



## Depressive symptoms, ruminative thinking, drinking motives, and alcohol outcomes: A multiple mediation model among college students in three countries



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### H I G H L I G H T S

- Tested a multiple mediation model among college drinkers in Argentina, Spain and US.
- Ruminative thinking is a mechanism linking depressive symptoms to drinking to cope.
- Depressive symptoms relate to alcohol problems via rumination and drinking to cope.
- Models were invariant across countries/sex, suggesting a culturally-universal model.

### A R T I C L E I N F O

#### Keywords:

Depression  
Rumination  
Drinking motives  
Alcohol-related problems  
Cross-cultural

### A B S T R A C T

**Background:** Recent research suggests that ruminative thinking (specifically problem-focused thoughts) may explain why individuals engage in drinking to cope (DTC) when dealing with depressive symptoms; which in turn leads to increased negative alcohol-related consequences. Cross-cultural studies addressing these phenomena are scarce.

**Objectives:** The present study cross-culturally tested whether four rumination facets (problem-focused thoughts, counterfactual thinking, repetitive thoughts, and anticipatory thoughts) uniquely mediate the relationships between depressive symptoms and drinking motives/alcohol outcomes in a multicultural sample of college student drinkers ( $n = 1429$ ) from Spain, Argentina, and the U.S.

**Method:** Structural equation modeling was conducted to test the models, controlling for sex. Further, we conducted invariance testing to determine whether our models were culturally-specific or culturally-universal.

**Results:** Within both proposed models, no rumination facet uniquely mediated the relationship between depressive symptoms and drinking motives. However, an exploratory model with a second-order latent factor of ruminative thinking did significantly mediate these associations (exception was conformity motives). Further, there were two significant double-mediated associations that suggested that increased depressive symptoms is associated with increased ruminative thinking, which is associated with higher DTC motives, which in turn is associated with higher alcohol consumption and negative alcohol-related consequences. All models were found to be invariant across countries and sex, suggesting that these associations may be relatively universal.

**Conclusions:** Rumination is relevant to understand the increased vulnerability of college drinkers to exhibit greater alcohol consumption and negative consequences via DTC motives when dealing with depressive symptoms.

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## 1. Introduction

Among college students, depressive symptoms has been found to be a robust risk factor associated with increased alcohol consumption (see Pedrelli, Borsari, Lipson, Heinze, & Eisenberg, 2016 for an overview) and negative alcohol-related consequences (Armeli, Conner, Cullum, & Tennen, 2010; Armeli et al., 2014; Dennhardt & Murphy, 2011). Drinking to cope motives has been found to be a robust psychosocial mechanism that explains (i.e., mediates) the associations between depressive symptoms and negative alcohol-related consequences among college students (Bravo & Pearson, 2017; Kenney, Jones, & Barnett, 2015; Kenney, Merrill, & Barnett, 2017). Despite the extensive support of depressive symptoms relating to negative alcohol-related consequences via drinking to cope motives, few studies have examined psychosocial factors that may explain why individuals engage in drinking to cope when dealing with depressive symptoms and how this may lead to increased negative alcohol-related consequences.

Ruminative thinking is one construct that has been recently proposed as a mechanism linking depressive symptoms to drinking to cope motives and in turn to negative alcohol-related consequences. Supporting Response Styles Theory (Nolen-Hoeksema, 1991; Nolen-Hoeksema, Wisco, & Lyubormisky, 2008), rumination has been shown to be a robust risk factor for alcohol use/misuse (Ciesla, Dickson, Anderson, & Neal, 2011; Nolen-Hoeksema & Harrell, 2002; Nolen-Hoeksema, Stice, Wade, & Bohon, 2007). Ciesla et al. (2011) concluded, “It is possible that individuals may drink in order to interrupt the repetitive, obsessive thoughts which exacerbate and prolong negative moods, rather than simply drinking due to the affective state itself” (pg. 149). Recently, Bravo, Pearson, and Henson (2017) tested this assertion by examining whether four distinct facets of rumination (i.e., problem-focused thoughts, counterfactual thinking, repetitive thoughts, and anticipatory thoughts) mediated the associations between depressive symptoms and drinking to cope motives, which in turn relate to negative alcohol-related consequences. The researchers found only one significant double-mediated association such that elevated depressive symptoms was associated with higher problem-focused thoughts (i.e., consistent thinking of causes, consequences, and symptoms of negative affect), which was associated with higher drinking to cope motives, which in turn was associated with higher negative alcohol-related consequences. Taken together, this study provides preliminary support for ruminative thinking as a mechanism linking depressive symptoms to drinking to cope motives.

Although an important preliminary study, the present study sought to cross-culturally replicate and extend these findings by examining, in a multicultural sample, four distinct research questions: a) are the effects they found in the double-mediation model extendible to alcohol consumption as an outcome, b) to what extent are the effects they found in the double-mediation model replicable when other drinking motives are introduced into the model (hypothesized mediation model), c) do rumination facets mediate the relationship between depressive symptoms and other drinking motives (comprehensive model), and d) are these models invariant across sex and different cultures/countries. Based on findings from Bravo et al. (in press), we expected that problem-focused thoughts would emerge as the strongest facet most relevant in the pathway to problematic alcohol consumption.

## 2. Method

### 2.1. Participants & procedures

College students from four distinct universities ( $n = 1864$ ) across the U.S. (two universities; one located in the southeast and the other in the southwest), Argentina, and Spain participated in an online survey study regarding personal mental health, personality traits, and alcohol use behaviors (for more information on recruitment procedures, see Bravo et al., in press). For the present study, we only used data from

students who completed the rumination measure and consumed alcohol at least once in the previous month ( $n = 1429$ ; 65.7% women [U.S. sites combined,  $n = 733$ , 70.5% women; Argentina,  $n = 404$ , 52.2% women, Spain,  $n = 292$ , 72.3% women]). The study was approved by the institutional review boards (or their international equivalent) at the participating universities.

### 2.2. Measures

#### 2.2.1. Depressive symptoms

We used the 20-item Center for Epidemiological Studies Depression (CESD; Radloff, 1977) and the 20-item Spanish Version (Masten, Cadwell-Colbert, Alcala, & Mijares, 1986; Perczek, Carver, & Price, 2000) to assess depressive symptoms at the U.S. sites and at the Spain/Argentina sites, respectively. Participants indicated how often they had felt the way described by each item during the previous week. Response scale ranged from 0 (*Not at all or < 1 day*) to 3 (*Nearly Every day for 1 week*).

#### 2.2.2. Rumination

Rumination was measured with the RTSQ (Brinker & Dozois, 2009). Participants were instructed to indicate how well each item described them on a 7-point response scale (1 = *Not at all*, 7 = *Very Well*). In Spain and Argentina, we employed the Spanish version of the RTSQ (see translating and adaptation procedures in Bravo et al., in press). Although originally examined as a single factor, Tanner et al. (2013) revealed four rumination subcomponents: problem-focused thoughts, counterfactual thinking, repetitive thoughts, and anticipatory thoughts.

#### 2.2.3. Drinking motives

Drinking motives for the past month were assessed using the 12-item Drinking Motives Questionnaire-Revised Short Form (DMQ-R SF; Kuntsche & Kuntsche, 2009) at the U.S. sites and the 12-item Spanish version (Spanish DMQ-R SF; Mezquita et al., 2016) at the Spain/Argentina sites. The measure assesses four drinking motive domains on a 5-point response scale (1 = *Almost never/never*, 5 = *Almost always/always*): social, conformity, enhancement, and coping.

#### 2.2.4. Negative alcohol-related consequences

Negative alcohol-related consequences were assessed using the 48-item YAACQ (Read et al., 2006) at the U.S. sites and the 48-item Spanish version at the Argentina/Spain sites (S-YAACQ, Pilatti et al., 2016). Some items were reworded to Castilian Spanish for the Spain site. Each item was scored dichotomously to reflect presence/absence of the alcohol-related problem in the past month (0 = *no*, 1 = *yes*).

#### 2.2.5. Alcohol consumption

Alcohol consumption was measured with the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985). Participants were first presented with a visual guide about typical drinks (specific to each country), in order to help orient them to Standard Drink Units (SDUs). To assess the total amount of alcohol consumed during a typical week, the total number of Standard Drink Units (SDUs) consumed (summed) were transformed into grams of alcohol taking into account that one SDU is equivalent to 14 g of alcohol in U.S and Argentina [NIAAA, 2015; International Alliance for Responsible Drinking (IARD), 2016], whereas it is equivalent to 10 g in Spain (Rodríguez-Martos, Gual, & Llopis, 1999; IARD, 2016).

### 2.3. Statistical analysis

To test the proposed models, structural equation modeling using Mplus 7.4 (Muthén & Muthén, 1998–2015) was conducted. In the hypothesized mediation model, we proposed a structural model in which depressive symptoms was examined as a statistical predictor of rumination facets, drinking to cope, and alcohol outcomes. Further, the

rumination subcomponents were modeled as predictors of drinking to cope and alcohol outcomes. Last, drinking motives were modeled as predictors of alcohol outcomes. Thus, a double-mediated path was examined for each subcomponent of rumination (e.g., depressive symptoms → rumination facet → drinking to cope → alcohol outcomes). In the comprehensive model, the structural model was the same as the hypothesized mediation model with the exception that depressive symptoms and all four rumination subcomponents were also entered as predictors of other drinking motives. Sex was modeled as a predictor of all variables in the models (i.e., covariate).

To evaluate overall model fit in each of our models, we used model fit criteria suggested by Hu and Bentler (1999) including the Comparative Fit Index (CFI) > 0.95, Tucker-Lewis Index (TLI) > 0.95, Root Mean Square Error of Approximation (RMSEA) < 0.06, and Standardized Root Mean Square Residual (SRMR) < 0.08. To reduce the complexity of the models, we followed the item-to-construct balance approach described by Little, Cunningham, Shahar, and Widaman (2002) by creating parcels for depressive symptoms and negative alcohol-related consequences. We first confirmed and then extracted a single factor in exploratory factor analyses (EFAs) for each latent construct, sorted the items from highest to lowest factor loadings, and created balanced parcels by pairing items with the highest factor loadings with items with the lowest factor loadings.

In order to test whether our models were culturally-specific or culturally-universal, we first conducted invariance testing of the measurement model across countries and sex. Specifically, we tested two levels of measurement invariance: configural (test whether items load on the proposed factors) and metric (test whether item-factor loadings are equal across groups). If metric invariance is achieved (based on model fit criteria described below), then we can confidently test for structural invariance of the proposed mediation models.

To test for structural invariance, we conducted  $\chi^2$  difference tests comparing a freely estimated multi-group model to a constrained multi-group model (i.e., constraining the paths of the SEM) to determine whether constraining the paths to be equivalent across countries resulted in a worst fitting model. Given that the  $\chi^2$  test statistic is sensitive to sample size (Brown, 2015), we also relied on model comparison criteria of  $\Delta$ RMSEA  $\leq$  0.015 (Chen, 2007) and  $\Delta$ CFI/ $\Delta$ TLI  $\leq$  0.01 (Cheung & Rensvold, 2002).

We examined the total, direct, and indirect effects of each predictor variable on alcohol outcomes using bias-corrected bootstrapped estimates (Efron & Tibshirani, 1993) based on 10,000 bootstrapped samples, which provides a powerful test of mediation (Fritz & MacKinnon, 2007) and is robust to small departures from normality (Erceg-Hurn & Mirosevich, 2008). Given our large sample size (i.e., large statistical power), statistical significance was determined by 99% bias-corrected bootstrapped confidence intervals that do not contain zero and we place emphasis on effect sizes of significant direct and indirect effects.

### 3. Results

The measurement model and all multi-group models (including constrained models) provided acceptable-to-excellent fit based on fit criteria suggested by Hu and Bentler and the minimal changes in CFI/TFI and RMSEA indicated measurement/model invariance across countries and sex (see Table 1). Based on these results, we present results of all our models within the total sample. Bivariate correlations, descriptive statistics, and reliability coefficients of all study variables for the total sample are presented in Table 2. It is important to note that all four rumination subcomponents were significantly associated with depressive symptoms, all four drinking motives, and negative alcohol-related consequences (see Table 2).

#### 3.1. Hypothesized mediation model

The hypothesized mediation SEM model (see Fig. 1) provided an acceptable fit to the data based on most fit indices, CFI = 0.949, TLI = 0.942, RMSEA = 0.044 (90% CI [0.042, 0.047]), SRMR = 0.072. The significant Model  $\chi^2$  [ $\chi^2(653) = 242.98$ ,  $p < 0.001$ ] would suggest poor model fit; however, the Model  $\chi^2$  is highly sensitive to sample size (Kline, 1998; Jöreskog & Sörbom, 1993). The total, total indirect, and specific indirect effects of the hypothesized mediation model are summarized in Table 3 and direct effects are depicted in Fig. 1.

As seen in Fig. 1, depressive symptoms were significantly positively associated with each rumination subcomponent, drinking to cope, and negative alcohol-related consequences. All four rumination subcomponents were not significantly associated with drinking to cope motives once we controlled for the other rumination facets. However, repetitive thoughts had a significant direct effect (negative) on negative alcohol-related consequences after controlling for other rumination facets. Finally, drinking to cope was the only drinking motive to significantly uniquely relate to alcohol outcomes. With regards to indirect effects, there were only three significant indirect effects in the model: 1) drinking to cope motivation mediated the relationship between depressive symptoms and alcohol consumption (positive indirect effect and a non-significant negative association between depressive symptoms and alcohol consumption), 2) drinking to cope motivation mediated the relationship between depressive symptoms and negative alcohol-related consequences accounting for 25.87% of the total effect, and 3) a unique significant negative indirect effect between depressive symptoms and negative alcohol-related consequences via repetitive thoughts (suppression effect given a negative indirect effect but a significant positive direct effect between depressive symptoms and negative alcohol-related consequences; see Table 3).

#### 3.2. Comprehensive mediation model

Similar to the hypothesized mediation model, the comprehensive mediation SEM model provided an acceptable fit to the data based on most fit indices, CFI = 0.955, TLI = 0.948, RMSEA = 0.041 (90% CI [0.039, 0.043]), SRMR = 0.036,  $\chi^2(638) = 2192.14$ ,  $p < 0.001$ . The total, total indirect, specific indirect, and direct effects of the comprehensive mediation model are summarized in Tables 4 and 5. Direct effects were largely the same as the hypothesized mediation model with the exception of significant positive associations between depressive symptoms and conformity motives ( $\beta = 0.34$ ), repetitive thoughts and conformity motives ( $\beta = -0.21$ ), and counterfactual thinking and conformity motives ( $\beta = 0.16$ ). Indirect effects were also largely the same as the hypothesized mediation model (all three indirect effects replicated; see Table 4) except for two new indirect associations: 1) counterfactual thinking mediated the relationship between depressive symptoms and conformity motives accounting for 14.71% of the total effect, and 2) repetitive thoughts mediated the relationship between depressive symptoms and conformity motives (suppression effect given a negative indirect effect but a significant positive direct effect between depressive symptoms and conformity motives; see Table 5).

#### 3.3. Exploratory second-order latent rumination factor model

Given the lack of significant unique double-mediated effects, one may wonder whether ruminative thinking in general is a viable explanatory mechanism linking depressive symptoms to drinking motives, which in turn would relate to increased alcohol consumption and negative alcohol-related consequences. Thus, we ran an exploratory model to test whether a second order latent factor of rumination (four ruminative factors as indicators) significantly mediates these relationships and examined the amount of variance ruminative thinking globally explains between depressive symptoms and drinking motives. This

**Table 1**  
Invariance testing results of the measurement model, hypothesized mediation model, and comprehensive model across countries and sex.

Measurement model across countries												
	Overall fit indexes						Comparative fit indexes					
	$\chi^2$	df	CFI	TLI	RMSEA	SRMR	Model comparison	$\Delta\chi^2$	$\Delta df$	$\Delta CFI$	$\Delta TLI$	$\Delta RMSEA$
1. Configural	3477.99	1752	0.951	0.944	0.045 (0.043, 0.048)	0.045						
2. Metric	3597.63	1806	0.949	0.943	0.046 (0.043, 0.048)	0.047	1 vs 2	121.64 <sup>*****</sup>	54	- 0.002	- 0.001	0.001
Measurement model across sex												
	Overall fit indexes						Comparative fit indexes					
	$\chi^2$	df	CFI	TLI	RMSEA	SRMR	Model comparison	$\Delta\chi^2$	$\Delta df$	$\Delta CFI$	$\Delta TFI$	$\Delta RMSEA$
1. Configural	2771.40	1168	0.953	0.946	0.044 (0.042, 0.046)	0.041						
2. Metric	2815.98	1195	0.952	0.947	0.044 (0.042, 0.046)	0.041	1 vs 2	44.59 <sup>*</sup>	27	- 0.001	0.001	0.000
Hypothesized mediational model across countries												
Models	Overall fit indexes						Model comparison fit indexes					
	$\chi^2$	df	CFI	TLI	RMSEA	SRMR	$\Delta\chi^2$	$\Delta df$	$\Delta CFI$	$\Delta TLI$	$\Delta RMSESA$	
Unconstrained	4533.34	2067	0.931	0.926	0.050 (0.048, 0.052)	0.078	246.99 <sup>***</sup>	104	- 0.004	- 0.001	0.000	
Constrained	4780.33	2171	0.927	0.925	0.050 (0.048, 0.052)	0.086						
Hypothesized mediational model across sex												
Models	Overall fit indexes						Model comparison fit indexes					
	$\chi^2$	df	CFI	TLI	RMSEA	SRMR	$\Delta\chi^2$	$\Delta df$	$\Delta CFI$	TLI	$\Delta RMSESA$	
Unconstrained	3018.88	1300	0.950	0.946	0.043 (0.041, 0.045)	0.052	81.66 <sup>***</sup>	40	- 0.001	0.000	0.000	
Constrained	3100.04	1340	0.949	0.946	0.043 (0.041, 0.045)	0.055						
Comprehensive model across countries												
Models	Overall fit indexes						Model comparison fit indexes					
	$\chi^2$	df	CFI	TLI	RMSEA	SRMR	$\Delta\chi^2$	$\Delta df$	$\Delta CFI$	$\Delta TLI$	$\Delta RMSESA$	
Unconstrained	4276.80	2022	0.937	0.930	0.048 (0.046, 0.050)	0.048	295.12 <sup>***</sup>	134	- 0.005	- 0.000	0.001	
Constrained	4571.92	2156	0.932	0.930	0.049 (0.047, 0.050)	0.063						
Comprehensive model across sex												
Models	Overall fit indexes						Model comparison fit indexes					
	$\chi^2$	df	CFI	TLI	RMSEA	SRMR	$\Delta\chi^2$	$\Delta df$	$\Delta CFI$	TLI	$\Delta RMSESA$	
Unconstrained	2930.06	1276	0.952	0.947	0.043 (0.041, 0.045)	0.041	109.42 <sup>***</sup>	29	- 0.002	0.001	- 0.001	
Constrained	3039.48	1331	0.950	0.948	0.042 (0.040, 0.044)	0.046						

Note. We used comparison criteria of  $\Delta RMSEA \leq 0.015$  (increase indicates worst fit; [Chen, 2007](#)) and  $\Delta CFI/\Delta TFI \leq 0.01$  (decrease indicates worst fit; [Cheung & Rensvold, 2002](#)) to test for measurement invariance. To ensure model convergence, we constrained the variance of alcohol consumption to be under 10 by dividing by a constant as recommended by [Muthén & Muthén \(1998–2015\)](#).

\*  $p < 0.05$ .  
 \*\*  $p < 0.01$ .  
 \*\*\*  $p < 0.001$ .

model provided an acceptable fit to the data based on most indices, CFI = 0.949, TLI = 0.943, RMSEA = 0.043 (90% CI [0.041, 0.045]), SRMR = 0.046,  $\chi^2(664) = 2429.19$ ,  $p < 0.001$ . The total, total indirect, and specific indirect effects of the exploratory mediation model are summarized in [Table 6](#) and direct effects are depicted in [Fig. 2](#).

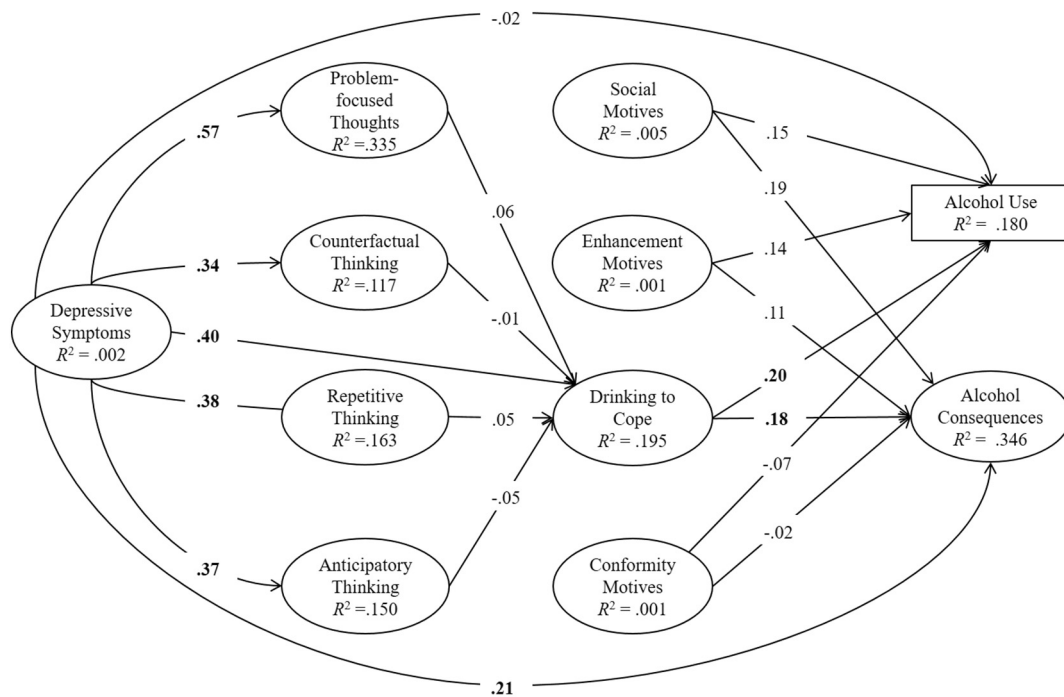
Within the exploratory model, a second-order latent factor of ruminative thinking significantly mediated the associations between depressive symptoms and three drinking motives: drinking to cope (accounting for 10.63% of the total effect), social motives (positive

indirect effect and a non-significant negative association between depressive symptoms and social motives), and enhancement motives (positive indirect effect and a non-significant negative association between depressive symptoms and enhancement motives). Drinking to cope was the only motive to significantly mediate the relationship between rumination and alcohol consumption (suppression effect given a positive indirect effect but a significant negative direct effect between rumination and alcohol consumption) as well as rumination and negative alcohol-related consequences (accounting for 61.22% of the total

**Table 2**  
Bivariate correlations among study variables in total sample.

	1	2	3	4	5	6	7	8	9	10	11	12	M	SD
1. Depressive symptoms	<u>0.90</u>												14.57	10.18
2. Problem-focused thoughts	<b>0.53</b>	<u>0.87</u>											3.47	1.44
3. Counterfactual thinking	<b>0.31</b>	<b>0.53</b>	<u>0.83</u>										4.72	1.56
4. Repetitive thoughts	<b>0.36</b>	<b>0.57</b>	<b>0.63</b>	<u>0.92</u>									4.85	1.58
5. Anticipatory thoughts	<b>0.31</b>	<b>0.58</b>	<b>0.56</b>	<b>0.54</b>	<u>0.67</u>								4.39	1.50
6. Drinking to cope motives	<b>0.45</b>	<b>0.31</b>	<b>0.20</b>	<b>0.22</b>	<b>0.20</b>	<u>0.83</u>							1.86	0.98
7. Social motives	<b>0.09</b>	<b>0.15</b>	<b>0.16</b>	<b>0.10</b>	<b>0.14</b>	<b>0.32</b>	<u>0.88</u>						3.01	1.21
8. Enhancement motives	<b>0.09</b>	<b>0.13</b>	<b>0.15</b>	<b>0.13</b>	<b>0.13</b>	<b>0.34</b>	<b>0.74</b>	<u>0.78</u>					2.67	1.10
9. Conformity motives	<b>0.32</b>	<b>0.22</b>	<b>0.18</b>	<b>0.09</b>	<b>0.14</b>	<b>0.36</b>	<b>0.26</b>	<b>0.23</b>	<u>0.85</u>				1.44	0.77
10. Negative alcohol-related consequences	<b>0.29</b>	<b>0.21</b>	<b>0.11</b>	<b>0.07</b>	<b>0.13</b>	<b>0.35</b>	<b>0.35</b>	<b>0.34</b>	<b>0.23</b>	<u>0.93</u>			8.31	8.35
11. Alcohol use in grams	0.04	0.02	- 0.01	- 0.05	- 0.01	<b>0.22</b>	<b>0.30</b>	<b>0.30</b>	<b>0.08</b>	<b>0.45</b>	-		89.73	106.51
12. Sex	0.05	<b>0.09</b>	0.05	<b>0.16</b>	<b>0.08</b>	0.05	- 0.07	- 0.04	- 0.04	- 0.05	- <b>0.19</b>	-	0.16	0.48

Note. Sex was coded - 0.5 = men, 0.5 = women. Significant correlations ( $p < 0.01$ ) are bolded for emphasis. Cronbach's alphas are underlined and shown on the diagonals.



**Fig. 1.** Depicts the standardized effects of the hypothesized mediation structural equation model ( $n = 1429$ ). Significant associations are in bold typeface for emphasis and were determined by a 99% bias-corrected unstandardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero. The disturbances among rumination subcomponents (problem-focused thoughts, counterfactual thinking, repetitive thoughts, and anticipatory thoughts), drinking motives (social, enhancement, coping, and conformity), and alcohol outcomes were allowed to correlate. Factor loadings to parcels and path coefficients between rumination facets and alcohol outcomes as well as sex effects on all study variables are not shown in the figure for reasons of parsimony. Factor loadings and sex effects are available from the authors upon request.

**Table 3**

Summary of total indirect effects of depressive symptoms, rumination facets, and drinking to cope on alcohol consumption and negative alcohol-related consequences in hypothesized mediational model.

Outcome variables	Drinking to cope motives		Alcohol use		Negative alcohol-related consequences	
	$\beta$	99% CI	$\beta$	99% CI	$\beta$	99% CI
Predictor variable: <i>depressive symptoms</i>						
Total	<b>0.435</b>	<b>0.35, 0.52</b>	0.036	-0.04, 0.12	<b>0.279</b>	<b>0.20, 0.036</b>
Total indirect <sup>a</sup>	0.032	-0.02, 0.09	0.054	-0.02, 0.13	0.070	-0.001, 0.14
Problem-focused thoughts	0.036	-0.05, 0.12	0.014	-0.06, 0.09	0.025	-0.05, 0.10
Counterfactual thinking	-0.004	-0.05, 0.04	-0.008	-0.05, 0.04	0.001	-0.04, 0.05
Repetitive thoughts	0.019	-0.02, 0.06	-0.021	-0.06, 0.02	<b>-0.050</b>	<b>-0.10, -0.01</b>
Anticipatory thoughts	-0.019	-0.10, 0.06	-0.017	-0.08, 0.05	0.017	-0.05, 0.09
Drinking to cope motives	-	-	<b>0.079</b>	<b>0.04, 0.13</b>	<b>0.072</b>	<b>0.03, 0.12</b>
Problem-focused thoughts - drinking to cope motives	-	-	0.007	-0.01, 0.03	0.006	-0.01, 0.03
Counterfactual thinking - drinking to cope motives	-	-	-0.001	-0.01, 0.01	-0.001	-0.01, 0.01
Repetitive thoughts - drinking to cope motives	-	-	0.004	-0.004, 0.01	0.003	-0.004, 0.01
Anticipatory thoughts - drinking to cope motives	-	-	-0.004	-0.02, 0.01	-0.003	-0.02, 0.01
Direct effect	<b>0.403</b>	<b>0.30, 0.51</b>	-0.018	-0.12, 0.09	<b>0.209</b>	<b>0.10, 0.32</b>
Predictor variable: <i>problem-focused thoughts</i>						
Total	0.063	-0.08, 0.21	0.038	-0.09, 0.14	0.054	-0.07, 0.15
Indirect via drinking to cope motives	-	-	0.012	-0.02, 0.05	0.011	-0.01, 0.04
Direct	0.063	-0.08, 0.21	0.025	-0.10, 0.16	0.043	-0.08, 0.14
Predictor variable: <i>counterfactual thinking</i>						
Total	-0.011	-0.15, 0.12	-0.025	-0.16, 0.11	0.001	-0.12, 0.13
Indirect via drinking to cope motives	-	-	-0.002	-0.03, 0.03	-0.002	-0.03, 0.02
Direct	-0.011	-0.15, 0.12	-0.022	-0.16, 0.11	0.003	-0.12, 0.13
Predictor variable: <i>repetitive thoughts</i>						
Total	0.050	-0.06, 0.17	-0.046	-0.15, 0.06	<b>-0.125</b>	<b>-0.24, -0.02</b>
Indirect via drinking to cope motives	-	-	0.010	-0.01, 0.04	0.009	-0.01, 0.04
Direct	0.050	-0.06, 0.17	-0.056	-0.16, 0.05	<b>-0.134</b>	<b>-0.24, -0.03</b>
Predictor variable: <i>anticipatory thoughts</i>						
Total	-0.051	-0.27, 0.15	-0.055	-0.24, 0.11	0.037	-0.14, 0.22
Indirect via drinking to cope motives	-	-	-0.010	-0.06, 0.03	-0.009	-0.06, 0.03
Direct	-0.051	-0.27, 0.15	-0.045	-0.22, 0.12	0.046	-0.13, 0.23

Note. Significant associations are in bold typeface for emphasis and were determined by a 99% bias-corrected standardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero.

<sup>a</sup> Reflects the combined indirect associations within the model.



**Table 4**

Summary of total, indirect, and direct effects of depressive symptoms, rumination facets, and drinking motives on alcohol consumption and negative alcohol-related consequences in a comprehensive mediation model.

Outcome variables	Alcohol use		Negative alcohol-related consequences	
	$\beta$	99% CI	$\beta$	99% CI
Predictor variable: <i>depressive symptoms</i>				
Total	0.056	– 0.02, 0.13	<b>0.323</b>	<b>0.25, 0.40</b>
Total indirect <sup>a</sup>	0.068	– 0.01, 0.16	<b>0.112</b>	<b>0.03, 0.19</b>
Problem-focused thoughts	0.014	– 0.06, 0.09	0.024	– 0.05, 0.10
Counterfactual thinking	– 0.007	– 0.06, 0.04	0.001	– 0.04, 0.05
Repetitive thoughts	– 0.022	– 0.06, 0.02	– <b>0.050</b>	– <b>0.10, – 0.01</b>
Anticipatory thoughts	– 0.017	– 0.09, 0.05	0.017	– 0.05, 0.09
Drinking to cope motives	<b>0.091</b>	<b>0.04, 0.15</b>	<b>0.081</b>	<b>0.04, 0.14</b>
Social motives	– 0.001	– 0.03, 0.02	– 0.001	– 0.03, 0.02
Enhancement motives	– 0.004	– 0.03, 0.01	– 0.004	– 0.03, 0.01
Conformity motives	– 0.024	– 0.06, 0.01	0.003	– 0.03, 0.04
Problem-focused thoughts – drinking to cope motives	0.011	– 0.01, 0.03	0.010	– 0.01, 0.03
Problem-focused thoughts – social motives	0.008	– 0.01, 0.04	0.010	– 0.01, 0.04
Problem-focused thoughts – enhancement motives	0.005	– 0.01, 0.04	0.004	– 0.01, 0.04
Problem-focused thoughts – conformity motives	– 0.003	– 0.02, 0.003	0.000	– 0.01, 0.01
Counterfactual thinking – drinking to cope	0.003	– 0.01, 0.02	0.003	– 0.01, 0.01
Counterfactual thinking – social motives	0.006	– 0.002, 0.03	0.008	– 0.001, 0.03
Counterfactual thinking – enhancement motives	0.004	– 0.003, 0.02	0.004	– 0.003, 0.02
Counterfactual thinking – conformity motives	– 0.004	– 0.01, 0.001	0.000	– 0.01, 0.01
Repetitive thoughts – drinking to cope	0.001	– 0.01, 0.01	0.000	– 0.01, 0.01
Repetitive thoughts – social motives	– 0.003	– 0.02, 0.003	– 0.004	– 0.02, 0.004
Repetitive thoughts – enhancement motives	0.001	– 0.001, 0.02	0.001	– 0.01, 0.01
Repetitive thoughts – conformity motives	0.005	– 0.01, 0.02	– 0.001	– 0.01, 0.01
Anticipatory thoughts – drinking to cope	– 0.002	– 0.02, 0.02	– 0.001	– 0.02, 0.01
Anticipatory thoughts – social motives	0.004	– 0.01, 0.03	0.004	– 0.01, 0.03
Anticipatory thoughts – enhancement motives	0.004	– 0.01, 0.04	0.003	– 0.01, 0.03
Anticipatory thoughts – conformity motives	– 0.001	– 0.01, 0.004	– 0.001	– 0.003, 0.01
Direct	– 0.012	– 0.11, 0.10	<b>0.211</b>	<b>0.11, 0.32</b>

Note. Significant associations are in bold typeface for emphasis and were determined by a 99% bias-corrected unstandardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero.

<sup>a</sup> Reflects the combined indirect associations within the model. Drinking to cope was the only drinking motive to be significantly associated with outcomes ( $\beta = 0.20$  for alcohol and  $\beta = 0.18$  for negative alcohol-related consequences).

effect). Finally, there were two significant double-mediated associations: 1) depressive symptoms → rumination → drinking to cope → alcohol consumption), accounting for 20.41% of the total effect of depressive symptoms on alcohol consumption and 2) depressive symptoms → rumination → drinking to cope → negative alcohol-related consequences), uniquely accounting for an additional 2.98% of the total effect of depressive symptoms on negative alcohol-related consequences.

#### 4. Discussion

The central goals of the present study were to cross-culturally test whether four rumination facets uniquely mediate the relationships between depressive symptoms and drinking to cope motives (replication of Bravo et al.'s in press model) as well as other drinking motives (extension of Bravo et al.'s in press model) and in turn account for an

increase in alcohol consumption and negative alcohol-related consequences among a multicultural sample of college-student drinkers in Spain, Argentina, and the U.S. Another important goal was to examine whether these explanatory models were culturally-universal (i.e., invariant across countries and sex) or culturally-specific (i.e., diverse across countries and sex).

Within both proposed models, no rumination facet uniquely mediated the relationship between depressive symptoms and drinking motives. It is important to highlight that, unlike the model tested by Bravo et al. (in press), our model took into account the effects of other drinking motives other than drinking to cope motives. However, an exploratory model with a second-order latent factor of ruminative thinking did significantly mediate the associations between depressive symptoms and drinking motives (exception was conformity motives). Further, there were two significant double-mediated associations that suggested that increased depressive symptoms is associated with

**Table 5**

Summary of total, indirect, and direct effects of depressive symptoms and rumination facets on drinking motives in a comprehensive mediation model.

Outcome variables	Drinking to cope motives		Social motives		Enhancement motives		Conformity motives	
	$\beta$	99% CI	$\beta$	99% CI	$\beta$	99% CI	$\beta$	99% CI
Predictor variable: <i>depressive symptoms</i>								
Total	<b>0.509</b>	<b>0.43, 0.58</b>	<b>0.092</b>	<b>0.02, 0.17</b>	0.071	– 0.01, 0.15	<b>0.370</b>	<b>0.29, 0.45</b>
Total indirect <sup>a</sup>	<b>0.064</b>	<b>0.01, 0.12</b>	<b>0.099</b>	<b>0.04, 0.17</b>	<b>0.102</b>	<b>0.04, 0.17</b>	0.031	– 0.04, 0.10
Problem-focused thoughts	0.054	– 0.03, 0.14	0.054	– 0.04, 0.15	0.038	– 0.06, 0.13	0.036	– 0.06, 0.13
Counterfactual thinking	0.016	– 0.03, 0.06	0.042	– 0.01, 0.10	0.031	– 0.02, 0.08	<b>0.053</b>	<b>0.01, 0.10</b>
Repetitive thoughts	0.002	– 0.04, 0.05	– 0.020	– 0.07, 0.03	0.005	– 0.05, 0.06	– <b>0.078</b>	– <b>0.12, – 0.04</b>
Anticipatory thoughts	– 0.008	– 0.09, – 0.07	0.024	– 0.06, 0.12	0.028	– 0.05, 0.13	0.019	– 0.06, 0.10
Direct	<b>0.444</b>	<b>0.34, 0.54</b>	– 0.007	– 0.11, 0.10	– 0.031	– 0.13, 0.07	<b>0.339</b>	<b>0.23, 0.45</b>

Note. Significant associations are in bold typeface for emphasis and were determined by a 99% bias-corrected unstandardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero.

<sup>a</sup> Reflects the combined indirect associations within the model. The only significant associations between rumination facets and drinking motives was found between repetitive thoughts and conformity motives ( $\beta = -0.21$ ) and counterfactual thinking and conformity motives ( $\beta = 0.16$ ).

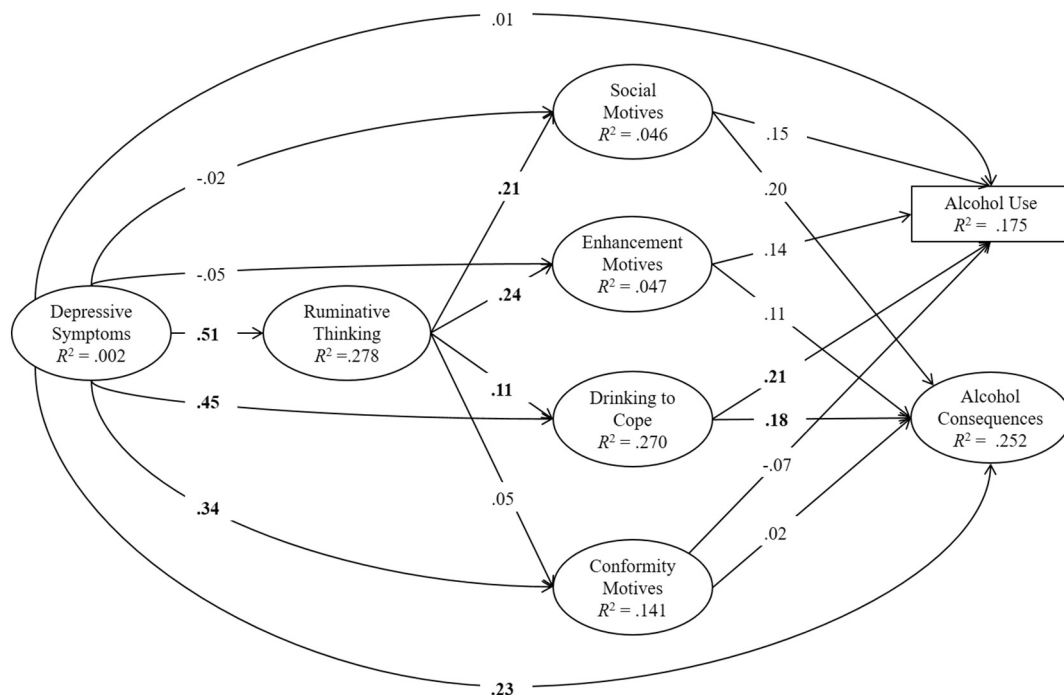
**Table 6**  
Summary of total, indirect, and direct effects of depressive symptoms and second-order latent rumination factor on drinking motives, alcohol consumption, and negative alcohol-related consequences in an exploratory comprehensive model.

Outcome variables	Alcohol use		Negative alcohol-related consequences	
Predictor variable: <i>depressive symptoms</i>	$\beta$	99% CI	$\beta$	99% CI
Total	0.056	-0.02, 0.13	<b>0.324</b>	<b>0.25, 0.40</b>
Total indirect <sup>a</sup>	0.047	-0.03, 0.13	<b>0.097</b>	<b>0.02, 0.17</b>
Rumination	<b>-0.057</b>	<b>-0.11, -0.01</b>	-0.003	-0.08, 0.02
Drinking to cope motives	<b>0.093</b>	<b>0.05, 0.15</b>	<b>0.082</b>	<b>0.03, 0.14</b>
Social motives	-0.003	-0.03, 0.01	-0.003	-0.03, 0.02
Enhancement motives	-0.007	-0.04, 0.01	-0.005	-0.04, 0.01
Conformity motives	-0.023	-0.06, 0.01	0.007	-0.03, 0.04
Rumination – drinking to cope motives	<b>0.011</b>	<b>0.002, 0.03</b>	<b>0.010</b>	<b>0.002, 0.03</b>
Rumination – social motives	0.017	-0.01, 0.05	0.021	-0.002, 0.05
Rumination – enhancement motives	0.017	-0.01, 0.05	0.013	-0.01, 0.05
Rumination – conformity motives	-0.002	-0.01, 0.002	0.001	-0.002, 0.01
Direct	0.009	-0.09, 0.12	<b>0.227</b>	<b>0.12, 0.33</b>
Predictor variable: <i>rumination</i>	$\beta$	99% CI	$\beta$	99% CI
Total	-0.027	-0.12, 0.06	0.032	-0.07, 0.12
Total indirect <sup>a</sup>	<b>0.084</b>	<b>0.05, 0.13</b>	<b>0.088</b>	<b>0.04, 0.14</b>
Drinking to cope motives	<b>0.022</b>	<b>0.01, 0.105</b>	<b>0.020</b>	<b>0.004, 0.05</b>
Social motives	0.033	-0.01, 0.09	0.042	-0.003, 0.10
Enhancement motives	0.033	-0.02, 0.10	0.025	-0.03, 0.09
Conformity motives	-0.004	-0.02, 0.003	0.001	-0.01, 0.01
Direct	<b>-0.111</b>	<b>-0.24, -0.03</b>	-0.056	-0.15, 0.04

Outcome variables	Drinking to cope motives		Social motives		Enhancement motives		Conformity motives	
Predictor variable: <i>depressive symptoms</i>	$\beta$	99% CI	$\beta$	99% CI	$\beta$	99% CI	$\beta$	99% CI
Total	<b>0.509</b>	<b>0.43, 0.58</b>	<b>0.093</b>	<b>0.02, 0.17</b>	0.071	-0.01, 0.15	<b>0.371</b>	<b>0.29, 0.45</b>
Indirect via rumination	<b>0.056</b>	<b>0.01, 0.10</b>	<b>0.109</b>	<b>0.06, 0.17</b>	<b>0.121</b>	<b>0.07, 0.18</b>	0.027	-0.03, 0.08
Direct	<b>0.453</b>	<b>0.40, 0.55</b>	-0.016	-0.11, 0.08	-0.050	-0.15, 0.05	<b>0.343</b>	<b>0.23, 0.45</b>

Note. Significant associations are in bold typeface for emphasis and were determined by a 99% bias-corrected unstandardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero.

<sup>a</sup> Reflects the combined indirect associations within the model.



**Fig. 2.** Depicts the standardized effects of the exploratory second-order rumination factor model ( $n = 1429$ ). Significant associations are in bold typeface for emphasis and were determined by a 99% bias-corrected unstandardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero. The disturbances among drinking motives and alcohol outcomes were allowed to correlate. Factor loadings to parcels and rumination, path coefficients between ruminative thinking and alcohol outcomes, as well as sex effects on all study variables are not shown in the figure for reasons of parsimony. Factor loadings and sex effects are available from the authors upon request.

increased ruminative thinking, which is associated with higher drinking to cope motives, which in turn was associated with both higher alcohol consumption and negative alcohol-related consequences. That is, it is plausible that students who engage in repetitive negative thinking are subsequently more motivated to drink alcohol to escape from or to diminish the increasing emotional dysregulation brought about by rumination. Finally, our models provide further support for the role of drinking to cope motivation as a robust mediator between negative affect and alcohol outcomes among college students (Bravo & Pearson, 2017; Cooper, Kuntsche, Levitt, Barber, & Wolf, 2016).

Remarkably, the models were invariant across countries and sex, suggesting a culturally-universal explanatory model. There are multiple implications of this finding. Cross-cultural studies addressing these phenomena are almost nonexistent, and the available research has been conducted with U.S. samples only. The importance and need of progressing in the study of psychological variables in more diverse cultural groups has been recently highlighted (Henrich, Heine, & Norenzayan, 2010; Wang, 2016). To our knowledge, this is the first work providing empirical evidence about the interplay of these alcohol-relevant psychological constructs across three culturally-diverse countries. This contribution helps promote better understanding of the complexity of alcohol drinking behaviors. The knowledge derived from the study could help improve the efficiency of interventions targeting heavy alcohol use in college students (for both men and women) across countries.

#### 4.1. Limitations

Some key limitations of the present study must be noted. First, the cross-sectional nature of the data prevents causal inferences from being made. Longitudinal and experimental data are needed to investigate rumination facets and their effects on drinking to cope motives among college student drinkers dealing with depressive symptoms. Second, we found multiple suppression effects (e.g., positive total effect, negative direct effect) that are difficult to interpret. Suppression effects can be meaningful and represent the varied nature of how a predictor transmits its effects; however, additional work is needed to determine if these effects are meaningful or a statistical artifact (i.e., spurious). Third, the participants of this study were college students, thus generalizability of findings may be limited to this population. Our explanatory model should be tested within other samples of individuals, including clinical populations and those who are at high risk for problematic alcohol consumption (e.g., military populations; Institute of Medicine, 2012). Last, although we chose the RTSQ as our primary measure given that it is a measure of rumination that does not focus on disorder-specific content (Brinker & Dozois, 2009; Tanner et al., 2013), many other rumination assessments (e.g., Ruminative Responses Scale, Treynor et al., 2003; Perseverative Thinking Questionnaire, Ehring et al., 2011) exist with different proposed rumination facets. Thus, future research is needed to identify whether other facets of ruminative thinking impact the relationships between depressive symptoms, drinking to cope, and alcohol outcomes.

#### 4.2. Clinical implications

Despite the limitations of the present study, our model supports the plausibility of rumination being one factor that may drive the motivation to drink to cope with negative affect in multiple cultural contexts. Rumination has been identified as an important transdiagnostic mechanism associated with a range of psychopathology (McEvoy, Watson, Watkins, & Nathan, 2013; McLaughlin & Nolen-Hoeksema, 2011). Although several affect regulation models posit an association between negative affect and alcohol outcomes (e.g., self-medication hypothesis, Khantzian, 1997; tension reduction hypothesis, Conger, 1951, 1956; affective processing model of negative reinforcement, Baker, Piper, McCarthy, Majeskie, & Fiore, 2004), the present study suggests that rumination may be a particular style of cognition that facilitates

drinking to alleviate negative affect. If this is the case, then addressing this maladaptive cognitive style may be an important component of alcohol interventions. Further, it is reasonable to expect that changes in rumination may mediate some existing treatments. For example, the focus of Mindfulness-Based Relapse Prevention (MBRP; Bowen, Chawla, & Marlatt, 2011) and Affect Regulation Training (ART; Stasiewicz et al., 2013) on experiencing negative emotions in a non-judgmental manner without trying to change or control them may decrease individuals' obsessing over their negative affect. To our knowledge, changes in rumination have yet to be examined as a possible mechanism of such alcohol interventions/treatments, but nonetheless may be an important mechanism to target in future interventions.

#### 4.3. Conclusions

A central premise of the present study is that students may be drinking to interrupt negative repetitive thoughts that exacerbate and prolong their depressive moods, rather than simply drinking due to the affective state itself (Ciesla et al., 2011; Bravo et al., in press). Although we did not find unique indirect effects for rumination facets in our proposed models, a second-order latent factor of ruminative thinking accounted for 10.63% of the total effect of depressive symptoms on drinking to cope motives (also significantly mediated the associations between depressive symptoms and social/enhancement motives) and in combination with drinking to cope significantly double-mediated the associations between depressive symptoms and alcohol outcomes. Moreover, the models were invariant across countries and sex, suggesting that these associations may be universal. Taken together, our results suggest that both ruminative thinking and drinking to cope motives should be targeted for alcohol prevention efforts among college student drinkers dealing with depressive symptoms.

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#### Contributors

Dr. Bravo organized the research study and coordinated the efforts of the research team, conceptualized the research questions, conducted the analyses, drafted the introduction, statistical analyses, and results sections (including tables and figures). Dr. Pilatti wrote the abstract, method section, and part of the discussion section. Dr. Pearson assisted with the statistical analyses, wrote the clinical implications section, and edited the introduction, method, and results sections of the first draft. Drs. Mezquita, Ibáñez, and Ortet drafted parts of the discussion section and edited the other sections of the first draft. The entire team selected the measures in the assessment battery and collected all data. All authors contributed to and approved of the final manuscript.

#### Conflict of interest

No conflict declared.

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