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Does the shape of a cup influence coffee taste expectations? A cross-cultural, online study

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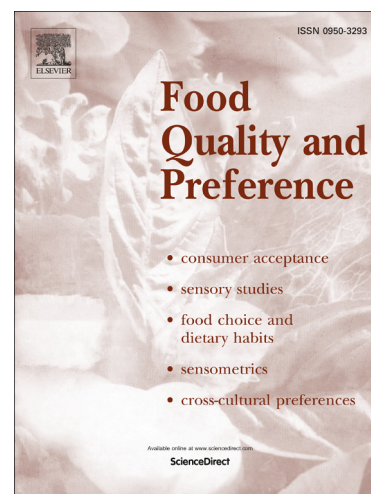
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1                   **Does the shape of a cup influence coffee taste expectations? A cross-cultural, online study**

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14  
15                   **Abstract**

16  
17                   We report a study designed to investigate whether shape-taste crossmodal correspondences would  
18                   influence consumers' expectations concerning coffee. To that end, we conducted a cross-cultural online  
19                   survey with respondents (N = 309) from China, Colombia, and the United Kingdom (UK). The participants  
20                   had to rate eight coffee mugs on eight scales by arranging the mugs within a 1000 × 250 pixel box, placing  
21                   each mug so that its horizontal position matched how strongly they thought the mug matched the scale  
22                   presented. Amongst other findings, the results revealed that (1) the coffee was expected to be more  
23                   aromatic from narrower diameter mugs, (2) the coffee associated with shorter mugs was expected to be  
24                   both more bitter and more intense, and (3) the coffee was expected to be sweeter from wider diameter  
25                   mugs. An interesting cross-cultural finding was that participants from the UK expected the mugs to be  
26                   hotter than participants from either China or Colombia. These results add to a large and growing body of  
27                   research highlighting the associations between visual information and a product's likely (or expected)  
28                   sensory qualities. These findings may be useful to those preparing coffee as they suggest that coffee should  
29                   be presented in certain mugs in order to convey a message that is congruent with the consumer's  
30                   expectations.

31  
32                   **Keywords:** coffee, shape, mugs, taste expectations, cross-cultural, online

33

34

35 **Introduction**

36 Even before tasting, we have access to, and interpret, various pieces of sensory information concerning  
37 foods and beverages (e.g., colour, orthonasal aroma, shape, and sometimes even sound and weight;  
38 Prescott, 2015; Spence, 2015a; Spence & Wang, 2015). The role of this information in priming people and  
39 setting their sensory and hedonic expectations<sup>1</sup> has been well-established (Yeomans, Chambers,  
40 Blumenthal, & Blake, 2008; see also Piqueras-Fiszman & Spence, 2015, for a recent review). Shankar,  
41 Levitan, and Spence (2010), for example, demonstrated that the same colour (e.g., blue) elicits different  
42 expectations in different groups of people. Specifically, when a group of Taiwanese participants were  
43 shown a clear plastic cup containing a blue liquid, the majority of them expected the liquid to be mint-  
44 flavoured - Spence (2015b) suggests that this may be a consequence of an association with mouthwash.  
45 However, when the same stimulus was shown to a group of British participants, the majority expected  
46 raspberry-flavour instead. Similarly, Shermer and Levitan (2014) found that changing the colour (e.g.,  
47 from red to blue) of pictures of salsa influenced participants' expectations regarding the salsa's spiciness.  
48 However, little is known about expectations when it comes to coffee or, and similar to Shankar et al.'s  
49 (2010) work, how expectations in relation to coffee might differ from one culture to the next.

50 The paucity of research exploring the influence of sensory cues on people's expectations concerning the  
51 taste/flavour of coffee is somewhat surprising, especially given Brits, for example, who are famous for  
52 their fondness for tea, consume an estimated 70 million cups of coffee in cafés, restaurants, and other  
53 outlets each and every day (Howie, 2012)<sup>2</sup>. Such figures hint at the ubiquity of coffee in many countries  
54 (see P. J. W., & D. H., 2013) and, given the economic incentive to keep consumers drinking coffee, café  
55 owners, restaurateurs, crockery designers and manufacturers ought, presumably, to be interested in  
56 anything that helps enhance the perception of the taste qualities, the enjoyment, or the overall coffee  
57 drinking experience for their clientele (cf. Van Doorn, Willemin, & Spence, 2014).

58 *Shape-taste associations*

59 Shape undoubtedly influences consumer behaviour (see Spence, 2012, for a review), and any shapes that  
60 are present on, or near, a food or beverage can be used by consumers to assess the likely qualities of that  
61 foodstuff. In general, people prefer rounded shapes (e.g., circles) to more angular shapes (e.g., triangles or  
62 stars; Bar & Neta, 2006; Gómez-Puerto, Munar, & Nadal, 2015; Silvia & Barona, 2009). Cheskin's (1957)  
63 oft-cited research drew attention to the impact of shapes on people's perception of different products.  
64 Cheskin placed identical products (e.g., crackers) in two different packages, one adorned with triangles, the  
65 other with circles. The participants' task was to state which product they preferred. Eighty-percent of  
66 participants reported a preference for the product from the package adorned with circles; often suggesting,

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<sup>1</sup> Consistent with Olson and Dover (1976), an expectation is defined here as "the perceived likelihood that a product possesses a certain characteristic or attribute" (p. 169).

<sup>2</sup> This figure includes the cups of coffee drunk at home and in other locations (e.g., staff tea rooms); approximately 70% of which are instant coffee.

67 when quizzed, that this was of better quality. Westerman et al. (2012) obtained similar results in relation to  
68 people's preference for rounded shapes on, and rounded contours of, product packages.

69 Shape also seems to have a role in the experience when drinking a beverage (see Hanson-Vaux, Crisinel, &  
70 Spence, 2013). Demonstrating a tangible impact of shape on drinking, Wansink and van Ittersum (2003,  
71 2005) found that both children and adults pour around 20-30% more of a drink (e.g., juice) into short/wide  
72 glasses relative to tall/thin glasses. However, participants believed the opposite to be true. These authors  
73 related this finding to Piaget's conservation task. Specifically, adults fail the task because it appears as  
74 though they believe that tall/thin containers hold more fluid than short/wide containers, and thus they pour  
75 less fluid into tall/thin containers.

76 Although associations between shape and taste have been explored in a range of food and beverage  
77 products, the correspondence between shape and expectations related to the taste of coffee remain  
78 unknown. Coffee is an interesting candidate for research because of its consistent, bitter character and the  
79 different bitter/sweet combinations that arise through bean selection, type of roasting of the beans, type of  
80 milk used (e.g., full fat), and whether or not sugar is added. According to Spence (2012), coffee is likely to  
81 be another product where shape-taste associations exist. The suggestion being that many coffee company  
82 logos are rounded in shape (e.g., New York Coffee Company, Costa Coffee, Starbucks Coffee), and that  
83 this might be used to suggest to customers that their coffee is not overly bitter (see also Batra, Seifert, &  
84 Brei, 2015; Zhang, Feick, & Price, 2006). However, it is important to note that this claim has yet to be  
85 substantiated, and Cheskin's (1957) early ideas (i.e., the ability of the shapes used on product packaging to  
86 affect people's product expectations) have yet to be applied to the coffee category. This research project  
87 addresses this salient gap in the literature. Specifically, and given that, in a restaurant setting, a coffee's  
88 package is often the mug or cup in which it is served, we sought to investigate shape-flavour associations  
89 in relation to coffee expectations.

#### 90 *Cross-cultural research*

91 Interestingly, Bremner et al. (2013) reported that the Himba tribe of Kaokoland in rural Namibia did not  
92 show the 'usual' (i.e., Western) associations between angular and rounded shapes and the tastes and oral-  
93 somatosensory properties of beverages. It was assumed that the Himba have been unable to accumulate the  
94 'usual' associations through experience because they have not been exposed to written language,  
95 supermarkets, or advertising. Bremner et al. found that the Himba did not match still water with an organic,  
96 amoeba-like shape, nor did they pair sparkling (i.e., carbonated) water with an angular, star-like shape.  
97 Additionally, they also matched chocolates varying in cocoa content in a manner opposite to that of their  
98 Western counterparts (i.e., Westerners match chocolate high in cocoa to angular, star-like shapes due to the  
99 increased bitterness). That said, Ngo et al. (2013) have observed consistent crossmodal correspondences  
100 across cultures. Specifically, they demonstrated that British and Colombian participants associated sweet  
101 fruit juices with round shapes and sour fruit juices with angular shapes (see also Salgado-Montejo et al.,  
102 2015; Wan et al., 2014). Bremner et al.'s (2013) findings, and the work of others (e.g., Williams & Bargh,  
103 2008), show that at least some of the associations between shapes and the tastes, flavours, aromas, and

104 oral-somatosensory attributes of food and beverages are likely learned. That said, it is possible that  
105 participants matched stimuli as a function of stimulus valence, which might differ across cultures (see  
106 Velasco, Woods, Petit, Cheok, & Spence, 2016). For example, the Himba might find both chocolate high  
107 in cocoa and rounded forms appealing, and thus match them.

#### 108 *Aims and hypotheses*

109 In the study reported here, we explored the impact of the shape of coffee mugs on people's expectations of  
110 the coffee. Most studies on taste/shape associations have focused on the curvilinearity of shapes. However,  
111 other shape features (in particular those that affect visual preference) may influence taste/shape  
112 associations (as shown by Salgado-Montejo et al., 2015, for symmetry; Deroy & Valentin, 2011, for  
113 thinness). Further, and similar to Piqueras-Fiszman, Alcaide, Roura, and Spence (2012), we wanted to  
114 explore the influence of the shape of the container the beverage is served in. For those reasons we explored  
115 some of the attributes that are typically varied in coffee cups, namely the 'height' of the mug (tall, short),  
116 the 'diameter' of the mug (wide, narrow), and the 'thickness' of the rim (thick, thin). It should be noted  
117 that factors other than shape can influence expectations as well. For example, the cup in which the coffee  
118 is served may affect us as a function of our perception of the general properties of the cup (i.e., cheap vs.  
119 expensive [Piqueras-Fiszman, Harrar, Alcaide, & Spence, 2011], flimsy vs. strong [Krishna & Morrin,  
120 2008]). Here, we explore these issues too.

121 In the remainder of this section, the hypotheses will be discussed according to the type of expectation  
122 measured. Specifically, 'bitterness' and 'sweetness' measure expectations relating to the taste of coffee,  
123 while 'aroma', 'energy', 'temperature', and 'intensity' measure expectations concerning the  
124 properties/qualities of coffee. Finally, 'liking' and 'willingness-to-pay' measure people's expectations  
125 concerning themselves.

#### 126 **Taste Expectations**

127 It was thought that if expectations are affected by a mug's attributes (e.g., height), a coffee's properties  
128 (e.g., bitterness) should be rated more favourably when associated with a particular change in that  
129 dimension. For example, it is common in several countries to serve more concentrated coffees (e.g.,  
130 espresso, macchiato) in smaller cups and, as such, we expected people to rate these mugs as containing  
131 coffees that were more bitter.

#### 132 **Expectations regarding the coffee's properties**

133 It is possible that different cup diameters influence expected aroma intensity. Cliff (2001) suggested that  
134 larger openings allow aromas to escape prior to evaluation, and the same logic could be applied here. That  
135 said, Spence (2011, 2016) suggested that a small-diameter glass reduces the surface area of the contents  
136 available for diffusion, and thus fewer odour molecules are released from the liquid. Given these  
137 conflicting findings, we thought it most appropriate to hypothesise that 'cup diameter' would not influence  
138 the expected aroma of coffee.

#### 139 **Expectations relating to the individual**

140 It was hypothesised that increases in ‘cup height’ and ‘cup diameter’ would be associated with an increase  
141 in the amount a person was willing-to-pay for the coffee, due to the expectation that there will be more  
142 coffee in these cups. Importantly though, and consistent with Wansink and van Ittersum (2003, 2005), it  
143 may be that people pay more attention to one dimension of the cup (e.g., height) than another (e.g., width).  
144 If this is true, and Wansink and van Ittersum are correct, it was thought that people might expect that  
145 tall/thin mugs hold more coffee relative to short/wide mugs. As such, people would be willing-to-pay more  
146 for coffee from these types of mugs.

147 Consistent with Harrar and Spence (2013), it was thought that the thickness of the mugs would influence  
148 expected attributes of the coffee. This thought is based on the fact that thicker objects (usually) weigh  
149 more than thinner objects. Harrar and Spence found that yoghurt was perceived of as being more expensive  
150 when it was tasted from a lighter plastic spoon, relative to an artificially-weighted spoon. As such, we  
151 hypothesised that the coffee associated with thin-walled mugs, which one assumes are expected to be  
152 relatively lighter, would be deemed more expensive than the coffee associated with mugs with thicker  
153 walls. However, it could be argued that, in Harrar and Spence’s work, there is a contrast between the  
154 weight of the spoon and the perceived thickness/creaminess (and thus expensiveness) of the yoghurt. In the  
155 study presented here, though, there was no real coffee, so there is no contrast. Consequently, it might be  
156 that people expect higher quality coffee to come in thicker cups.

## 157 **Method**

### 158 Participants

159 Three hundred and nine participants took part in the study. One hundred and three volunteers (46 women)  
160 aged between 17 and 29 years were from China ( $M_{age} = 21.50$  years,  $SD_{age} = 8.07$  years). Ninety-seven  
161 volunteers (56 females) aged between 18 and 69 years were from Colombia ( $M_{age} = 29.19$  years,  $SD_{age} =$   
162  $14.21$  years). Finally, 105 participants (52 females) aged between 16 and 60 years were from the UK ( $M_{age}$   
163  $= 34.10$  years,  $SD_{age} = 11.05$  years).

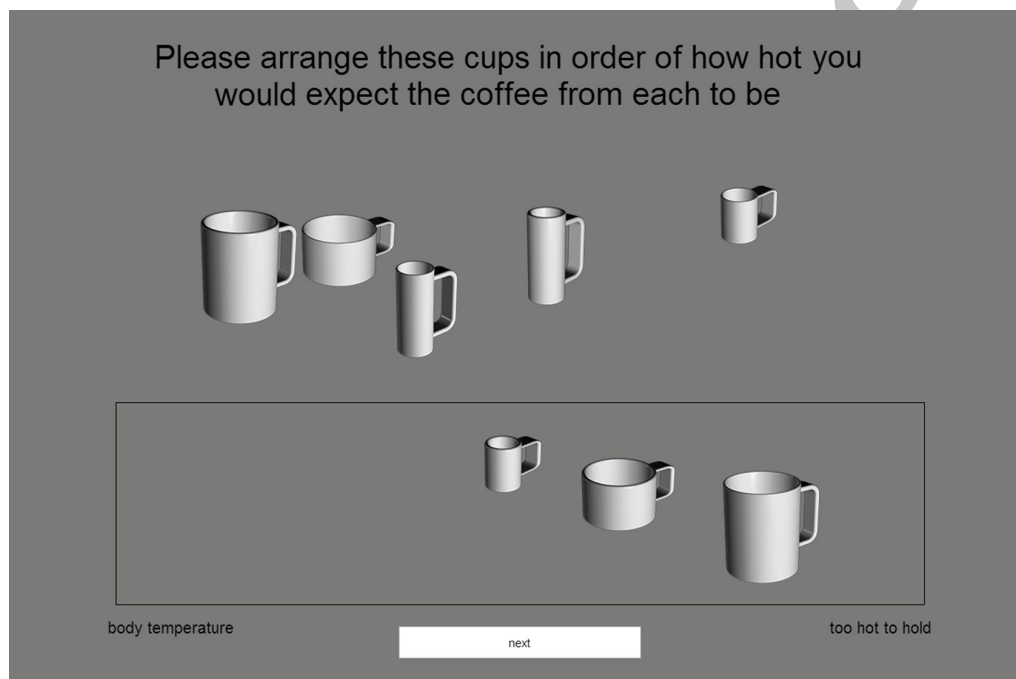
164 The Chinese participants were undergraduate or graduate students from Tsinghua University, Beijing,  
165 China. For their participation, volunteers received either course credit in order to fulfil the requirements of  
166 an introductory psychology course that they were enrolled in, or were compensated ¥12.5 CNY. The  
167 experiment was approved by the ethics committee at the Psychology Department of Tsinghua University,  
168 and conformed to the ethical standards for conducting research established by the American Psychological  
169 Association. The Colombian participants were recruited from a database of participants created at the  
170 International School of Economic and Administrative Sciences at Universidad de La Sabana, Bogota,  
171 Colombia, and took part in the experiment voluntarily. The UK participants were recruited from Prolific  
172 Academic to take part in the study in return for a payment of 1.00 UK pound. By means of Prolific  
173 Academic’s ‘filter’ feature, only those participants who reported having been born in the UK were allowed  
174 to take part in the study. The study was reviewed and approved by the Central University Research Ethics  
175 Committee at Oxford University and was carried out in accordance with the World Medical Association

176 (WMA, 2013) Helsinki Declaration. All participants provided informed consent prior to taking part in the  
177 study.

178

### 179 Stimuli

180 Given that the experiment was conducted online, the apparatus varied by participant. Nevertheless, the  
181 experiment utilized ‘full screen’ mode (i.e., utilizing the entirety of the participant’s monitor), and took  
182 place within a 1024 × 768 pixel box in the centre of the screen (see Figure 1), irrespective of the size of the  
183 participant’s monitor. The experiment was conducted online using the Adobe Flash-based version of  
184 Xperiment (<http://www.xperiment.mobi>).



185

186 **Figure 1.** The pictures used in the survey.

187

### 188 Design

189 A mixed-factorial design was used that included a between-participant factor (country of origin: China,  
190 Colombia, or the UK) and the within-participants factors of the ‘height of cup’ (tall, short), the ‘cup  
191 diameter’ (wide, narrow), and the ‘thickness of rim’ (thick, thin). The dependent variables are defined in  
192 Table 1. Note that due to human error whilst scripting the study, participants from the UK were asked to  
193 specify how much they would pay for drinks in terms of US dollars, not UK pounds.

194

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198

199 **Table 1.** The dependent variables, the question asked to assess each, and the anchors used to define the scale  
 200 participants had to place the mugs along (the anchors were always placed on the far left and right of  
 201 the scale; in the case of ‘Willingness-to-pay’ though, the additional anchors were evenly spaced  
 202 between the far left and far right anchor).

Dependent variable	Question asked	Scale anchors (left to right)
Aroma	Please arrange these mugs of coffee in order of how strong smelling you would expect the coffee from each to be	Not aromatic at all; Very strongly aromatic
Bitter	Please arrange these cups of coffee in order of how bitter you would expect each to taste	Not bitter at all; Very bitter
Energy	Please arrange these mugs in order of how energising you think the coffee in each would be	Not at all energising; Very energising
Temperature	Please arrange these cups in order of how hot you would expect the coffee from each to be	Body temperature; Too hot to hold
Intensity	Please arrange these mugs of coffee in order of how intense you would expect coffee from each to taste	Not intense at all; Very intense
Liking	Please arrange these mugs of coffee in order of how much you expect to like the coffee from each	Greatest imaginable dislike; Greatest imaginable like
Sweetness	Please arrange these mugs of coffee in order of how sweet you would expect coffee from each to taste	Not sweet at all; Very sweet
Willingness-to-pay	Please arrange these mugs of coffee in order of how much money you would be willing to pay for a cup of coffee in each	English: 0 - 10 US dollars Chinese: 0 - 45 Chinese Yen Colombia: 0 - 31000 \$Pesos

203

#### 204 **Procedure**

205 A screen shot of the task is shown in Figure 1. The participants had to arrange the mugs within a 1000 ×  
 206 250 pixel box, placing each mug so that its horizontal position matched how strongly they thought each  
 207 mug matched the scale presented (e.g., in Figure 1, the participant is being asked to arrange the mugs  
 208 according to how hot they think coffee presented in each will be). Mugs could be placed so that they  
 209 overlapped (with the most recently moved placed on top of mugs moved earlier). Parenthetically, the mugs  
 210 we showed to participants did not have coffee in them and we (deliberately) did not specify whether there  
 211 was the same amount of coffee in each cup. As such, each participant may have had a different idea with  
 212 regards to the ‘amount’.

213 After placing all eight mugs, the participant could proceed to the next trial by pressing the space bar or  
214 clicking the 'next' button (there was a 100ms pause between trials). On each of the eight trials, a different  
215 scale was presented. The original starting positions for the mugs were arranged randomly in a 1000 × 269  
216 pixel area above the box (if a mug's random placement overlapped with another mug, a new random  
217 placement was generated; this was repeated up to 100 times, after which the mug was placed in the  
218 position that, out of the prior 100 attempts, least overlapped existing mugs). Trial order was randomised  
219 between participants<sup>3</sup>. The participants took an average of 650 seconds to complete the study. After  
220 completing all the trials participants were debriefed as to the nature of the study. This kind of task has been  
221 used successfully in several recent studies (e.g., Velasco, Woods, Hyndman, & Spence, 2015).

## 222 **Analyses**

223 Eight mixed-factorial ANOVAs, subjected to Holm-Bonferroni corrections, were conducted that were  
224 identical in terms of design except for their dependent variable (Aroma, Bitterness, Energy, Temperature,  
225 Intensity, Liking, Sweetness, and Willingness-to-pay); the dependent variable was the position on the x-  
226 axis of the centre of the images of the coffee mugs, relative to the size of the box within which the mugs  
227 were placed - percentage position values were used. In relation to the Holm-Bonferroni corrections, there  
228 were 15 main effects and interactions per ANOVA, so the most stringent critical  $p$ -value used was 0.05 /  
229 (15 x 8) = 0.00042; critical  $p$ -values and statistics are detailed in Appendix 1. Contrary to popular opinion,  
230 ANOVA does *not* control for Type 1 error (see Lakens, 2016). Each ANOVA consisted of the between-  
231 participant factor of 'country of origin' (China vs. Colombia vs. UK), and the repeated-measures factors of  
232 'height of cup' (tall vs. short), 'cup diameter' (narrow vs. wide), and 'thickness of rim' (thick vs. thin). The  
233 full report of these analyses is given in Appendix 1.

## 234 **Results**

### 235 Data screening

236 Outliers were screened, and corrected separately, for each country (values exceeding 3 x  $SD$  +/- mean were  
237 replaced with the next most extreme, but non-outlying, value). Eleven out of 6720 data points were  
238 corrected in this fashion for UK data, and 11/6208 for Colombian data (none of the 6592 Chinese data  
239 points were outliers).

### 240 Taste Expectations

#### 241 *Bitterness*

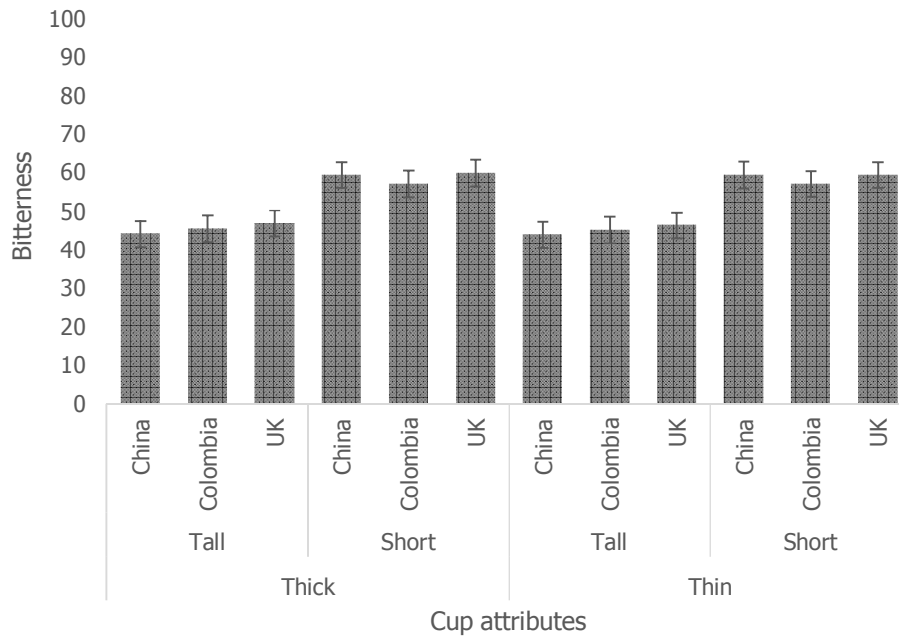
242 Although the three-way interaction between 'thickness of rim', 'height of cup', and 'country of origin' was  
243 significant [ $F(2, 302) = 9.32, p < .001, \eta^2_p = .06$ ], inspection of the data (see Figure 2) indicates that  
244 'height of cup' was more impactful than 'thickness of rim' and/or 'country of origin'. This is supported by  
245 the fact that the only main effect, from these three factors, that reached statistical significance was 'height  
246 of cup' [ $F(2, 302) = 69.04, p < .001, \eta^2_p = .19$ ]. Here, the coffee associated with short mugs ( $M = 58.62$ ; CI

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<sup>3</sup> Please contact Andy Woods ([andywoods@gmail.com](mailto:andywoods@gmail.com)) for the script for the Cantonese and Spanish versions of the text used in the study.

247 [56.76, 60.48]) was expected to be more bitter than the coffee associated with taller mugs ( $M = 45.34$ ; CI  
 248 [43.46, 47.21]). There was also a significant main effect of 'cup diameter' [ $F(1, 302) = 137.56, p < .001,$   
 249  $\eta^2_p = .31$ ], with the coffee associated with narrower diameter mugs ( $M = 64.07$ ; CI [61.69, 66.46]) thought  
 250 to be more bitter than the coffee associated with wider diameter mugs ( $M = 39.89$ ; CI [37.74, 42.03]).  
 251 Table 2 presents a summary of all the significant main effects.

252



253

254 **Figure 2.** The interaction between 'thickness of rim', 'height of cup' and 'country of origin' for Bitterness (error  
 255 bars here and henceforth represent the 95% CI around the mean).

256

257 **Table 2.** A summary of the significant main effects.

Expectations	DV	Main effects			
		Height of cup	Diameter of cup	Thickness of rim	Country of origin
Taste	Bitter	√	√	-	-
	Sweetness	-	√	-	-
Quality	Aroma	√	√	-	-
	Energy	-	-	-	-
	Temperature	-	-	-	√
	Intensity	√	√	-	-
Subjective ratings	Liking	-	-	-	-

---

 Willingness-to-pay      √      √      -      -
 

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258 *Note:* √ denotes a significant main effect

259

260

261

262

263 *Sweetness*

264 The main effect of ‘cup diameter’ achieved significance [ $F(1, 302) = 33.55, p < .001, \eta^2_p = .10$ ], with the  
 265 coffee from mugs with a wider diameter ( $M = 55.38$ ; CI [53.05, 57.71]) expected to be sweeter than coffee  
 266 from mugs with a narrower diameter ( $M = 42.40$ ; CI [39.75, 45.05]).

267 **Expectations regarding the coffee’s properties**

268 *Aroma*

269 The main effects of ‘cup diameter’ [ $F(1, 302) = 13.78, p < .001, \eta^2_p = .04$ ] and ‘height of cup’ [ $F(1, 302) =$   
 270  $45.73, p < .001, \eta^2_p = .13$ ] exerted a significant influence on participants’ ratings of expected aroma. In  
 271 terms of ‘cup diameter’, the coffee associated with narrower diameter mugs ( $M = 59.32$ ; CI [56.64, 62.01])  
 272 was expected to be more aromatic than the coffee associated with wider diameter mugs ( $M = 50.77$ ; CI  
 273 [48.42, 53.12]). In relation to ‘height of cup’, the coffee from short mugs ( $M = 60.47$ ; CI [58.50, 62.45])  
 274 was thought to be more aromatic than was the coffee from taller mugs ( $M = 49.62$ ; CI [47.74, 51.50]).

275 *Energy*

276 There were no significant main effects or interactions (see Appendix 1).

277 *Intensity*

278 The main effects of ‘cup diameter’ [ $F(1, 302) = 110.67, p < .001, \eta^2_p = .27$ ] and ‘height of cup’ [ $F(1, 302)$   
 279  $= 81.51, p < .001, \eta^2_p = .21$ ] were significant. The coffee associated with narrower diameter mugs ( $M =$   
 280  $64.61$ ; CI [62.09, 67.12]) was expected to be more intense than that associated with wider diameter mugs  
 281 ( $M = 42.12$ ; CI [40.02, 44.22]). Likewise, coffee in short mugs ( $M = 60.56$ ; CI [58.66, 62.46]) was  
 282 expected to be more intense than coffee from tall mugs ( $M = 46.17$ ; CI [44.39, 47.95]).

283 *Temperature.*

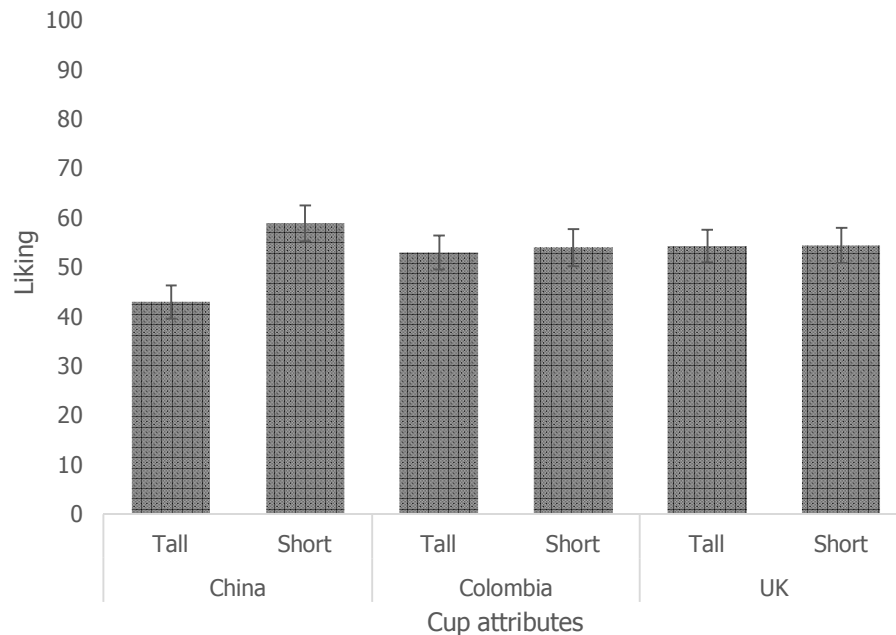
284 The only main effect that achieved statistical significance here was ‘country of origin’ [ $F(2, 302) = 12.89,$   
 285  $p < .001, \eta^2_p = .08$ ], with UK participants expecting the mugs to be hotter ( $M = 55.50$ ; CI [53.61, 57.39])  
 286 than participants from either China ( $M = 50.14$ ; CI [48.23, 52.04]) or Colombia ( $M = 48.96$ ; CI [47.00,  
 287 50.93]).

288 **Expectations relating to the individual**

289 *Liking*

290 The interaction between ‘height of cup’ and ‘country of origin’ achieved significance [ $F(2, 302) = 9.90, p$   
 291  $< .001$ ], with a medium effect size ( $\eta^2_p = .06$ ). Figure 3 shows that the interaction was largely driven by

292 Chinese participants liking coffee from short mugs ( $M = 58.90$ ; CI [55.28, 62.51]) relative to taller mugs  
 293 ( $M = 42.94$ ; CI [39.61, 46.26]). Confidence intervals revealed that Colombians' liking of coffee from short  
 294 [50.25, 57.71] and tall mugs [49.58, 56.44] and UK participants' preference for coffee from short [50.82,  
 295 57.99] and tall mugs [51.04, 57.63] overlapped – but were greater than the Chinese participants liking for  
 296 coffee from tall mugs.



297

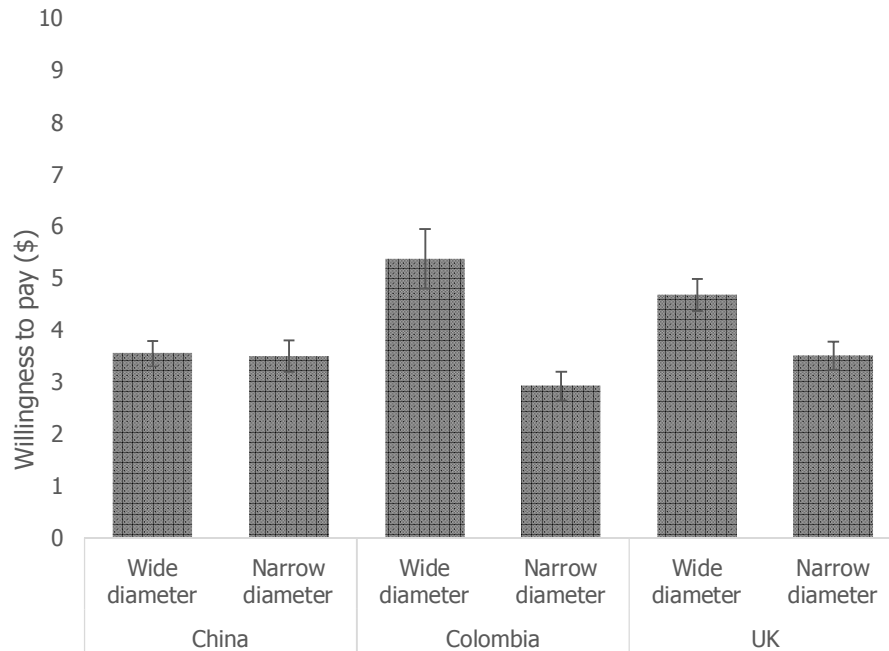
298 **Figure 3.** The interaction between 'height of cup' and 'country of origin' for Liking.

299 *Willingness-to-pay*

300 Chinese Yen (6.214 CNY = 1 USD) and Colombian Peso (2382 COP = 1 USD) were converted to US  
 301 dollars using the currency exchange rate midway through testing (20th January, 2016, via  
 302 <http://www.exchangerates.org.uk/>). We were interested in the relative changes as a function of our  
 303 experimental conditions and although the amounts may represent something different in each country, they  
 304 nevertheless provide us with the relative changes, in terms of the manipulation of interest. Given that the  
 305 study was conducted over a 6 month period, and given the degree of variation of the exchange of these  
 306 currencies (which, even if the relative value of the currencies remained stable, could have many possible  
 307 explanations), we decided to focus more on within country variation in the Discussion as opposed to  
 308 variation across countries.

309 There was a significant interaction (see Figure 4) between 'cup diameter' and 'country of origin' [ $F(2, 302)$   
 310  $= 28.71, p < .001, \eta^2_p = .16$ ]. Whilst both Colombians ( $M = 5.38$ ; CI [4.81, 5.95]) and participants from the  
 311 UK ( $M = 4.68$ ; CI [4.38, 4.99]) rated coffee from wider diameter mugs as being more expensive than  
 312 coffee from mugs with a narrower diameter (Colombians:  $M = 2.93$ ; CI [2.65, 3.21]; UK:  $M = 3.51$ ; CI  
 313 [3.24, 3.78]), Colombians reported that they were willing-to-pay less for coffee from smaller diameter

314 mugs than were participants from the UK. The amount Chinese participants were willing-to-pay for coffee  
 315 did not depend on the diameter of the cup (i.e., wide diameter:  $M = 3.55$ ; CI [3.31, 3.80]; narrow diameter  
 316  $M = 3.51$ ; CI [3.20, 3.81]).  
 317



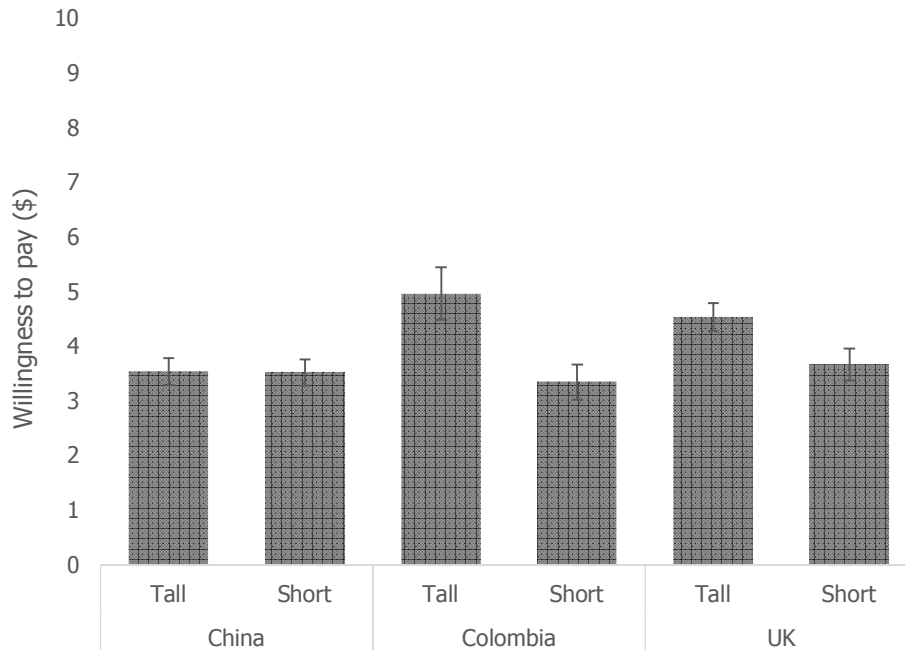
318

319 **Figure 4.** The interaction between ‘cup diameter’ and ‘country of origin’ for the Willingness-to-pay DV.

320

321 The interaction (see Figure 5) between ‘height of cup’ and ‘country of origin’ also achieved significance  
 322 [ $F(2, 302) = 20.04, p < .001$ ], with a medium effect size ( $\eta^2_p = .12$ ). The interaction is almost identical to  
 323 the previous interaction (see Figure 4). Specifically, both Colombians ( $M = 4.96$ ; CI [4.48, 5.44]) and  
 324 UK participants ( $M = 4.53$ ; CI [4.21, 4.79]) were willing-to-pay more for coffee from tall mugs than they  
 325 were for coffee from short mugs (Colombians:  $M = 3.35$ ; CI [3.02, 3.67]; UK:  $M = 3.66$ ; CI [3.37, 3.96]),  
 326 whereas the amount Chinese participants were willing-to-pay did not depend on the height of the mug (i.e.,  
 327 tall:  $M = 3.54$ ; CI [3.29, 3.79]; short:  $M = 3.52$ ; CI [3.28, 3.76]).

328



329

330 **Figure 5.** The interaction between ‘height of cup’ and ‘country of origin’ for the amount one was Willing-to-pay.

331

332 ‘Cup diameter’ and ‘height of cup’ also interacted [ $F(1, 302) = 12.83, p < .001, \eta^2_p = .04$ ]. People were  
 333 willing-to-pay the most for tall/wide cups ( $M = 5.06$ ; CI [4.75, 5.38]), followed by short/wide cups ( $M =$   
 334  $3.98$ ; CI [3.76, 4.21]) and tall/narrow mugs ( $M = 3.60$ ; CI [3.41, 3.79]), which did not differ from one  
 335 another, and, finally, short/narrow mugs ( $M = 3.05$ ; CI [2.83, 3.26]).

336 The main effects of ‘cup diameter’ [ $F(1, 302) = 90.62, p < .001, \eta^2_p = .23$ ] and ‘height of cup’ [ $F(1, 302) =$   
 337  $66.10, p < .001, \eta^2_p = .18$ ] exerted a significant influence on the amount participants’ were willing-to-pay.  
 338 Unsurprisingly, and in relation to ‘cup diameter’, people were willing-to-pay more for coffee from mugs  
 339 with a wider diameter ( $M = 4.57$ ; CI [4.37, 4.78]) than they were for coffee from narrower diameter mugs  
 340 ( $M = 3.53$ ; CI [3.35, 3.72]). As for ‘height of cup’, people were willing-to-pay less for coffee from short  
 341 mugs ( $M = 3.70$ ; CI [3.53, 3.87]) than they were for coffee from taller mugs ( $M = 4.41$ ; CI [4.22, 4.60]).

## 342 Discussion

343 The main issue explored in this study was whether expectations about coffee are influenced by changes in  
 344 the shape of the mug. The results revealed that ‘cup diameter’ and ‘cup height’ influenced the expected  
 345 aroma, bitterness, intensity, and amount a participant was willing-to-pay; ‘cup diameter’ also influenced  
 346 the expected sweetness. An interesting cross-cultural finding was that participants from the UK expected  
 347 the mugs to be hotter than participants from either China or Colombia. In contrast to Harrar and Spence’s  
 348 (2013) finding relating to the weight of spoons, the weight (which was assumed to be associated with  
 349 ‘thickness’) of the mugs did not influence expected attributes of the coffee – this seems odd given that tea  
 350 drinkers would presumably consider ‘cup thickness’ an important issue (consider, for example, the thin lip

351 of a bone China cup). Harrar and Spence found that yoghurt was thought to be more expensive when it was  
352 tasted from a lighter plastic spoon, relative to an artificially-weighted spoon. As such, we initially thought  
353 that coffee associated with thin-walled mugs, which one assumes are expected to be relatively lighter,  
354 would be considered more expensive than the coffee associated with mugs with thicker walls. However,  
355 some literature (e.g., Piqueras-Fiszman et al., 2011; Piqueras-Fiszman & Spence, 2012) suggests that the  
356 coffee associated with thick-walled mugs, which one assumes are expected to be relatively heavier, would  
357 be deemed more expensive than the coffee associated with mugs with thinner walls. Further, in Harrar and  
358 Spence's work there was a contrast between the weight of the spoon and the perceived  
359 thickness/creaminess (and thus expensiveness) of the yoghurt. Consequently, it might be that people expect  
360 higher quality coffee to come in thicker cups. Neither of these hypotheses were supported, which may be a  
361 consequence of the fact that our task measured expectations, whereas Harrar and Spence (2013) tested  
362 perceptions. It might also be true that, because we used conservative Holm-Bonferroni corrections, effects  
363 that achieved significance in previous work did not do so here. However, the null finding might be an  
364 artefact of the stimuli we used. It is possible that participants had difficulty distinguishing the two variable  
365 levels (i.e., thick walls vs. thin walls), and thus provided similar responses regardless of the 'thickness of  
366 rim'.

### 367 **Taste Expectations**

#### 368 *Bitterness*

369 The coffee associated with short mugs was expected to be more bitter than the coffee associated with taller  
370 mugs. A seemingly logical interpretation of this finding is that people (from several cultures) expect the  
371 ratio of coffee to milk (or water) in the shorter mugs to be greater than they expect the ratio to be in taller  
372 mugs, and thus expect the coffee in shorter mugs to be more bitter. Similarly, perhaps it is that people  
373 expect certain types of coffees to be served in smaller cups. For example, in the UK and Australia, it is  
374 common for "strong" coffees (think espresso, macchiato) to be served in very small cups. At this point, it  
375 is worth considering that features such as 'cup height' may be matched to specific taste attributes. Here, we  
376 are dealing with the specific semantic context of 'coffee', and in that sense people may filter information  
377 as a function of their 'experience' with coffee (see Bohrn, Nabecker, & Carbon, 2008; Carbon, 2010 for  
378 similar arguments in relation to shape curvature preference).

379 This same logic can be applied to the finding that 'cup diameter' was significant. Specifically, the coffee  
380 associated with narrow-diameter mugs was thought to be more bitter than the coffee associated with wide-  
381 diameter mugs. Again, and holding mug height constant, it may be that people expect the ratio of coffee to  
382 milk (or water) in the narrower mugs to be greater than it is in wider mugs, and thus expect the coffee in  
383 narrower mugs to be more bitter.

#### 384 *Sweetness*

385 The main effect of 'cup diameter' achieved statistical significance, with the coffee from mugs having a  
386 wider diameter expected to be sweeter than coffee presented in mugs having a narrower diameter. This  
387 might be the inverse of the "bitterness" finding. Specifically, the coffee associated with mugs with a



388 narrower diameter was thought to be less sweet (or more bitter) than the coffee associated with mugs of a  
389 wider diameter. Again, one possibility here is that people expect the ratio of coffee to milk (or water) in the  
390 wider diameter mugs to be less than it is in narrower mugs, and thus expect the drink to be less bitter (or  
391 sweeter).

## 392 Expectations regarding the coffee's properties

### 393 *Aroma*

394 To reiterate, the main effects of 'cup diameter' and 'height of cup' exerted a significant influence on  
395 participants' ratings of the expected aroma. Although it is difficult to disentangle the important factors in  
396 the work of Cliff (2001), the results presented here seem to be (somewhat) consistent with her findings in  
397 relation to wine. Specifically, we found that the coffee associated with smaller diameter mugs was thought  
398 to be more aromatic than the coffee associated with larger diameter mugs. Cliff found that wine glasses  
399 with large bowl diameters but small openings had the highest aroma intensities, regardless of the type of  
400 wine sampled. Cliff suggested that larger openings allow aromas to escape prior to evaluation, and the  
401 same logic could be applied here. However, Spence (2011) suggested that a small-diameter glass reduces  
402 the surface area of the contents that is available for diffusion, and thus fewer odour molecules are released  
403 from the liquid. Coffee might be an interesting case where expectations and perceptions differ.

404 In relation to 'height of cup', the coffee from short mugs was thought to be more aromatic than that from  
405 taller mugs. Although speculative, this finding (and the finding regarding 'cup diameter') might, again, be  
406 related to bitterness and the idea that people filter information as a function of their experiences. It might  
407 also relate to the work of Jeon, Lee, and Kim (2014) who highlight the importance of expectations. Jeon  
408 and colleagues showed that people expect soup to be presented in certain type of bowls, and this  
409 expectation can influence its perceived saltiness. The same logic could be applied here in that it is common  
410 in several countries to serve more concentrated coffees in smaller cups and, as such, people might expect  
411 coffees presented in these mugs to be more aromatic.

### 412 *Energy*

413 None of the main effects or interactions achieved significance. As such, the coffee associated with certain  
414 mug types was not deemed more energizing than the coffee associated with any other mug type.  
415 Supporting the null hypothesis here is interesting because one might assume that there is a correlation  
416 between 'energy' and 'volume'. Consider, for example, energy drinks: A relatively uncontroversial  
417 assumption would be that people expect larger volumes of energy drink to be more energizing than smaller  
418 volumes. It is, therefore, somewhat surprising that people do not expect larger volumes of a similarly  
419 caffeinated beverage (i.e., coffee) to be more energizing. A tentative explanation here is that the coffee  
420 category might be somewhat unique. That is, people understand that smaller coffees (e.g., espresso) are  
421 usually quite strong, and that larger coffees (e.g., lattes) often have an equivalent amount of coffee in them,  
422 but are topped-up with milk and foam.

### 423 *Temperature*

424 There was a main effect of ‘country of origin’. Here, participants from the UK expected the mugs to be  
425 hotter than did the participants from either China or Colombia. An interesting, yet speculative, idea here is  
426 that people from the UK expect coffees to be warmer because the climate (13.5°C) there is, on average,  
427 colder than it is in Bogota (Colombia: 18.0°C) and Beijing (China: 17.8°C). This proposition, obviously,  
428 requires further testing.

#### 429 *Intensity*

430 The main effects of ‘cup diameter’ and ‘height of cup’ were significant. The coffee associated with the  
431 narrower diameter cups was expected to be more intense than that associated with wider mugs. Likewise,  
432 coffee in short mugs was expected to be more intense than that from tall mugs. Interestingly, these findings  
433 mimic those for bitterness. Consistent with an argument made by Van Doorn, Wullemin, and Spence  
434 (2014), consumers appear to blur the distinction between ‘intensity’ and ‘bitterness’. Dijksterhuis (1998)  
435 has suggested that because of the use of the word ‘strong’ in coffee advertising, consumers often confuse a  
436 coffee’s strength or intensity with its ‘bitterness’ – the finding here that intensity ratings mirror bitterness  
437 ratings would support such a view.

#### 438 **Expectations relating to the individual**

##### 439 *Liking*

440 The interaction between ‘height of cup’ and ‘country of origin’ was significant, and driven largely by  
441 Chinese participants’ preference for coffee in short mugs. Colombians and participants from the UK  
442 showed no preference for coffee from either short or tall mugs. However, both groups rated the coffee in  
443 these mugs as being more likeable than was Chinese participants rating of the coffee in tall mugs (see  
444 Figure 3). A possible explanation for this findings is that participants might simply be responding as a  
445 function of the ‘regularities’ found in coffee drinking experiences, over-and-above any crossmodal feature  
446 matching. More work is needed to clarify this issue.

##### 447 *Willingness-to-pay*

448 There was a significant interaction between ‘diameter of cup’ and ‘country of origin’. Whilst both  
449 Colombian and UK participants were willing-to-pay more for coffee from mugs having a wider (as  
450 compared to a narrower) diameter, the Chinese participants failed to differentiate between narrow and wide  
451 diameter mugs with respect to the amount they were willing-to-pay. This seems like an odd finding but,  
452 perhaps, is a consequence of the fact that coffee is still not a common beverage in China. That is,  
453 Colombians and those from the UK hold an expectation that a greater volume of coffee (as one would get  
454 in a wider diameter mug) would cost more but, due to their lack of familiarity with coffee, Chinese  
455 participants did not necessarily expect to pay more for a slightly larger quantity. The interaction between  
456 ‘height of cup’ and ‘country of origin’ mimics the interaction between ‘diameter of cup’ and ‘country of  
457 origin’ and the same explanation seems applicable. That said, as Chinese participants were younger than  
458 those from either Colombia or the UK, willingness-to-pay might be influenced by (possible) differences in  
459 coffee consumption patterns and income, regardless of the shape of mug. Further investigation is required.

460 There was a significant interaction between ‘cup diameter’ and ‘height of cup’ that demonstrated that  
461 participants were willing-to-pay the most for tall/wide cups, and the least for short/narrow mugs.  
462 Unsurprisingly, this finding suggests that willingness-to-pay is better explained by the perceived volume of  
463 the coffee, as opposed to the individual factors of ‘height of cup’ and ‘cup diameter’. This interpretation is  
464 supported by the significant main effects of ‘cup diameter’ and ‘height of cup’ – where people were  
465 willing-to-pay less for *smaller* cups of coffee relative to *larger* cups of coffee. Interestingly, the findings  
466 do not seem to support those of Wansink and van Ittersum (2003, 2005). In the present study, the  
467 willingness-to-pay CIs for the short/wide mug overlap those of from the tall/narrow mug. As such, one  
468 could draw the conclusion that adults expected these mug types to hold an equivalent amount of coffee.

#### 469 **Limitations**

470 There are several issues that may have influenced our results and should be considered. The first, as raised  
471 by a reviewer, was that the participants from the different countries had different mean ages and it could be  
472 the case that coffee consumption varies as a function of age. A further two differences were that whilst  
473 participants from China and the Colombia were students recruited through their universities, those from the  
474 UK were recruited through the online recruitment panel [www.prolificacademic.co.uk](http://www.prolificacademic.co.uk). Further, participants  
475 recruited in Colombia did not receive monetary compensation for taking part. It is less clear if these factors  
476 would have influenced our results, nevertheless, it is worth outlining these as potential confounds to avoid  
477 in future studies related to ours.

#### 478 **Conclusions**

479 The results of the survey reported here demonstrate that the shape of the mug influenced people’s  
480 expectations of the taste and qualities of coffee that would be served in such a mug. Shape, or more likely  
481 ‘volume’, also influenced the amount participants were willing-to-pay for a coffee. If café owners, baristas,  
482 and crockery manufacturers want to manipulate people’s expectations of coffee, they should carefully  
483 consider the diameter and height of the cups they use/produce, as these features will likely affect expected  
484 aroma, bitterness, sweetness, and intensity. Further, these people should be cognizant of traditions (e.g.,  
485 serving more concentrated coffees in smaller cups) as they are likely to be important. When providing  
486 customers with coffee, café owners and baristas should use a mug shape that conveys a message that is  
487 congruent with consumer expectations. This is important because aligning a product with consumer  
488 expectations could contribute to product purchasing behaviour. These results add to a growing body of  
489 research highlighting the associations between visual information and a product’s likely (or expected)  
490 sensory qualities.

491

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## Appendix

592 Table 3: The results of 8 separate mixed-factorial ANOVAs, one for each of the dependent variables.  
593 As these were exploratory analyses, the Holm-Bonferroni multiple-comparison correction  
594 incorporated both the number of dependent variables and the number of separate comparisons for  
595 each ANOVA (maximum critical alpha was thus  $0.05 / 8 \times 15 = 0.00042$ , see Lakens, 2016).  
596 Significant factors and interactions less than this critical alpha have been suffixed with a plus-sign.

	Factors	df	F	Sig.	Critical alpha	Partial Eta Squared	
Aroma	Country of origin	2	4.230	0.015	0.001	0.027	
	Cup diameter	1	13.778	0.000	0.000	0.044	+
	Thickness of rim	1	2.447	0.119	0.001	0.008	
	Height of cup	1	45.734	0.000	0.000	0.132	+
	Diameter * Country	2	2.110	0.123	0.001	0.014	
	Thickness * Country	2	0.245	0.783	0.005	0.002	
	Height * Country	2	0.859	0.425	0.001	0.006	
	Diameter * Thickness	1	0.420	0.518	0.002	0.001	
	Diameter * Thickness * Country	2	0.146	0.864	0.007	0.001	
	Diameter * Height	1	0.146	0.703	0.004	0.000	
	Diameter * Height * Country	2	0.777	0.461	0.001	0.005	
	Thickness * Height	1	0.041	0.840	0.006	0.000	
	Thickness * Height * Country	2	1.667	0.191	0.001	0.011	
	Diameter * Thickness * Height	1	3.804	0.052	0.001	0.012	
	Diameter * Thickness * Height * Country	2	0.206	0.814	0.005	0.001	
Bitter	Country of origin	2	2.065	0.129	0.001	0.013	
	Cup diameter	1	137.560	0.000	0.000	0.313	+
	Thickness of rim	1	0.537	0.464	0.001	0.002	
	Height of cup	1	69.037	0.000	0.000	0.186	+
	Diameter * Country	2	1.414	0.245	0.001	0.009	
	Thickness * Country	2	5.012	0.007	0.001	0.032	
	Height * Country	2	0.011	0.989	0.050	0.000	
	Diameter * Thickness	1	0.045	0.833	0.006	0.000	
	Diameter * Thickness * Country	2	0.029	0.971	0.025	0.000	

	Diameter * Height	1	3.250	0.072	0.001	0.011
	Diameter * Height * Country	2	1.991	0.138	0.001	0.013
	Thickness * Height	1	0.019	0.891	0.008	0.000
	Thickness * Height * Country	2	9.317	0.000	0.000	0.058 +
	Diameter * Thickness * Height	1	1.993	0.159	0.001	0.007
	Diameter * Thickness * Height * Country	2	1.274	0.281	0.001	0.008
Energy	Country of origin	2	7.421	0.001	0.000	0.047
	Cup diameter	1	5.521	0.019	0.001	0.018
	Thickness of rim	1	0.294	0.588	0.002	0.001
	Height of cup	1	3.831	0.051	0.001	0.013
	Diameter * Country	2	3.264	0.040	0.001	0.021
	Thickness * Country	2	0.355	0.701	0.003	0.002
	Height * Country	2	0.826	0.439	0.001	0.005
	Diameter * Thickness	1	0.006	0.937	0.017	0.000
	Diameter * Thickness * Country	2	2.571	0.078	0.001	0.017
	Diameter * Height	1	11.905	0.001	0.000	0.038
	Diameter * Height * Country	2	5.240	0.006	0.001	0.034
	Thickness * Height	1	0.507	0.477	0.001	0.002
	Thickness * Height * Country	2	0.364	0.695	0.003	0.002
	Diameter * Thickness * Height	1	0.173	0.678	0.003	0.001
	Diameter * Thickness * Height * Country	2	1.102	0.334	0.001	0.007
Temp.	Country of origin	2	12.893	0.000	0.000	0.079 +
	Cup diameter	1	5.711	0.017	0.001	0.019
	Thickness of rim	1	0.159	0.690	0.003	0.001
	Height of cup	1	0.897	0.344	0.001	0.003
	Diameter * Country	2	0.261	0.771	0.004	0.002
	Thickness * Country	2	0.361	0.697	0.003	0.002
	Height * Country	2	2.866	0.058	0.001	0.019
	Diameter * Thickness	1	0.015	0.903	0.010	0.000
	Diameter * Thickness * Country	2	0.943	0.390	0.001	0.006
	Diameter * Height	1	1.507	0.221	0.001	0.005
	Diameter * Height * Country	2	5.301	0.005	0.001	0.034
	Thickness * Height	1	1.470	0.226	0.001	0.005
	Thickness * Height * Country	2	1.296	0.275	0.001	0.009
	Diameter * Thickness * Height	1	0.441	0.507	0.002	0.001
	Diameter * Thickness * Height * Country	2	1.420	0.243	0.001	0.009
Intensity	Country of origin	2	6.369	0.002	0.000	0.040
	Cup diameter	1	110.671	0.000	0.000	0.268 +
	Thickness of rim	1	6.276	0.013	0.001	0.020

	Height of cup	1	81.507	0.000	0.000	0.213	+
	Diameter * Country	2	2.987	0.052	0.001	0.019	
	Thickness * Country	2	0.699	0.498	0.002	0.005	
	Height * Country	2	0.742	0.477	0.001	0.005	
	Diameter * Thickness	1	4.662	0.032	0.001	0.015	
	Diameter * Thickness * Country	2	0.914	0.402	0.001	0.006	
	Diameter * Height	1	2.589	0.109	0.001	0.008	
	Diameter * Height * Country	2	3.966	0.020	0.001	0.026	
	Thickness * Height	1	4.021	0.046	0.001	0.013	
	Thickness * Height * Country	2	0.996	0.370	0.001	0.007	
	Diameter * Thickness * Height	1	0.287	0.593	0.002	0.001	
	Diameter * Thickness * Height * Country	2	1.281	0.279	0.001	0.008	
Liking	Country of origin	2	2.900	0.057	0.001	0.019	
	Cup diameter	1	6.078	0.014	0.001	0.020	
	Thickness of rim	1	2.178	0.141	0.001	0.007	
	Height of cup	1	11.844	0.001	0.000	0.038	
	Diameter * Country	2	5.335	0.005	0.001	0.034	
	Thickness * Country	2	0.683	0.506	0.002	0.005	
	Height * Country	2	9.896	0.000	0.000	0.062	+
	Diameter * Thickness	1	0.207	0.649	0.002	0.001	
	Diameter * Thickness * Country	2	0.393	0.675	0.003	0.003	
	Diameter * Height	1	1.587	0.209	0.001	0.005	
	Diameter * Height * Country	2	0.516	0.598	0.002	0.003	
	Thickness * Height	1	1.495	0.222	0.001	0.005	
	Thickness * Height * Country	2	0.919	0.400	0.001	0.006	
	Diameter * Thickness * Height	1	1.863	0.173	0.001	0.006	
	Diameter * Thickness * Height * Country	2	0.662	0.517	0.002	0.004	
Money	Country of origin	2	6.963	0.001	0.000	0.044	
	Cup diameter	1	90.621	0.000	0.000	0.231	+
	Thickness of rim	1	0.274	0.601	0.002	0.001	
	Height of cup	1	66.102	0.000	0.000	0.180	+
	Diameter * Country	2	28.706	0.000	0.000	0.160	+
	Thickness * Country	2	1.326	0.267	0.001	0.009	
	Height * Country	2	20.040	0.000	0.000	0.117	+
	Diameter * Thickness	1	0.707	0.401	0.001	0.002	
	Diameter * Thickness * Country	2	0.132	0.877	0.007	0.001	
	Diameter * Height	1	12.828	0.000	0.000	0.041	+
	Diameter * Height * Country	2	2.620	0.074	0.001	0.017	
	Thickness * Height	1	2.317	0.129	0.001	0.008	
	Thickness * Height * Country	2	0.668	0.514	0.002	0.004	



	Diameter * Thickness * Height	1	5.390	0.021	0.001	0.018
	Diameter * Thickness * Height *					
	Country	2	1.859	0.158	0.001	0.012
Sweet	Country of origin	2	6.348	0.002	0.001	0.040
	Cup diameter	1	33.552	0.000	0.000	0.100 +
	Thickness of rim	1	0.470	0.493	0.002	0.002
	Height of cup	1	2.457	0.118	0.001	0.008
	Diameter * Country	2	6.715	0.001	0.000	0.043
	Thickness * Country	2	0.551	0.577	0.002	0.004
	Height * Country	2	4.568	0.011	0.001	0.029
	Diameter * Thickness	1	2.325	0.128	0.001	0.008
	Diameter * Thickness * Country	2	1.985	0.139	0.001	0.013
	Diameter * Height	1	7.687	0.006	0.001	0.025
	Diameter * Height * Country	2	4.289	0.015	0.001	0.028
	Thickness * Height	1	3.707	0.055	0.001	0.012
	Thickness * Height * Country	2	0.095	0.910	0.013	0.001
	Diameter * Thickness * Height	1	2.380	0.124	0.001	0.008
	Diameter * Thickness * Height *					
	Country	2	0.755	0.471	0.001	0.005

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599 **Highlights**

- 600       • Shape-taste expectations elicited by pictures of mugs were examined.  
601       • The relevant research about crossmodal associations is highlighted and reviewed.  
602       • The width and height of the mugs was shown to be important.  
603       • Findings highlight the complex nature of shape-flavour interactions.  
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