Cross-cultural comparisons of drinking motives in 10 countries: Data from the DRINC project

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Abstract

Introduction and Aims. This study tested the measurement invariance of the Drinking Motives Questionnaire-Revised Short Form (DMQ-R-SF) in undergraduates across 10 countries. We expected the four-factor structure to hold across countries, and for social motives to emerge as the most commonly endorsed motive, followed by enhancement, coping and conformity motives. We also compared individualistic and collectivistic countries to examine potential differences in the endorsement of drinking motives when countries were divided according to this broad cultural value. *Design and Methods.* A sample of 8478 undergraduate drinkers from collectivistic (Portugal, Mexico, Brazil, Spain; *n* = 1567) and individualistic (Switzerland, Hungary, Canada, the Netherlands, the UK and Ireland, and the USA; *n* = 6911) countries completed the DMQ-R-SF. Countries were classified as individualistic or collectivistic based on world-wide norms. *Results.* Using multigroup confirmatory factor analysis, the 4-factor model of the DMQ-R-SF showed configural and metric invariance across all 10 countries. As predicted, the rank order of undergraduates' drinking motive endorsement was identical across countries (social > enhancement > coping > conformity), although a mixed model analysis of variance revealed a significant interaction where undergraduates from individualistic countries more strongly endorsed social and enhancement motives relative to undergraduates from collectivistic countries. *Discussion and Conclusions.* There was broad cross-cultural consistency in the factor structure and mean patterns of drinking motives. Undergraduate students appear to drink mainly for positive reinforcement (i.e. for social and enhancement reasons), although this tendency is particularly pronounced among those from more individualistic countries. [Mackinnon SP, Couture M-E, Cooper ML, Kuntsche E, O'Connor RM, Stewart SH, and the DRINC Team. Cross-cultural comparisons of drinking motives in 10 countries: Data from the DRINC project. *Drug Alcohol Rev* 2017;36:721–730]

Key words: drinking motives, cross-cultural, individualism, collectivism, factor analysis.

Introduction

Drinking motives are the most proximal predictors of alcohol use quantity, frequency and problems [1,2]. Drawing on Cox and Klinger's [3] motivational model, Cooper's [4] model of drinking motives crosses two dimensions: valence (approach vs. avoidance) and source (internal vs. external). Crossing these two dimensions produces four motives: social (approach, external; drinking to obtain positive social rewards), enhancement (approach, internal; drinking to enhance positive affect), conformity (avoidance, external; drinking to avoid social rejection), and coping (avoidance, internal; drinking to reduce negative affect) motives. A widely used measure of drinking motives is the Drinking Motives Questionnaire-Revised (DMQ-R) [4]. Recently, a short-form was created to reduce participant burden and enhance cross-cultural comparability (DMQ-R-SF)

[5]. The DMQ-R and DMQ-R-SF have consistently shown a clear 4-factor structure in a variety of countries, including the USA [4], Canada and Switzerland [6], Spain [7], Sweden [8], Italy [9] and the Netherlands [10]. Although prior psychometric research has been primarily limited to adolescent samples with two or three countries compared, no substantial differences in the factorial structure of the DMQ-R or DMQ-R-SF have been found across European and North American countries [6,11,12]. However, prior research examining the factor structure of the DMQ-R and DMQ-R-SF has mostly focused on individualistic countries, with comparatively little focus on collectivistic countries. Thus, the present study examined the psychometric properties of the DMQ-R-SF in undergraduates within individualistic [Canada, the Netherlands, Hungary, Switzerland, UK and Ireland (GBR/IRL), USA] and collectivistic (Brazil, Mexico, Portugal and Spain) countries.

Culture and drinking motives

Social motives have been the most commonly endorsed across all countries studied to date, followed by enhancement, coping and conformity motives, respectively [2,6,11]. Thus, we expect this general pattern to emerge cross-culturally in the present study. However, there are also theoretical reasons to expect cross-cultural differences. One important distinction in drinking motives research [2] is the extent to which a motive is internally driven (agentic and self-focused) or externally driven (communal and other-focused). The distinction between agentic and communal goals has long been discussed in cross-cultural research [13] and continues to play a central role in many motivational models, such as self-determination theory [14]. Collectivistic countries are interdependent, communal and prioritise group goals, while individualistic countries are autonomous, self-focused and prioritise individual goals [15,16]. Thus, it seems intuitively reasonable that people from collectivistic countries would tend to drink for communal reasons (social and conformity motives) more so than people from individualistic countries.

A less intuitive cross-cultural distinction involves approach (directing behaviour towards positive stimuli) and avoidance (directing behaviour away from negative stimuli) motives [17]. A small body of literature supports a preference for approach motives in individualistic relative to collectivistic cultures. American samples were found to endorse more approach goals relative to avoidance goals on an open-ended personal strivings measure when compared with South Korean and Russian samples [18]. Similarly, compared with Japanese students, American and Canadian students better recalled information framed in approach (relative to avoidance) terms,

and preferred book reviews with more approach-focused content [19]. Moreover, North Americans are more likely to self-enhance and pursue tasks that increase or improve their positive traits relative to those from Japan [20]. In other words, North Americans were more motivated to approach positive outcomes. Thus, a competing prediction might be that people from individualistic countries will endorse approach-oriented (social and enhancement) drinking motives more so than people from collectivistic countries.

Results from cross-cultural studies of drinking motives are mixed. In one study, Hungarian students scored higher on enhancement, social and coping motives compared with Spanish students, with no differences in conformity motives [12]. In another, drinking motives were more strongly endorsed in Northern European countries (more individualistic), compared with southern European countries (more collectivistic), although the magnitude of this difference was greatest for social motives [11,21]. However, few collectivistic countries [15] have been examined, so this question remains open and requires further study.

Rationale and hypotheses

The present study extends previous cross-cultural research on drinking motives in four ways. First, this study includes data from 10 cultural groups across three continents, representing the broadest cross-cultural analyses of drinking motives to date [22]. Second, there have been few cross-cultural comparisons of the factor structure of drinking motives [11,12] and when cross-cultural mean comparisons are examined, they tend to be exploratory and atheoretical. Third, although past research provides good representation from North America and individualistic European countries, there has been comparatively less representation from more collectivistic countries. Hypotheses were as follows:

H 1: The four-factor structure of the DMQ-R-SF would replicate across all 10 countries. More specifically, we expected both configural invariance (same factor structure) and metric invariance (same magnitude of factor loadings) to hold across countries.

H 2: Positively reinforcing motives (social and enhancement) would be more frequently endorsed than negatively reinforcing motives (coping and conformity) across all countries. Specifically, we expected social motives to be the most frequently endorsed motive, followed by enhancement, coping and conformity motives, respectively.

Additionally, two competing hypotheses regarding cross-cultural differences were tested:

H 3a: Individuals from countries classified as collectivistic based on the Hofstede *et al.* [15] individualism-collectivism criteria (Brazil, Mexico, Portugal and Spain) were expected to endorse communal motives (social and conformity) more so than individuals from individualistic countries (Canada, Hungary, the Netherlands, Switzerland, GBR/IRL and USA).

H 3b: Individuals from countries classified as individualistic based on the Hofstede *et al.* [15] scale were expected to endorse approach motives (social and enhancement) more so than individuals from collectivistic countries.

Method

Participants

The present study used data from the Drinking Reasons Inter-National Collaboration (DRINC) Project [22], comprising 21 datasets from 10 countries (Brazil, Canada, Hungary, Mexico, the Netherlands, Portugal, Spain, Switzerland, GBR/IRL and the USA). Data were convenience samples of undergraduates collected between the years 2001 and 2013. See Couture *et al.* [22] for a more detailed summary of participants and methods. All data were collected in compliance with ethical guidelines outlined in the Declaration of Helsinki [23]. Participants were university undergraduate students aged 17 to 30 ($M = 20.31$, $SD = 2.45$) years. Individuals who reported abstaining from drinking were excluded, yielding a final sample of 8478.

Measures

Drinking motives. Participants completed the DMQ-R [4], a 20-item self-report measure of drinking motives. In the present study, we used a subset of 12 items that comprise the DMQ-R-SF, as these items were specifically developed for use in cross-cultural studies [5]. The DMQ-R-SF assesses four drinking motives: social, enhancement, conformity and coping. The factor structure and inter-factor correlations of the DMQ-R-SF are equivalent to those of DMQ-R across age, sex and different language subgroups (German, French and Italian). Furthermore, this measure has demonstrated good psychometric properties, comparable with those of the DMQ-R [6]. Participants were typically asked to indicate how often they drink for each given reason, on a scale ranging from 1 (never/almost never) to 5 (always/almost always). When different response scales were used in some samples (e.g. a 1–4 scale), responses on the DMQ-R-SF were recoded to a 1–5 scale to maintain numeric equivalence across samples, as in previous cross-national studies [6,11]. When the measure was administered in languages other than English, collaborators provided their translations and back translations to the authors for review prior to inclusion of the dataset [22].

Individualism-collectivism. Individualism-Collectivism was calculated for each country based on Hofstede *et al.*'s individualism (IDV) dimension [15]. Collectivistic countries are interdependent, communal and group-oriented; individualistic countries are autonomous and self-focused. Hofstede *et al.* [15] calculated IDV scores based on factor analytic results; they multiplied standardised factor scores by 25, then added a constant of 50, creating a bipolar scale with a theoretical range of 0 (collectivistic) to 100 (individualistic). Given this method, we considered countries with scores lower than 50 as collectivistic, and scores above 50 as individualistic. The one exception was Spain, which fell at the midpoint on IDV relative to other countries worldwide. Thus, we categorised Spain relative to other countries in our sample. Spain's IDV score was closer to the next most collectivistic country in our sample (Brazil) than it was to next most individualistic country (Switzerland). Spain is also more collectivistic on the IDV scale than all other European nations except for Portugal, Turkey and Greece [15], and has been considered to be collectivistic in past cross-cultural research [24]. Moreover, Portugal, Brazil, Spain and Mexico are more culturally and linguistically similar to each other than to other countries in the sample (e.g. Latin-origin language). Thus, we classified Spain as collectivistic. Individualistic countries included Canada, Hungary, the Netherlands, Switzerland, GBR/IRL and the USA (average IDV = 80.5). Collectivistic countries included Brazil, Mexico, Portugal and Spain (average IDV = 36.5). Because one sample combined data from two countries (GBR/IRL) a weighted average was calculated based on the proportion of participants from the UK (IDV = 89) and Ireland (IDV = 70).

Data analytic strategy

Confirmatory factor analysis (CFA) using MLR estimation in Mplus 7.11 was employed to test the factorial validity of the DMQ-R-SF. Missing data due to item non-response ($<0.5\%$) were handled using full information maximum likelihood. When interpreting model fit, a root-mean-square error of approximation (RMSEA) and a standardised root mean square residual (SRMR) below 0.05 indicated excellent fit, values below 0.08 represented adequate fit, and values larger than 0.08 indicated poor fit. Moreover, a comparative fit index (CFI) and

Tucker-Lewis Index (TLI) over 0.95 indicated excellent fit, values over 0.90 were adequate, and values lower than 0.90 fit poorly [25,26]. Overall, models were determined to be well-fitting if at least 3 out of 4 indices met criteria for adequate fit.

First, CFAs were estimated for the entire sample and for each country separately. Given repeated evidence of a high correlation between the two approach motives, the four-factor models were compared with 3-factor models where social and enhancement items loaded onto the same factor [4]. Next, we tested a series of multi-group models to see if the factor structures were invariant across countries. For each of the 45 pairwise comparisons of countries, we tested both configural and metric invariance [27]. In configural invariance models, the factor structure was identical, but factor loadings, intercepts and residual variances were allowed to freely vary. In metric invariance models, factor loadings were constrained to equality across countries. The configural and metric invariance models are nested models, and were compared using ΔCFI. A ΔCFI ≤ −0.01 indicated the metric model fit worse than the configural model [28]. When the ΔCFI was a positive value, or smaller than −0.01, the more parsimonious metric invariance model was retained. We also conducted likelihood ratio tests to compare nested models. Because of the sensitivity of this test to large samples [26], we converted the likelihood ratio test statistics into a standardised effect size 'r' [29]. Effect sizes smaller than 0.10 were considered to be very small [30], and unlikely to be of practical significance. Next, we examined latent correlations to see if the magnitude of correlations differed across countries (structural invariance). We were interested in this constraint to see if the associations between different motives was approximately the same across countries. Specifically, using nested model comparison, we tested if a model where latent correlations were constrained to equality across countries fit better than a model where correlations were freely estimated using ΔCFI ≤ −0.01 as a cut-off [28]. Means, SDs and Cronbach's alphas were calculated for the whole sample and for each country separately. Hypotheses 2 and 3a were tested by running a 4 × 2 mixed model with type of motive (social, enhancement, coping and conformity) and individualistic versus collectivistic countries predicting drinking motives scores.

Results

Confirmatory factor analyses

We first conducted 4-factor CFAs for the whole sample, and for each country separately with items loading on their theorised factors. Fit indices are presented in Table 1, and demonstrate adequate-to-excellent fit in all cases. The fit indices for Mexico were lower than other countries, although still within an acceptable range. Standardised factor loadings ranged from 0.49 to 0.92, and were all statistically significant at $P < 0.05$. In comparison, 3-factor models with social and enhancement items loading on the same factor fit the data more poorly than the 4-factor models, with ΔCFIs ranging from −0.021 (the Netherlands) to −0.051 (Canada). Figures 1 and 2 depict the measurement models, factor loadings and latent correlations for the three-factor and four-factor models when data are combined across all countries. We proceeded to test measurement invariance using the 4-factor model.

Measurement invariance

We first tested for measurement invariance between individualistic and collectivistic cultures. The metric invariance model fit well, $\chi^2(104) = 1018.86$, $P < 0.001$, CFI = 0.98; TLI = 0.97; RMSEA = 0.05 and the CFI was identical (to three decimal places) when compared with the configural model.

We tested configural invariance for each pairwise comparison of countries as a more stringent test of whether or not the same 4-factor structure holds across countries. Fit indices for these models were all adequate-to-excellent, RMSEAs ≤0.07, SRMRs ≤0.07, CFIs ≥0.94, TLIs ≥0.92. In all 10 countries, the four-factor model fit the data well, supporting the notion that the theorised 4-factor model of drinking motives is configurally invariant across countries. We tested metric invariance by running similar models, and constraining factor loadings to equality across countries. Overall, these models fit well, with RMSEAs ≤0.07, SRMRs ≤0.07, CFIs ≥0.94 and TLIs ≥0.93. We compared these models to the configural models using ΔCFI (Table 2). Overall, 40 of 45 pairwise comparisons suggested the magnitude of factor loadings was invariant across countries in most cases. The five exceptions involved Hungary, as compared with Canada, Mexico, Switzerland, Spain and GBR/IRL (Table 2). Effect sizes for likelihood ratio tests ranged from 0.02 to 0.09. Thus, cross-cultural differences in the magnitude of the factor loadings are small and unlikely to be of practical significance. Fit indices for all pairwise comparisons as well as tests of partial measurement invariance are included as supplementary materials.

Latent correlations

We compared a model with latent correlations constrained to be equal to a model where latent

Table 1. *Fit indices for confirmatory factor analyses within each country*

Country	*n*	χ^2	RMSEA	CFI	TLI	SRMR
Portugal	489	127.74	0.058	0.96	0.94	0.06
Mexico	298	149.95	0.08	0.93	0.91	0.06
Brazil	384	98.42	0.05	0.96	0.94	0.05
Spain	396	113.32	0.06	0.96	0.94	0.07
Switzerland	364	89.35	0.05	0.96	0.95	0.06
Hungary	839	128.73	0.05	0.97	0.96	0.03
Canada	1223	194.15	0.05	0.97	0.96	0.04
The Netherlands	1297	251.53	0.06	0.97	0.96	0.04
UK and Ireland	733	181.99	0.06	0.95	0.93	0.05
USA	2455	486.41	0.06	0.96	0.95	0.04
All countries	8478	892.31	0.046	0.98	0.97	0.03

P-values for chi-squares were all statistically significant $P < 0.001$. CFI, comparative fit index; RMSEA, root-mean-square error of approximation; SRMR, standardised root mean square residual; TLI, Tucker-Lewis Index.
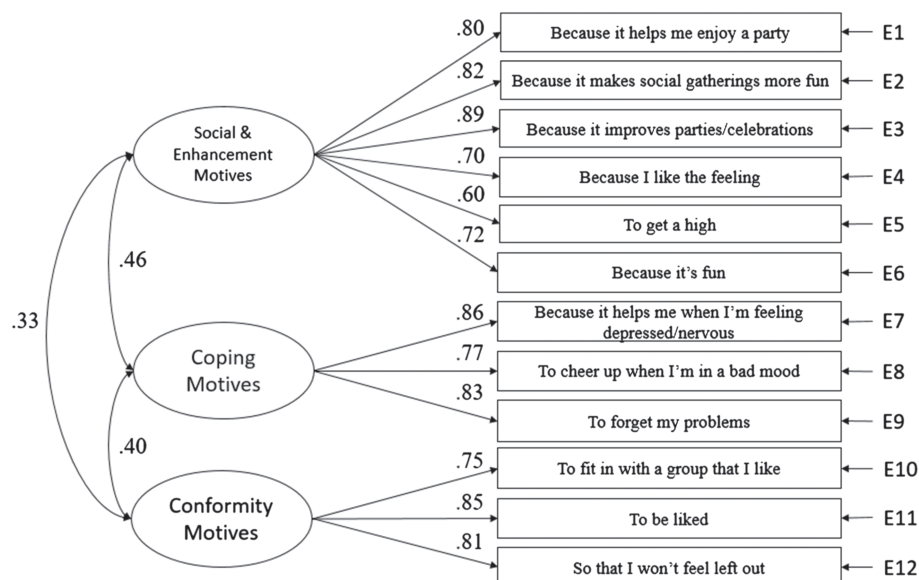

Figure 1. *Three-factor confirmatory factor analysis model across all countries ($n = 8478$). Ovals indicate latent variables. Rectangles indicate manifest indicators. E1–E12 indicate residual error terms. Numbers above single-headed arrows indicate standardised factor loadings. Numbers above double-headed arrows indicate latent correlations. All correlations and loadings significant at $P < 0.001$.*

correlations were allowed to vary across countries in a single model, including all countries. A single overall test of invariance was conducted for parsimony. When comparing these nested models, the ΔCFI was −0.006, suggesting the magnitude of the correlations did not differ across countries. Latent correlations from the whole sample are presented in Figure 2. Motives were moderately intercorrelated (*r*s from 0.28 to 0.46), with the exception of one large correlation between social and enhancement motives (0.83). Nevertheless, a 3-factor model constraining social and enhancement motives to load on one factor (Figure 1) fit more poorly than a 4-factor model, suggesting these are best considered distinct, albeit highly correlated, constructs.

Drinking motive reliability and mean comparisons

IDV scores, along with means, standard deviations, and reliabilities for drinking motives within each country are presented in Table 3. We used observed scores, rather than factor scores, to facilitate comparison across studies. All motives had acceptable reliability within each country (*α*'s > 0.68) especially when considering only three items
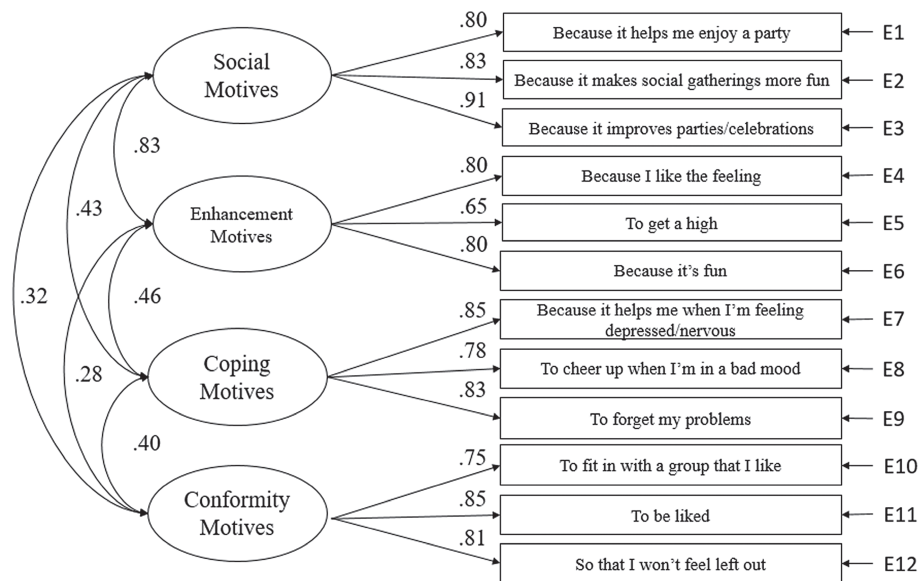
Figure 2. *Four-factor confirmatory factor analysis model across all countries (n = 8478). Ovals indicate latent variables. Rectangles indicate manifest indicators. E1–E12 indicate residual error terms. Numbers above single-headed arrows indicate standardised factor loadings. Numbers above double-headed arrows indicate latent correlations. All correlations and loadings significant at P < 0.001.*

were used for each subscale. As shown in Figure 3 and consistent with H 2, a consistent rank order in mean levels of endorsement emerged across all 10 countries (social > enhancement > coping > conformity). Moreover, the pattern of means in Figure 3 supports H 3b, but not H 3a (i.e. social and enhancement motives are endorsed more frequently in individualistic countries).

Data were re-structured, such that motives were a within-subjects factor with 4 levels, and individualism-collectivism was a between-subjects component with two levels. A 4×2 mixed model showed that there was a main effect for individualism-collectivism, $F(1\,8489) = 358.98, P < 0.001$, indicating that undergraduates from individualistic countries score higher on all four drinking motives compared with undergraduates from collectivistic countries. A main effect for type of motive was also found, $F(1\,25310) = 4641.72, P < 0.001$, confirming the previously described rank order of motives. There was also an interaction effect, $F(1\,25310) = 117.93, P < 0.001$. Communal motives (social and conformity) were not more commonly endorsed in collectivistic cultures relative to individualistic countries, failing to support H 3a (Figure 4). In fact, individualistic countries tended to endorse all motives more frequently than collectivistic countries; however, the magnitude of this effect was larger for approach (social $d = 0.53$; enhancement $d = 0.54$) than for avoidance motives (coping $d = 0.19$; conformity $d = 0.25$), supporting H 3b. However, people from Hungary had lower endorsement of enhancement motives relative to collectivistic cultures than might have been expected given Hungary's status as an individualistic country (Figure 3). All pairwise comparisons of drinking motive means by country are presented

in Supplementary Table 3. These comparisons support this analysis.

Discussion

The present study extended past cross-cultural work validating the psychometric properties of the DMQ-R-SF [11] by studying undergraduates in individualistic and collectivistic countries using the broadest cross-cultural samples to date. The 4-factor model of the DMQ-R-SF was largely invariant across 10 countries, supporting H 1. Moreover, the rank order of motives (social > enhancement > coping > conformity) was identical in all 10 countries, supporting H 2. Finally, individualistic countries more strongly endorsed positively reinforcing motives (social and enhancement) than collectivistic countries, supporting H 3b.

Although the factor structure was largely invariant across countries, undergraduates from Hungary did show slight differences in the magnitude of factor loadings when compared with Canada, Mexico, Spain, Switzerland and GBR/IRL, suggesting Hungarian participants may place slightly different weight on individual items within the enhancement and conformity subscales, or that certain items may not translate well into Hungarian. Moreover, Hungary showed markedly lower levels of enhancement motives than might be expected given its status as an individualistic culture. These differences might be due to strong Russian or Slavic influences not present in Western individualistic countries. Overall, there are broad cross-cultural similarities, with some

Table 2. *ΔCFI values comparing configural invariance to metric invariance models*

Country 1	Country 2	N1	N2	ΔCFI	Δχ²	r
Portugal	Mexico	489	298	0.004	5.22	0.03
Portugal	Brazil	489	384	0.006	4.34	0.02
Portugal	Spain	489	396	−0.004	20.26	0.05
Portugal	Switzerland	489	364	0.004	4.56	0.03
Portugal	Hungary	489	839	−0.009	37.86★	0.06
Portugal	Canada	489	1223	0.001	9.97	0.03
Portugal	The Netherlands	489	1297	−0.002	24.50	0.04
Portugal	UK and Ireland	489	733	−0.001	15.62	0.04
Portugal	USA	489	2455	−0.001	28.35★	0.03
Mexico	Brazil	298	384	0.003	8.16	0.04
Mexico	Spain	298	396	−0.003	18.15	0.06
Mexico	Switzerland	298	364	0.001	8.79	0.04
Mexico	Hungary	298	839	−0.01	45.56★	0.07
Mexico	Canada	298	1223	0	11.24	0.03
Mexico	The Netherlands	298	1297	0	13.07	0.03
Mexico	UK and Ireland	298	733	−0.001	16.04	0.04
Mexico	USA	298	2455	0	15.61	0.03
Brazil	Spain	384	396	0	12.02	0.04
Brazil	Switzerland	384	364	0.004	7.09	0.03
Brazil	Hungary	384	839	−0.003	19.27	0.04
Brazil	Canada	384	1223	0.001	12.22	0.03
Brazil	The Netherlands	384	1297	0	15.11	0.03
Brazil	UK and Ireland	384	733	0.003	9.18	0.03
Brazil	USA	384	2455	0.002	16.89	0.03
Spain	Switzerland	396	364	−0.003	16.25	0.05
Spain	Hungary	396	839	−0.02	88.53★	0.09
Spain	Canada	396	1223	−0.003	26.26★	0.05
Spain	The Netherlands	396	1297	−0.001	21.63	0.04
Spain	UK and Ireland	396	733	−0.002	20.89	0.05
Spain	USA	396	2455	0	21.68	0.03
Switzerland	Hungary	364	839	−0.011	42.99★	0.07
Switzerland	Canada	364	1223	0.002	6.59	0.02
Switzerland	The Netherlands	364	1297	−0.003	30.43★	0.05
Switzerland	UK and Ireland	364	733	−0.002	19.28	0.05
Switzerland	USA	364	2455	−0.001	28.98★	0.04
Hungary	Canada	839	1223	−0.013	111.44★	0.08
Hungary	The Netherlands	839	1297	−0.009	76.23★	0.07
Hungary	UK and Ireland	839	733	−0.013	76.53★	0.08
Hungary	USA	839	2455	−0.006	86.75★	0.06
Canada	The Netherlands	1223	1297	−0.005	64.43★	0.06
Canada	UK and Ireland	1223	733	−0.002	24.18	0.04
Canada	USA	1223	2455	−0.003	62.20★	0.05
The Netherlands	UK and Ireland	1297	733	−0.002	24.89	0.04
The Netherlands	USA	1297	2455	0.001	8.62	0.02
UK and Ireland	USA	733	2455	−0.002	31.68★	0.04

ΔCFI refers to a comparison between the configural and metric models. Values ≤ -0.01 suggest that the configural model fits better than the metric model. $\Delta\chi^2$ refers to the chi-square difference test (i.e. likelihood ratio test). and r is a standardised effect size measure for the likelihood ratio test, where 0.10 is a small effect, 0.30 is a medium effect, and 0.50 is a large effect. Effect sizes were calculated by the following formula: SQRT[$\Delta\chi^2$/(N * Δdf)]. CFI, comparative fit index. ★Tests were significant at $P < 0.001$.

evidence suggesting enhancement motives might operate differently in Hungary [12]. Results suggest the DMQ-R-SF's factor structure generalises across countries, and is suitable for cross-cultural comparisons, consistent with research conducted in Europe with adolescents [11]. Thus, future researchers can be confident in the cross-cultural utility of this questionnaire in undergraduates.

Broad similarities in the rank order of drinking motivations across countries suggest some core principles of drinking reinforcement cut across all countries. Specifically, it appears normative for undergraduates across

Table 3. *Means and standard deviations of drinking motives split by country*

Country	IDV Score	N	Social			Enhancement			Coping			Conformity		
			M	SD	α	M	SD	α	M	SD	α	M	SD	α
Portugal	27	479	2.55	1.16	0.89	2.32	1.10	0.81	1.63	0.78	0.74	1.21	0.51	0.80
Mexico	30	264	2.69	1.18	0.92	2.63	1.02	0.76	1.92	0.99	0.87	1.46	0.65	0.82
Brazil	38	384	3.01	1.25	0.87	2.49	1.13	0.75	1.91	0.96	0.70	1.21	0.50	0.69
Spain	51	395	2.51	1.12	0.87	2.13	1.03	0.77	1.50	0.68	0.79	1.30	0.58	0.73
Switzerland	68	348	2.62	1.05	0.86	2.44	0.98	0.73	1.42	0.60	0.74	1.20	0.53	0.81
Hungary	80	838	2.97	1.10	0.85	2.06	0.89	0.68	1.74	0.84	0.86	1.35	0.55	0.69
Canada	80	1218	3.02	1.17	0.92	2.66	1.12	0.81	1.77	0.91	0.84	1.45	0.73	0.82
The Netherlands	80	1278	3.15	1.01	0.88	2.94	1.02	0.81	1.65	0.82	0.84	1.29	0.58	0.83
UK and Ireland	84	730	3.40	1.01	0.88	3.07	1.00	0.76	1.95	0.88	0.81	1.66	0.78	0.82
USA	91	2402	3.61	1.03	0.85	3.52	0.99	0.75	2.23	1.15	0.89	1.59	0.91	0.88
Whole sample	—	8336	3.16	1.14	0.89	2.86	1.14	0.79	1.87	0.98	0.86	1.43	0.74	0.84

Listwise deletion was used for calculation of means, so Ns will vary slightly from the analyses using a full information maximum likelihood approach, such as the confirmatory factor analyses. Individualism-collectivism scores for countries were retrieved from Hofstede *et al.* [15]. IDV, individualism-collectivism.
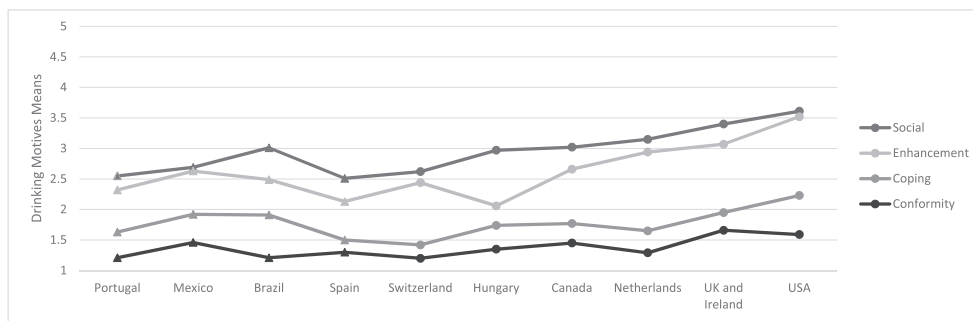

Figure 3. *Graphical depiction of drinking motives means. Countries arranged in order from least to most individualistic. Means from collectivistic countries (Portugal, Mexico, Brazil and Spain) indicated with triangles, and means from individualistic countries (Switzerland, Hungary, Canada, the Netherlands, UK and Ireland and USA) indicated with circles.*
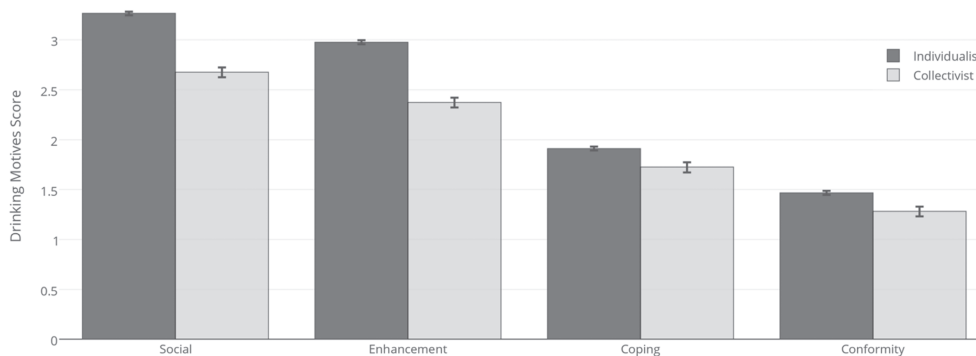

Figure 4. *Type of motive and individualism-collectivism predicting drinking motive scores. Error bars represent 95% confidence intervals.*

the world to drink alcohol for positive reinforcement (social and enhancement motives) and comparatively uncommon for students to drink for negative reinforcement (coping and conformity motives). The intuitive prediction of H 3a (that collectivistic cultures would tend to endorse external drinking motives) was not supported. Instead, positively reinforcing motives were most common overall, but were also more strongly endorsed within individualistic as opposed to collectivist countries. People from individualistic countries may be more approach-

focused in their motivational styles, as some theorists have argued [18–20]. Thus, this study highlights the centrality of positive reinforcement in the drinking motivations of undergraduates, particularly in individualistic cultures. These cross-cultural distinctions have important clinical implications. If individualistic cultures favour approach motives, clinicians might target approach motives when developing and tailoring alcohol prevention programs.

This study has limitations. Our sampling strategy utilised convenience samples. Because participants self-selected into the study based on advertisements and/or incentives, readers should be cautious about generalising results to all undergraduate students, or to other populations, such as older adults. We used a short form questionnaire; thus, measurement invariance across countries cannot be assumed for the full DMQ-R. Although we included a relatively broad subset of countries, our selection remains limited. Notably, there were no participants from Asia or Africa where many of the most collectivistic countries are located [15]. Moreover, a country's individualism-collectivism is confounded with other variables, such as Gross Domestic Product, the Human Development Index, language and geographic location [15] making pure tests of H 3a and H 3b difficult. Construct overlap is a problem for virtually all quantified measures of culture and for observational studies more generally. We believe that the theoretical rationale for the links between individualism-collectivism and drinking motives is stronger than for competing, but related constructs. However, readers should not infer causality from the present study as there are many other cultural variables that might produce the same results. Future studies might measure individualism-collectivism as individual difference variables [16]. A multiple regression analysis at the country level may also become feasible as more cross-cultural data becomes available. Cross-cultural differences in social desirability might have also influenced results. For instance, approach motives may be more culturally acceptable in individualistic rather than collectivistic cultures. Future studies might use informant reports instead of self-report. There is also growing interest in higher-order and bi-factor models [31]; exploring, such models cross-culturally may prove fruitful for future research.

This paper represents the first set of empirical results from the DRINC project. Results clearly supported the cross-cultural validity of the DMQ-R-SF, and suggested the measure is appropriate for use in a wide range of countries. The next step with the DRINC dataset [22] will be to test whether drinking motives have similar antecedents (personality) and consequences (drinking behaviours and problems) across cultures. There is potential for further research advances to emerge from the DRINC project, and with future international collaboration developed and solidified through the DRINC project, a more complete cross-cultural understanding of drinking motives and alcohol use may be achieved.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Supplementary Table 1. Fit indices for configural invariance analyses

Supplementary Table 2. Fit indices and ΔCFI values for metric invariance analyses

Supplementary Table 3. Cohen's d effect sizes for all cross-country pairwise comparisons of mean drinking motives