4 (1.4)	22.1 (1.4)
Undergraduate, *n* (%)	1292 (68.4)	2455 (77.2)
Domestic student, *n* (%)	1660 (89.1)	2985 (93.1)
Psychological measures, mean (SD)		
Warwick–Edinburgh Mental Well-being Scale	49.6 (8.3)	48.7 (7.7)
Self-esteem	16.4 (2.6)	15.9 (2.4)
General self-efficacy	16.3 (2.4)	15.6 (2.3)
Social factors, median (25th–75th percentile)		
Social support	66 (56–72)	72 (64–78)
Social capital	2.3 (2.1–2.7)	2.5 (2.1–2.7)
Personality characteristics, median (25th–75th percentile)		
Extraversion	3.3 (2.8–3.8)	3.4 (2.9–3.9)
Agreeableness	3.7 (3.3–4.1)	3.9 (3.6–4.3)
Conscientiousness	3.4 (3.1–4.0)	3.8 (3.3–4.1)
Neuroticism	2.8 (2.1–3.1)	3.0 (2.5–3.5)
Openness	3.6 (3.3–4.0)	3.6 (3.2–3.5)
Alcohol use		
Drinking pattern, *n* (%)		
Abstainer	169 (9.5)	292 (9.6)
Moderate drinker[a]	1073 (58.9)	1631 (51.7)
Hazardous drinker[b]	619 (31.6)	1281 (38.7)
	$n = 1692$[c]	$n = 2912$[c]
AUDIT-C, median (25th–75th percentile)	5 (3–8)	4 (2–6)
Consumption indicator, *n* (%)		
Typical frequency		
Less than monthly	334 (20.9)	707 (25.1)
Monthly to less than weekly	485 (29.0)	1036 (35.5)
Weekly or more often	873 (50.1)	1169 (39.5)
Typical quantity (standard drinks[d])		
≤5	986 (60.2)	2080 (72.8)
6–10	411 (23.8)	736 (24.0)
≥11	295 (16.1)	96 (3.2)
Heavy drinking frequency (≥6 standard drinks[d])		
Never	253 (15.9)	565 (20.4)
Less than monthly	631 (38.4)	1313 (44.9)
Monthly to less than weekly	377 (21.4)	638 (21.6)
Weekly or more often	431 (24.3)	396 (13.2)

Numbers are raw frequencies; percentages, means, and medians are weighted for the sampling design

SD standard deviation, *AUDIT-C* Alcohol Use Disorders Identification Test-Consumption

[a] Men: AUDIT-C score 1–6, women: AUDIT-C 1–4 score

[b] Men: AUDIT-C score ≥7, women: AUDIT-C score ≥5

[c] Analyses restricted to participants who answered all three AUDIT-C items

[d] Equivalent to 10 g pure ethanol

Mental well-being

For men, mental well-being was positively associated with overall drinking pattern, and each individual consumption measure, in the unadjusted analyses of WEMWBS scores. However, after adjusting for the individual, social and personality variables, no significant positive associations between mental well-being and any individual

consumption indicator remained. In fact, there were significant negative associations with mental well-being for men who reported moderate or hazardous overall drinking patterns compared to men who abstained from drinking (moderate drinkers AUDIT-C score 1–6: $B = -0.87$, 95 % confidence interval (CI) -1.52 to -0.22, $p = 0.02$; hazardous drinkers AUDIT-C score ≥ 7: $B = -0.97$, 95 % CI -1.91 to -0.03, $p = 0.04$; overall model $p < 0.001$).

For women, both levels of higher typical frequency (monthly to less than weekly, weekly or more often) compared to occasional drinking were significantly associated with higher mental well-being in the unadjusted analysis. However, these associations were no longer significant in the adjusted model. Moreover, in the adjusted model, women's overall drinking pattern was negatively associated with mental well-being; women who reported drinking hazardously (AUDIT-C score ≥ 5) reported lower mental well-being (B $= -1.29$, 95 % CI -1.77 to -0.82, $p < 0.001$, overall model $p < 0.001$) than women who abstained from drinking.

The interactions between sex and the individual consumption measures were not significant for mental well-being (all $p > 0.105$).

Self-esteem

For men, there were significant positive associations in the unadjusted models between self-esteem scores and overall drinking pattern, typical frequency and heavy drinking frequency. However, in the adjusted models, significant positive associations were only observed for heavy drinking frequency (any level) (occasionally: $B = 0.30$, 95 % CI 0.11–0.49, $p = 0.007$; monthly to less than weekly: $B = 0.32$, 95 % CI 0.02–0.62, $p = 0.040$; weekly or more often: $B = 0.26$, 95 % CI 0.06–0.46, $p = 0.020$; overall model $p < 0.001$) compared to non-abstaining men who reported never drinking heavily.

For women, overall drinking pattern was not associated with self-esteem scores in the unadjusted model. However, in the adjusted model both a moderate and a hazardous pattern were significantly associated with lower self-esteem compared to abstention (moderate drinkers AUDIT-C 1–4: $B = -0.26$, 95 % CI -0.51 to -0.01, $p = 0.047$; hazardous drinkers AUDIT-C ≥ 5: $B = -0.43$, 95 % CI -0.71 to -0.16, $p = 0.007$; overall model $p < 0.001$). Among women drinkers, greater typical drinking frequency was also significantly associated with higher self-esteem scores, but these associations were no longer significant in the adjusted model. Women who reported typically drinking 11 or more standard drinks per occasion had significantly lower self-esteem scores in the unadjusted model than women who reported drinking five or fewer drinks per occasion. This association remained significant, although attenuated, in the adjusted model ($B = -0.55$, 95 % CI -0.95 to -0.15, $p = 0.014$; overall model $p < 0.001$). Heavy drinking frequency was not associated with self-esteem scores in the unadjusted model, although women who drank heavily weekly or more often had significantly lower self-esteem in the adjusted model ($B = -0.43$, 95 % CI -0.65 to -0.21, $p = 0.003$; overall model $p < 0.001$) than non-abstaining women who reported never drinking heavily.

There was a significant interaction between sex and heavy drinking frequency for self-esteem ($p < 0.001$), but no interactions between sex and the other individual consumption measures.

General self-efficacy

For men, overall drinking pattern, typical frequency and heavy drinking frequency were all significantly associated with higher general self-efficacy scores in the unadjusted models (Table 2). After adjustment, significant positive associations remained, albeit attenuated, for the higher levels of both typical frequency and heavy drinking frequency. Moreover, a significant positive association was observed in the adjusted model for typical quantity and general self-efficacy; men who reported typically drinking six to ten drinks per occasion also reported higher general self-efficacy than men who typically drank five or few drinks per occasion.

For women, overall drinking pattern and heavy drinking frequency were both significantly associated with higher general self-efficacy scores, with these associations remaining significant in the adjusted models (Table 2). Women who reported a moderate or hazardous drinking pattern were more likely to also report higher general self-efficacy than women who abstained from drinking. Women who reported drinking heavily less than monthly, or monthly to less than weekly, also reported higher general self-efficacy than non-abstaining women who reported never drinking heavily. Typical frequency and typical quantity were not associated with general self-efficacy in the unadjusted or adjusted models.

There were significant interactions between sex and typical quantity ($p = 0.008$) and heavy drinking frequency ($p = 0.013$) for general self-efficacy, but no interaction between sex and typical frequency.

Table 2 Results of the unadjusted and adjusted linear regression models for the associations between overall drinking pattern, Alcohol Use Disorders Identification Test-Consumption (AUDIT-C), typical drinking frequency, typical drinking quantity and heavy drinking frequency (≥6 standard drinks[a]) with general self-efficacy scores, for men and women aged 25 years and under who were approaching graduation from a New Zealand university in 2011

	Men ($n = 1869$)			Women ($n = 3213$)		
	B	Robust *SE*	95 % CI	*B*	Robust *SE*	95 % CI
Overall drinking pattern[b,c]						
Unadjusted						
Moderate[d]	0.43	0.25	−0.15, 1.02	0.43	0.12	0.14, 0.72*
Hazardous[e]	0.83	0.24	0.26, 1.40*	0.41	0.16	0.04, 0.78*
Overall model *p*	0.009			0.026		
Adjusted[f]						
Moderate[d]	−0.04	0.17	–0.44, 0.37	0.27	0.10	0.04, 0.51*
Hazardous[e]	0.16	0.20	–0.30, 0.62	0.29	0.11	0.03, 0.54*
Overall model *p*	<0.001			<0.001		
Participants who reported drinking	$n = 1692$			$n = 2912$		
Typical frequency[g]						
Unadjusted						
Monthly to less than weekly	0.75	0.15	0.40, 1.11**	0.26	0.13	–0.04, 0.55
Weekly or more often	0.98	0.11	0.72, 1.24***	0.26	0.12	–0.01, 0.54
Overall model *p*	<0.001			0.108		
Adjusted[f]						
Monthly to less than weekly	0.11	0.09	−0.10, 0.32	−0.02	0.06	–0.17, 0.12
Weekly or more often	0.25	0.06	0.10, 0.40**	0.05	0.12	–0.23, 0.32
Overall model *p*	<0.001			<0.001		
Typical quantity[h] (standard drinks[a])						
Unadjusted						
6–10	0.36	0.23	–0.19, 0.91	–0.20	0.11	–0.46, 0.06
11+	0.38	0.16	0.003, 0.75	–0.40	0.27	–1.03, 0.23
Overall model *p*	0.124			0.187		
Adjusted[f]						
6–10	0.21	0.08	0.02, 0.41*	–0.07	0.08	–0.26, 0.11
11+	0.13	0.09	–0.08, 0.34	–0.22	0.28	–0.88, 0.44
Overall model *p*	<0.001			<0.001		
Heavy drinking (≥6 standard drinks[a]) frequency[i]						
Unadjusted						
Less than monthly	0.56	0.14	0.22, 0.89**	0.25	0.07	0.08, 0.43*
Monthly to less than weekly	0.77	0.19	0.32, 1.22**	0.23	0.10	–0.003, 0.47
Weekly or more often	0.99	0.11	0.73, 1.24***	−0.05	0.14	–0.38, 0.29
Overall model *p*	<0.001			0.003		
Adjusted[f]						
Less than monthly	0.29	0.13	–0.01, 0.58	0.14	0.05	0.03, 0.24*
Monthly to less than weekly	0.34	0.09	0.13, 0.56**	0.20	0.06	0.05, 0.34*
Weekly or more often	0.46	0.10	0.22, 0.69**	−0.03	0.9	–0.24, 0.18
Overall model *p*	<0.001			<0.001		

CI confidence interval

[a] Equivalent to 10 g pure ethanol

[b] Reference: abstaining participants

[c] Calculated from AUDIT-C scores, separately for men and women

[d] Men: AUDIT-C 1–6, women: AUDIT-C 1–4

[e] Men: AUDIT-C ≥7, women: AUDIT-C ≥5

[f] Adjusted for age, degree level, fee status, social support, social capital and personality variables

[g] Reference: less than monthly

[h] Reference: ≤5 standard drinks

[i] Reference: never

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Discussion

Associations between drinking and mental well-being

We observed that a moderate or hazardous drinking pattern among men, and a hazardous drinking pattern among women, was associated with significant decreases in mental well-being scores compared to men and women who abstained from drinking, after adjusting for the individual, social and personality characteristics. Furthermore, none of the individual consumption indicators (typical drinking frequency, typical drinking quantity, heavy drinking frequency) were associated with mental well-being in the adjusted models, for either men or women. Our findings are at odds with other research among university students that reported positive associations with consumption measures, such as heavy drinking frequency, and subjective well-being [14] or satisfaction [21]. These studies did not use validated outcome measures however, thus the constructs may differ from those examined in the present study. Our findings also differ from the results of a single-institution Irish study, which observed no association between alcohol use and mental well-being (WEMWBS) scores. However, this study did not adjust for social support, social capital or personality characteristics [23].

Associations between drinking and self-esteem

Our findings suggest that the association between drinking and self-esteem is different for men and women. Heavy drinking frequency was associated with higher self-esteem for men. Conversely, for women, lower self-esteem scores were observed with overall drinking pattern, typical quantity and heavy drinking frequency. These findings are similar to previous research among university student samples that also observed differences in the association between alcohol use and self-esteem between men and women [27, 31]. Corbin et al. [27] reported that women who reported moderate (one to 14 drinks per week) and heavy (more than 15 drinks per week) consumption had significantly lower Rosenberg Self-esteem scores than women who abstained from drinking. In contrast, as weekly alcohol volume increased for men, there were small yet statistically significant increases in self-esteem scores. Similarly, Walitzer and Sher [31] observed lower Rosenberg Self-esteem scores among women who met Diagnostic and Statistical Manual of Mental Disorders (third edition) criteria for an alcohol use disorder, compared to women who did not meet the criteria.

Associations between drinking and general self-efficacy

As far as we are aware, this is the first study to investigate associations between drinking and general self-efficacy among university students. We found a general pattern of significantly increased general self-efficacy scores for both men and women who reported drinking alcohol. While the increases in the scores, relative to the respective reference categories, were small, a general pattern of improved general self-efficacy associated with higher levels of drinking for both men and women in our sample is nevertheless an interesting observation.

Implications

While we found a number of statistically significant differences in our analyses of drinking and mental well-being, self-esteem and general self-efficacy, it is important to note that the size of the differences we observed, both increases and decreases, relative to the respective reference groups for each individual analysis, were all small and hence of questionable clinical significance. It is unlikely that these minor, yet statistically significant differences would manifest as notably impaired or enhanced functioning for the participants. In this population of New Zealand university students approaching graduation, drinking at what would be regarded as very high levels of consumption among community samples, does not appear to have any substantive association with the measured psychological outcomes.

We found that a number of the associations observed in the unadjusted analyses changed with the inclusion of the potential confounding variables to the models. Previous studies among university students assessing the same psychological measures as those in the present investigation have included personal factors (age, sex, ethnicity, body mass index, subject of study, accommodation type, tobacco and illicit drug use, number of sexual partners, family history of alcoholism), interpersonal factors (time spent with friends, recent positive and negative interpersonal encounters), drinking-related factors (alcohol-related problems, intentions to drink, drinking with others), and personality factors (including narcissism and social desirability, the tendency to describe oneself favourably to gain approval from others) [23, 27, 28, 30, 31, 35, 36], as potential confounders. However, none have measured levels of social support or social capital, and only one assessed the Big Five personality inventory [36]. Examining both the unadjusted and adjusted models in the present study helps inform our understanding of possible underlying causal influences on the associations between

drinking and the psychological measures, while highlighting the need to include a fuller range of social and personality factors when modelling drinking and psychological outcomes among a university student population.

Finally, research is required to confirm the associations we observed between drinking and general self-efficacy. If future studies among university students do confirm our results, more investigation is needed into the nature of the association. General self-efficacy involves a "global", generalized assessment of one's ability to perform and function, in contrast to task-specific behaviour. Therefore, the appropriate drinking dimension to investigate may be overall patterns of alcohol consumption, as opposed to context-specific drinking indicators.

Strengths and limitations

The main strengths of this study include the representativeness of the sample, with students from each of New Zealand's eight universities participating, and analyses that allowed for possible clustering within campuses. Additionally, communication with the eligible students was facilitated by access to the students' contact details, which were held by the universities, resulting in a virtually complete sampling frame. This is in contrast to much of the previous research investigating drinking and psychological health or well-being among university students, which has generally used small, single-institution convenience samples, and therefore may be of limited generalizability. In a university student population, web-based surveys have a number of advantages compared to postal or interview methods, including higher observed response rates, better quality data, cost efficiencies and potentially less social desirability bias [53–55]. A satisfactory response level was achieved for this study through intensive follow-up of non-responders and non-completers. The response level of our sample (65 %) was at least comparable to other surveys of similarly aged New Zealand students [2, 6], but there will still be some loss of representativeness due to self-selection.

Limitations of this study include the cross-sectional design of the study, which precludes assessment of the direction of causality for any of the associations we observed. We were also unable to distinguish lifetime abstainers from former problem drinkers, however the proportion of the latter among the abstaining participants is expected to be very low in this sample of students aged 25 years and under, and unlikely to substantially bias our results. Finally, as the study was not designed specifically for this analysis, there was a range of other factors that may be associated with alcohol consumption and psychological outcomes, such as drinking expectancies, alcohol-related adverse events and family history of alcoholism [14, 17], which we were unable to incorporate in our models.

Conclusion

Our results indicate that there are unlikely to be substantial, clinically meaningful harms or benefits associated with greater alcohol consumption and mental well-being, self-esteem or general self-efficacy in this sample of New Zealand university students aged 25 years and under. We will be able to examine the predictive value of the baseline drinking characteristics on the participants' future psychological outcomes at later stages of this on-going cohort study. Our findings underscore the importance of investigating a fuller range of social and personality factors that may confound the association of alcohol consumption and psychological outcomes.

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Compliance with ethical standards

Ethical standards The study was approved by the New Zealand Multi-region Ethics Committee (MEC/11/EXP/049). All participants gave informed consent prior to participating in the study.

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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