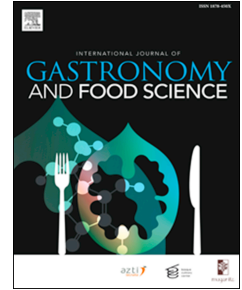


# Journal Pre-proof

Determining the appropriate location for consuming Korean rice wine (*makgeolli*) in New Zealand

Barry Wong, Megan Phillips, Rothman Kam



PII: S1878-450X(24)00074-X

DOI: <https://doi.org/10.1016/j.ijgfs.2024.100941>

Reference: IJGFS 100941

To appear in: *International Journal of Gastronomy and Food Science*

Received Date: 29 February 2024

Revised Date: 11 April 2024

Accepted Date: 14 April 2024

Please cite this article as: Wong, B., Phillips, M., Kam, R., Determining the appropriate location for consuming Korean rice wine (*makgeolli*) in New Zealand, *International Journal of Gastronomy and Food Science*, <https://doi.org/10.1016/j.ijgfs.2024.100941>.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2024 Published by Elsevier B.V.

# 1 **Determining the appropriate location for consuming Korean rice** 2 **wine (*makgeolli*) in New Zealand**

3

4 Barry Wong<sup>1</sup>, Megan Phillips<sup>2\*</sup> and Rothman Kam<sup>1</sup>5 <sup>1</sup>Department of Food Science and Microbiology, Faculty of Health and Environmental

6 Sciences, Auckland University of Technology, Private Bag 92006, Auckland 1142, New

7 Zealand

8 <sup>2</sup>Department of Marketing and International Business, School of Business, Auckland

9 University of Technology, Auckland, New Zealand

10 \*Corresponding author. Email: Megan.Phillips@aut.ac.nz

11

12

13

## 14 **Highlights:**

- 15 • *Makgeolli* was examined in different scenarios and environmental contexts.
- 16 • Study 1 used evoked context method for providing different scenarios to subjects.
- 17 • Study 2 compared subjects' sensory behaviour and perception between CLT and HUT.
- 18 • Appropriateness was an important factor for *makgeolli* consumption.
- 19 • Asian restaurant was most appropriate location to consume *makgeolli*.

20

21

22

## 23 **Abstract**

24           This study examined the relationships in how different environments affect the  
25 subjects' attitudes, behavior, and perception while consuming Korean rice wine (*makgeolli*)  
26 in New Zealand. Two studies were conducted in the Auckland metropolitan area. Study 1 (n =  
27 60) was carried out in a laboratory setting using the evoked context method to simulate a  
28 context scenario. The context scenario includes consuming a beverage at home with friends,  
29 at an Asian restaurant, and no context with n = 20 in each scenario. For Study 2 (n = 113),  
30 subjects evaluated the *makgeolli* sample in three natural environments. These natural  
31 environments include home (n = 48), a local Asian restaurant (n = 30), and the Food Science  
32 Laboratory (n = 35). Mood was evaluated before and after the experiment using the Bond-  
33 Lader scale, while emotions were evaluated using the Check-All-That-Apply method on  
34 specific terms. From both studies, context appropriateness indicated that the Asian restaurant  
35 was an appropriate location to consume *makgeolli*. For emotions, it was evident that there  
36 was a positive association between context appropriateness and positive emotional terms such  
37 as *energetic* and *excited* for Asian restaurant for both studies. In terms of flavor and taste  
38 perception, there were differences between the studies, this may suggest that subjects may be  
39 hypersensitive in laboratory settings while evaluating *makgeolli*. Overall liking was not  
40 affected by the different scenarios or environmental contexts. Therefore, context  
41 appropriateness may be an important factor in consumers' decision-making when consuming  
42 food products.

43

## 44 **Keywords:**

45 Korean rice wine, mood, emotions, environmental context, consumption appropriateness

## 46 **1. Introduction**

47

48 Korean rice wine, known as *makgeolli*, is a relatively new product in Western  
49 markets, originating from the Korean peninsula. From 2019 to 2020, the number of registered  
50 *makgeolli* companies in South Korea increased from 931 to 961 (Lee & Lves, 2022) with the  
51 largest *makgeolli* exporter reporting sales worth \$10 million in 2022 (Yang, 2023). This surge  
52 in commercial interest has led to the introduction of new *makgeolli* products in Western  
53 markets (Watman, 2023). In addition to commercial interest, research has shown *makgeolli*  
54 has good sources of nutrition such as vitamins (specifically vitamins B and C), organic acids  
55 (specifically succinic acid and pyruvic acid), and amino acids (specifically proline) (Nile,  
56 2015; Wong et al., 2023a).

57 The taste of *makgeolli* is often described as being sour with floral and fruity flavors  
58 (Lee & Lee, 2008). Overall liking of Korean rice wine including *makgeolli* is correlated with  
59 sweetness while negatively correlated with yeasty flavor characteristics (Kwak et al., 2015).  
60 Research on Korean rice wine (especially *makgeolli*) in Western societies such as New  
61 Zealand is relatively limited. Although prior research shows overall liking in American  
62 consumers (Kwak et al., 2015) and differing sensory perception in New Zealand subjects  
63 (Wong et al., 2023b), both studies were conducted in laboratories where the findings may not  
64 be transferrable to natural consumption settings such as restaurants and at home.

65 Acceptance tests are usually conducted in sensory laboratories under a controlled  
66 environment where all factors are held constant to avoid bias (Boutrolle et al., 2005).  
67 However, researchers have also criticized this practice as it is not realistic and does not mirror  
68 how consumers eat or drink. Other eating events such as feelings, emotions, and activities are  
69 referred to as the consumption context which is often ignored in sensory evaluation (Jaeger &  
70 Porcherot, 2017). Meiselman (1996) mentions there are three broad aspects of an eating event

71 where (1) the food often includes aspects such as culinary tradition and culture (e.g.,  
72 packaging, naming, and also labelling), (2) people interact with the social and physical  
73 environment, and (3) consumers have food preferences, different food attitudes, and  
74 consumption patterns. Köster (2003) commented that sensory evaluation falls into the  
75 problem of situational fallacy where food is evaluated in the absence of a situational context.  
76 Köster (2003) further stated that food products are rarely consumed in isolation or various  
77 types of food are all consumed within one setting. Therefore, consumption context should be  
78 considered to increase context validity in sensory evaluation and consumer research.

79 One approach is to conduct the sensory evaluation in natural environments where  
80 consumers are likely to use the product. For example, Danner et al. (2020); Danner et al. (2016)  
81 compared different locations such as homes, restaurants, and the sensory laboratory and  
82 Holthuysen et al. (2017) examined the sensory differences of aeroplane meals between the  
83 laboratory, re-created environment (e.g., immersive environment), and aeroplane environment.  
84 Alternatively, to counter the situational fallacy problem, researchers have created different  
85 consumption context methods to incorporate in their sensory evaluation in the sensory  
86 laboratory. Examples include virtual reality, immersive environment, and evoked context.  
87 Virtual reality uses technology to stimulate environments that are similar to the real world while  
88 sensory evaluation is carried out (Torricco et al., 2020). For an immersive environment,  
89 researchers use visual, auditory, and olfactory cues to represent similar real-life situations in  
90 the laboratory setting (Sinesio et al., 2019). However, not all institutions or companies can  
91 provide an immersive environment during sensory evaluation due to cost and resource  
92 constraints. A possible alternative to virtual reality and immersive environments is evoked  
93 context. Evoked context was first systematically introduced into food literature by Hein et al.  
94 (2010). Unlike immersive environments, physical objects or virtual reality headsets are not  
95 required, evoked context uses participants' experiences and imagination during sensory

96 evaluation. Experiments with evoked context include dry-cured ham (Hersleth et al., 2015),  
97 packaged lamb meat (de Andrade et al., 2016), fruit juices (Hein et al., 2010, 2012; Lusk et al.,  
98 2015), and beer (Dorado et al., 2016; Nijman et al., 2019).

99         This research aims to determine which consumption environment (e.g., Asian restaurant  
100 or home environment) is the most appropriate place to consume *makgeolli* in New Zealand.  
101 The study was conducted in two parts. The first study (referred to as Study 1) was conducted  
102 entirely in a sensory laboratory setting using simulated environmental scenarios. The second  
103 study (referred to as Study 2) was conducted in three natural environments including an Asian  
104 restaurant, home, and the food science laboratory. Changes in mood and emotions, overall  
105 liking, and appropriateness of consuming *makgeolli* were measured in both studies. Mood is  
106 defined as a long-lasting psychological arousal state that affects the energy, tension, and  
107 pleasure of the individual (Köster & Mojet, 2015) while emotions are responses towards a  
108 specific situation and are short lasting while the mood is non-specific and require gradual build-  
109 up over time (Meiselman, 2015). This article plans to fulfil three objectives: (1) establish the  
110 most appropriate consumer environment to consume *makgeolli* in New Zealand, (2) identify  
111 whether subjects will experience mood/emotional changes in each environmental setting while  
112 consuming *makgeolli*, and (3) determine whether evoked context scenarios or different  
113 environments change sensory perception among the subjects.

114

## 115 **2. Materials and methods**

### 116 **2.1. Makgeolli sample**

117         The *makgeolli* processing methods were first identified from scientific literature and  
118 later categorized into four main processing methods by Wong et al. (2023a).

119 Physicochemical, taste, flavor, and volatile compounds were previously investigated by Wong

120 et al. (2023a); Wong et al. (2023b); Wong et al. (2024) to identify differences between the  
121 *makgeolli* samples. For this research, a single *makgeolli* sample was used across both studies.  
122 This sample, which underwent two-stage fermentation (2SF), was chosen as it received the  
123 highest-rating among the four different processing methods identified by Wong et al. (2023a).  
124 Additionally, it was the most preferred *makgeolli* sample compared to other wine and  
125 *makgeolli* products (Wong et al., 2024). All *makgeolli* samples used in Study 1 and Study 2  
126 were prepared in the Food Science Laboratory of Auckland University of Technology, and all  
127 materials were purchased from the Auckland CBD area.

128 Two-stage fermented *makgeolli* (2SF) is a process involving two stages, where a  
129 fermentation base is initially produced by fermenting non-glutinous rice with *nuruk*, a  
130 traditional Korean fermentation starter. This base is then combined with the glutinous rice for  
131 further fermentation. To create the fermentation base, the researcher washed 400 g of non-  
132 glutinous rice (Wang Ltd., Korea) with deionized (DI) water until the water ran clear  
133 (approximately 10 min of continuous washing), soaked for 3 h, and then drained for 1 h. The  
134 soaked rice was pulverized into smaller particles such as rice powder using a blender (Russell  
135 Hobbs, UK). The rice powder was then cooked for 15 min with 1.25 L of DI water, cooled to  
136 25°C, and mixed with 200 g of ground *nuruk* (Wang Ltd., Korea). The mixture was left to  
137 ferment at 25°C for 1 day, then filtered. One liter of the resulting fermentation base was  
138 added to the glutinous rice for the second phase.

139 In the second phase, 2 kg of glutinous rice (Wang Ltd, Korea) were washed with  
140 deionized (DI) water until the water ran clear (approximately 10 min of continuous washing),  
141 soaked for 3 h, and drained for 1 h. The soaked rice was steamed for 120 min, cooled to  
142 25°C, and combined with 1 L of fermentation base and 1.5 L of DI water. The mixture was  
143 fermented in vessels for 7 days at 25°C.

144 After fermentation, the 2SF makgeolli was filtered to remove the rice wine mash, and the  
145 remaining liquid was stored in amber-colored bottles in a 4°C refrigerator until used for  
146 sensory evaluation. Samples stored for more than two weeks were discarded and not used for  
147 sensory evaluation. **Figure 1** demonstrates the process of pouring the fermentation base into  
148 the cooled glutinous rice, while **Figure 2** illustrates the appearance of the resulting  
149 2SF *makgeolli*.

150

## 151 2.2. Study protocol

152 Advertisements for both studies were carried out on social media such as Facebook,  
153 and posters/flyers around the AUT University student announcement walls. Subjects from  
154 both studies were recruited from the Auckland Metropolitan area and were screened for the  
155 following the same criteria set out by Wong et al. (2023a) and Wong et al. (2023b). Subjects  
156 must satisfy the following criteria to participate in the studies: (1) the subject does not suffer  
157 from food allergies such as wheat, rice, and alcohol, (2) the subject is not pregnant or trying  
158 to conceive a child, (3) not operating heavy machinery or driving within 2 h after completing  
159 the sensory evaluation and lastly (4) the subject must be at least 18 years of age or over to  
160 take part in the sensory evaluation (the legal age of consuming alcohol in New Zealand).  
161 Both studies were approved by the AUT Ethics Committee, and the application number is  
162 19/241.

163 Study 1 differed from Study 2 where subjects were required to write a statement  
164 based on a specific context such as '*afternoon at home friends for a drink*' (referred to as  
165 home), '*at an Asian restaurant*' (referred to as Asian restaurant), or no context (e.g., a typical  
166 laboratory environment). Study 1 used the sensory evaluation method called evoked context  
167 (Hein et al., 2010) while Study 2 used real environments including a local Asian restaurant

168 (Faro, Auckland CBD), the subject's home, and the Food Science Laboratory at AUT City  
169 campus.

170

### 171 **2.3. Questionnaire, scale, and sociodemographic**

172 The general structure of the questionnaire was as follows: subjects were asked to rate  
173 their mood baseline using the Bond-Lader scale (1), evoked context page for subjects to write  
174 their thoughts (Study 1 only) (2), consume the *makgeolli* sample and rate the overall liking on  
175 9-point hedonic category scale, JAR questions regarding taste, flavor, and appearance of the  
176 *makgeolli* sample (3), check or circle the emotional terms that best describe their feeling  
177 when drinking *makgeolli* using the BE survey (4), Bond-Lader scale to measure the effects of  
178 consuming the *makgeolli* sample in the specified scenario or environment (5), specific  
179 questions about the environmental context such as appropriateness and accuracy of the  
180 information given (6), need for uniqueness (short version) (7) and lastly, sociodemographic  
181 questions (8). The survey questions were all randomized within their specific section to  
182 reduce the first-order effect.

183 The Bond-Lader scale was used in both studies as a measure of mood changes before  
184 and after consuming the *makgeolli* sample. Sixteen bi-polar 100 mm line scale questions were  
185 presented before the experiments took place and after answering questions regarding overall  
186 liking, seven JAR questions, and the subject's emotional state in both studies.

187 A 9-point hedonic category scale labelled from '*dislike extremely*' to '*like extremely*'  
188 was used to determine the overall liking of the *makgeolli* sample. Context appropriateness,  
189 compelled something to drink, the vividness of environmental context (Study 1 only), ease of  
190 rating their overall liking based on environment, and the accuracy of the information given  
191 were also examined on a 9-point category scale for both studies and will be referred to as

192 environmental context questions. Most of the environmental context questions are inspired by  
193 Hein et al. (2010, 2012) apart from willingness to consume, willingness to pay, and likelihood  
194 of purchase. The context question reads: ‘*To what extent did this sensory experiment compel*  
195 *you to desire something to drink?*’ (1 = ‘not at all compelled’, 9 = ‘very compelled’) for  
196 compelled something to drink, ‘*While you taste the rice wine sample, how vivid in your mind*  
197 *was the occasion you imagined?*’ (1 = ‘not at all vivid, 9 = ‘very vivid’) for vividness of  
198 environmental context (Hein et al., 2012). ‘*How easy/difficult did you find it to rate your*  
199 *liking/dislike of the rice wine drink?*’ (1 = ‘very difficult’, 9 = very easy) for ease of rating  
200 their overall liking based on environment, ‘*To what extent do you feel that the liking*  
201 *information you have given is accurate?*’ (1 = ‘not at all accurate’, 9 = ‘very accurate’) are  
202 questions designed to measure the suitability of the environmental context (Hein et al., 2012).  
203 “*To what extent do you feel appropriate to drink rice wine in this environment?*” (1 = ‘not at  
204 all appropriate’, 9 = ‘very appropriate’) for context appropriateness while consuming the  
205 *makgeolli*. Additional questions such as ‘*How willing are you going to consume this*  
206 *product?*’ (1 = ‘not at all willing, 9 = ‘very much willing’), ‘*How likely are you going to buy*  
207 *this product?*’ (1 = ‘not at all likely’, 9 = ‘very much likely’), and ‘*How much are you willing*  
208 *to pay for this product in a 750 ml (normal wine bottle)?*’ subjects need to fill in the blank  
209 ‘ \_\_\_ NZD per 750 ml normal wine bottle’.

210 The JAR scale was used in both studies to understand the intensity of the *makgeolli*  
211 while being consumed in different contextual environments. Like Wong et al. (2023b), seven  
212 attributes including sweetness, sourness, astringency, color, alcohol strength, fruitiness, and  
213 smoothness were examined on a 5-point JAR scale (1 = *Not enough*, 3 = *Just about right*, 5 =  
214 *Too much*). Subjects were encouraged to ask the researcher if they did not understand the  
215 terms.

216 The beverage emotional (BE) survey designed by Silva et al. (2016) was used in both  
217 studies because this survey has been used in different beverages such as beer, wine, and non-  
218 alcoholic beverages. The survey consists of 19 terms: *adventurous, amused, calm, comforted,*  
219 *curious, disappointed, energetic, excited, exuberant, free, friendly, good, grumpy, happy,*  
220 *joyful, pleased, relaxed, restless, and sad* which was identified by van Zyl (2016). Subjects  
221 marked the emotions that they perceived using the Check-All-That-Apply method.

222 The need for uniqueness is a measure of the consumers' desire to pursue differences  
223 between individuals via consumption to develop a distinctive shelf and social image (Tian et  
224 al., 2001). Both studies use the short version of the Consumers' Need for Uniqueness  
225 (CNFU) questionnaire designed by (Ruvio et al., 2008) which consists of three dimensions:  
226 creative choice, unpopular choice, and avoidance of similarity measured on a 7-point  
227 category scale (1 = disagree extremely; 7 = agree extremely). CNFU information will be  
228 shown as the total sum for each study under section 2.6 Subjects of Study 1 and Study 2.

229

## 230 **2.4. Study 1 experimental design and procedure**

231 Study 1 was a laboratory experiment whereby participants were randomly assigned to  
232 one of three evoked contexts (evoked context: afternoon drinks with friends, Asian restaurant,  
233 or none) in a between-subjects design while consuming *makgeolli*. The evoked context was  
234 used to simulate real-life experiences that subjects have while consuming alcoholic  
235 beverages. Two written scenarios were developed for this sensory experiment including at  
236 home with friends, and at an Asian restaurant. The first evoked context was *afternoon drinks*  
237 *with friend(s)* where subjects were presented with the statement "*Think about an occasion*  
238 *when you are at home with friends having an afternoon drink. Clearly imagine you are*  
239 *experiencing this occasion. Now write a detailed description of the occasion that you are*

240 *imagining.*” The second statement was *Asian restaurant context* where consumers were  
241 presented with “*Think about an occasion when you are at an Asian restaurant, and you are*  
242 *having a sip of your drink. Clearly imagine you are experiencing this occasion. Now write a*  
243 *detailed description of the occasion that you are imagining.*” Throughout the experiment,  
244 subjects were reminded of the specific scenario by having to read the same evoked context  
245 statement on each questionnaire page. The third condition was no context, where the  
246 experiment was carried out without written statements.

247 Study 1 took place in the Marketing Sensory Laboratory at the AUT city campus with  
248 the temperature set at 22 °C and white fluorescent light was used. Before the experiment took  
249 place, a researcher explained the nature and purpose of the experiment and the processes of  
250 the questionnaire. One *makgeolli* sample was presented when the subject completed the  
251 specific question (e.g., after writing the evoked context or finishing the Bond-Lader scale  
252 questions for no context) and indicated to the researcher that they were ready to consume the  
253 sample. Subjects were allowed to request more *makgeolli* samples, and water and crackers  
254 were provided as palate cleansers but were not mandatory for the subjects to consume. All  
255 *makgeolli* samples for Study 1 were prepared at least 2 h before the experiment took place, 40  
256 ml was measured and placed in a transparent 60 ml plastic vessel with a lid. All the *makgeolli*  
257 samples were stored in the refrigerator at 4 °C before the experiment took place.

258

## 259 **2.5. Study 2 experimental design and procedure**

260 Study 2 was a field experiment conducted in three environments including an Asian  
261 restaurant, the subject’s home, and the Food Science Laboratory in Auckland, New Zealand.  
262 Subjects were recruited from the wider community and invited to consume *makgeolli* in one

263 of the three environmental contexts. Criteria for the subject's selection were consistent with  
264 Study 1.

265 The Asian restaurant, situated in Auckland's CBD area (see **Figure 3**), was chosen as  
266 the venue for the experiment. The experiment was conducted on a Tuesday and Wednesday  
267 between 17:30 and 19:30 in May 2023, as this was the least disruptive time for the restaurant.  
268 During this time frame, a researcher approached diners who had been seated by the restaurant  
269 staff and placed their orders to see if they would like to participate in the study. Those who  
270 agreed were given a 'sensory pack' containing a 40 ml *makgeolli* sample, sensory  
271 questionnaire, consent form, information sheet, pen, and set of instructions. The researcher  
272 introduced the research project and informed diners they would receive NZD 15.00  
273 compensation per a person for participating and completing the questionnaire while  
274 consuming the *makgeolli*. Once the participant information sheet and consent form had been  
275 read and signed, participants were asked to consume the *makgeolli* sample while answering  
276 the questionnaire. Subjects were encouraged to complete the experiment before starting their  
277 meal and were given the option to do so either individually or with company.

278 For the Food Science Laboratory, located in Auckland, New Zealand, the experiment  
279 took place between 11:00 and 15:00 during university opening hours. The temperature was  
280 set to 22.0 °C and white fluorescent light was used in the Food Science Laboratory. Subjects  
281 were given the same sensory pack as in the Asian restaurant condition, and similar procedures  
282 were followed.

283 In the home environment, there were no restrictions on when subjects could complete  
284 the experiment or whether they needed to do it alone or with company. It was recommended  
285 that subjects complete the experiment in the most natural state possible, however, the  
286 experiment must be completed in the subject's home environment. Subjects received the

287 same sensory pack used in other environmental conditions, and similar procedures were  
288 followed. To maintain consistency, subjects were instructed to store the *makgeolli* sample in  
289 the refrigerator at approximately 4.0 °C before the experiment. They collected the sensory  
290 pack between 10:00 and 16:00 on a weekday during the University's open hours.  
291 Arrangements for both collection and drop off of the sensory pack were made in advance  
292 between the subjects and researcher via email or phone message.

293

## 294 **2.6. Subjects of Study 1 and Study 2**

295 Both Study 1 and Study 2 used convenience sampling within Auckland CBD, New  
296 Zealand. Apart from Study 2 in the Asian restaurant environment where diners were  
297 approached by the researcher and asked to participate in the sensory evaluation, Study 1 and  
298 most of Study 2 were conducted on a pre-arranged basis with the researcher. A general  
299 description of the subjects is presented in **Table 1**. In total, 60 subjects (24 female, 35 males,  
300 and 1 not recorded) participated in Study 1 with 20 subjects in each evoked context scenario.  
301 Around 51.6% of subjects were aged between 18 to 29, with one subject age bracket not  
302 being recorded. Sixty-one percent of the subjects consumed alcoholic beverages at least once  
303 a week or more and 51.7% of subjects consumed rice more than once a week. In terms of  
304 ethnicity, researchers used the self-prioritization method as part of the sociodemographic  
305 question regarding the subject's ethnicity (Kukutai & Callister, 2009). Subjects are asked to  
306 only select one ethnic group that they strongly associate themselves with. For ease of  
307 interpretation, some ethnic groups were categorized together. New Zealand Europeans are  
308 defined as individuals who have strong affiliation with New Zealand such as citizenship or  
309 cultural identity with European ancestry.

310 For Study 2, 30 subjects took part in the local Asian restaurant, 35 subjects in the  
311 Food Science Laboratory, and 48 participated in the home environment. Like Study 1, the  
312 self-prioritization method was used in the sociodemographic questions to determine the  
313 subjects' ethnic affiliation. The largest ethnic group category identified in Study 2 was East  
314 Asian (49.6%) consisting of subjects with Chinese, Korean, Filipino, Thai, Vietnamese, and  
315 Taiwanese backgrounds followed by New Zealand Europeans (20.4%).

316 For Consumer's Need for Uniqueness, the overall mean of the three dimensions for  
317 Study 1 includes creative choice ( $4.38 \pm 1.37$ ), unpopular choice ( $3.68 \pm 1.58$ ), and avoidance  
318 of similarity ( $3.18 \pm 1.39$ ). The overall mean of the three dimensions for Study 2 is  $4.01 \pm$   
319  $1.33$  for creative choice,  $3.31 \pm 1.52$  for unpopular choice, and  $3.07 \pm 1.59$  for avoidance of  
320 similarity on a 7-point scale.

321

## 322 **2.7. Statistical analysis**

323 For Study 1, the Shapiro-Wilk test was used to identify whether parametric tests were  
324 appropriate for significant testing for the environmental questions. When statistical  
325 significance was reached for the Shapiro-Wilk test ( $p \leq 0.05$ ), alternative non-parametric  
326 statistics were used e.g., the Kruskal-Wallis  $\chi^2$  test. When statistical significance was reached,  
327 the Mann-Whitney U test was used as a post hoc test, a non-parametric version of the  
328 Student's t-test.

329 For Study 2, environmental questions were analyzed using a one-way analysis of  
330 variance (ANOVA) with the  $p$ -value set at 0.05 for statistical significance. When statistical  
331 significance was reported, a post hoc test was performed to identify the degree of difference  
332 between the natural environment conditions using Tukey's Honestly Significance Difference  
333 test.

334 From the recommendations by Bond and Lader (1974), Bond-Lader scale bipolar  
335 attributes were grouped into three categories: alertness, contentedness, and calmness. Paired  
336 Student's t-test was used to compare consumers before and after completing the experiment  
337 and alpha was set at  $p \leq 0.05$ . For analyzing the BE survey, Pearson's  $\chi^2$  test was chosen as  
338 the information was presented as count data and statistical significance was reached with  
339 alpha set at  $p < 0.05$ . Cochran's Q test was not used as subjects only attended to one  
340 environment context and subjects only consumed one 2SF *makgeolli* sample, therefore, it was  
341 considered inappropriate to employ this analysis. For JAR questions, the SensMineR  
342 package was used to determine the penalty score and  $p$ -value of the specific sensory attributes  
343 signalled by subjects while consuming *makgeolli* in different environmental settings (Le &  
344 Husson, 2008). All data were analysed using R version 4.2.0.

345 A prior power analysis was conducted using G\*Power version 3.1.9.7 for both Study  
346 1 and Study 2 to determine the minimum sample size required for hypothesis testing (Faul et  
347 al., 2007). Results indicated the required sample size to achieve 80% power for detecting a  
348 large effect, a significance criterion of  $\alpha = 0.05$ , was  $n = 66$  for a one-way ANOVA test.  
349 Previous research by Wu et al. (2022) showed that different consumer environments strongly  
350 affect our sensory perception, therefore effect size was set at large. Sixty subjects participated  
351 in Study 1 and 113 subjects participated in Study 2. Post hoc power analysis was conducted  
352 due to the low subject participation in Study 1, the power was calculated to be 0.776.  
353 Additionally, Cohen's  $d$  value was calculated for each context interaction with mood and  
354 environmental questions that reached statistical significance for Study 1 and Study 2. When  
355 appropriate, epsilon squared ( $\epsilon^2$ ) statistics were employed to determine the effect size in  
356 Study 1.

357

### 358 3. Study 1: Results and Discussion

359 **Table 2** is a verbatim example of a written description from subjects who participated  
360 in Study 1. Each column represents a specific evoked context such as home (left column) and  
361 Asian restaurant (right column). Examples were selected at random from subjects #4, #5, and  
362 #7 for both specific evoked contexts. Subjects that were allocated to the Asian restaurant  
363 context noted a lot of celebrations with friends while answering the evoked context question.  
364 The variety of Asian restaurants mentioned by subjects include Japanese, Thai, and also  
365 Korean cuisines. The written description of the specific evoked contexts was not analyzed  
366 further for Study 1.

367 Kruskal-Wallis  $\chi^2$  test was selected to analyze the environmental context questions as  
368 the Shapiro-Wilk normality test showed that all environmental context questions reached  
369 statistical significance at  $p < 0.05$ . From the Kruskal-Wallis  $\chi^2$  test, only context  
370 appropriateness was statistically significant ( $\chi^2$  test = 6.78;  $p$ -value = 0.03). The effect size  
371 was measured using epsilon squared ( $\epsilon^2$ ) statistics, the  $\epsilon^2 = 0.115$  which indicates that the  
372 effect size was moderate. Mann-Whitney U test was used to determine the differences  
373 between the different evoked context scenarios. The mean score with standard deviation for  
374 Asian Restaurant is  $8.00 \pm 1.26$ , followed by home ( $6.85 \pm 2.13$ ) and no context ( $6.35 \pm$   
375  $2.10$ ). Asian Restaurant was statistically significant compared to home and no context, while  
376 no statistical difference was observed between home and no context. Based on the  
377 information acquired from the subjects present in Study 1, shows that Asian Restaurant was  
378 the most appropriate evoked context scenario to consume *makgeolli*. This finding was not  
379 surprising as *makgeolli* is not a common alcoholic beverage in the New Zealand market and  
380 the Asian restaurant context provides a sense of where the product is from. Statistical  
381 significance was not reached for overall liking in *makgeolli* between the different scenarios,  
382 showing similar results in the literature (Danner et al., 2016). **Table 3** shows the mean score

383 and standard deviation with the  $p$ -value of the environmental questions observed in Study 1  
384 only. Results of the environmental context questions for Study 2 are displayed in **Table 4** due  
385 to Study 2 using parametric statistics (e.g., one-way ANOVA) compared to non-parametric  
386 statistics such as the Kruskal-Wallis  $\chi^2$  test for testing statistical significance in Study 1.

387 **Table 5** shows the mean mood changes of alertness, contentedness, and calmness  
388 before and after consuming *makgeolli* in the evoked context environments including Asian  
389 restaurant, home, and no context for Study 1. No difference in the change of mood (e.g.,  
390 alertness, contentedness, and calmness) is observed in the Asian restaurant environment,  
391 however, statistical significance in mood changes is observed for the home environment and  
392 no context. Specifically, for the home environment scenario, the key mood that reached  
393 statistical significance was alertness ( $t$ -value = 3.67;  $p$ -value = 0.002) with a mood change of  
394 +14.20 points. This observation from subjects was expected, as alertness is often associated  
395 with mental clarity, improvement in attention and faster reaction time. The increase of 14.20  
396 points shows that subjects were less alert, therefore, the consumption of alcoholic beverages  
397 reduced the subject's alertness to be less attentive, energetic, and clear-headedness (Smith,  
398 2013). The effect size was measured using Cohen's  $d$ , for alertness and in the home  
399 environment scenario was  $d = 0.96$  indicating the effect size was large. For no context, the  
400 key mood that reached statistical significance was contentedness ( $t$ -value = -6.832;  $p$ -value =  
401 <0.001) with a mood change of -12.86. The negative change from the baseline of  
402 contentedness for no context subjects indicates that subjects were more content (e.g., happy)  
403 after consuming *makgeolli*. Smith (2013) observed similar findings as subjects indicated that  
404 their hedonic tone increased over time as the subjects consumed alcoholic beverages along  
405 with reduced anxiety. In comparison with the home environment scenario and alertness, the  
406 effect size was moderate according to Cohen's  $d$  for no context and contentedness ( $d = 0.70$ ).

407 All  $\chi^2$  values and  $p$ -values for each emotional term are displayed in **Table 6** for both  
408 Study 1 and Study 2. Of the emotional terms selected by subjects in Study 1 between the  
409 three evoked context scenarios, three emotional terms reached statistical significance  
410 including *comforted* ( $\chi^2$ -value = 6.45,  $p$ -value = 0.04), *curious* ( $\chi^2$ -value = 13.75,  $p$ -value =  
411 0.001), *energetic* ( $\chi^2$ -value = 6.89,  $p$ -value = 0.03) and *free* ( $\chi^2$ -value = 11.85,  $p$ -value =  
412 0.003). Fifty-five percent of subjects selected *comforted* in the home context, while 25% of  
413 subjects selected *comforted* in the Asian restaurant context followed by 20% of subjects  
414 selecting this emotion term in no context. Interestingly, 85% of subjects selected *curious* in  
415 no context while consuming the *makgeolli* sample, followed by 40% of subjects who selected  
416 this emotional term in Asian restaurant and 30% of subjects who selected this term in the  
417 home context. For *energetic*, 40% of subjects in the Asian restaurant context selected this  
418 emotional term while no context had 25% of subjects and 5% of subjects in the home context  
419 selected this term. For the emotional term for *free*, both home context and Asian restaurant  
420 context had 55% and 40% of subjects selected this term respectively.

421 From the observations of Study 1, there seems to be a correlational relationship  
422 between environmental appropriateness and the emotional terms selected while consuming  
423 *makgeolli*. Piqueras-Fizman and Jaeger (2014) observed that context appropriateness was an  
424 important aspect of food-emotional research as participants selected more negative terms  
425 when there was a mismatch between the food investigated (e.g., chocolate brownie) and the  
426 context during consumption (e.g., breakfast, lunch, or dinner). Interestingly, the three  
427 emotional terms (e.g., *comforted*, *curious*, and *free*) that reached statistical significance are  
428 positive terms and negative emotional terms such as *disappointed*, *grumpy*, and *sad* were  
429 hardly selected. Study 1 shows similar findings from previously published work that subjects  
430 tend to select more positive emotional terms in food-related emotional research than negative

431 terms (Danner et al., 2016; Desmet & Schifferstein, 2008; King & Meiselman, 2010a; King et  
432 al., 2010b).

433 **Table 7** shows the penalty analysis for both Study 1 and Study 2. Overall, four  
434 attributes were identified as either being too-much or not-enough influencing the low hedonic  
435 score of the overall liking of *makgeolli* in all three evoked context scenarios including Asian  
436 restaurant, home, and no context in Study 1. The highest penalty score in Study 1 was  
437 sweetness being not-enough with an overall score of  $2.11 \pm 0.48$ , indicating some  
438 reformulation is required to increase the overall liking of *makgeolli* among New Zealand  
439 subjects. Kwak et al. (2015) showed that there is a correlation between sweetness and overall  
440 liking of Korean rice wine in the United States and Wong et al. (2023a) showed subjects  
441 having a higher liking of *makgeolli* with a higher concentration of sugars such as maltose and  
442 glucose. To increase the hedonic score of *makgeolli* in Western markets, it would be  
443 advantageous for manufacturers to reformulate *makgeolli* with higher sweetness such as  
444 increasing the sugar content in the final product. Around 25% of subjects noted that  
445 smoothness of *makgeolli* was not-enough with a penalty score of  $1.58 \pm 0.57$ . In terms of  
446 sourness, subjects in Study 1 cited that sourness was too much with a penalty score of  $1.18 \pm$   
447  $0.47$ , reformulation of *makgeolli* should be considered to optimize the overall hedonic score.  
448 Sourness in Korean rice wine tends to be negatively correlated with overall liking (Kwak et  
449 al., 2015). Interestingly, subjects in Study 1 indicated that *makgeolli* had both not-enough  
450 astringency with a penalty score of  $1.76 \pm 0.62$  and too-much astringency with a penalty  
451 score of  $1.47 \pm 0.54$ . Similar to Wong et al. (2023b) findings, the differences between the  
452 perception of astringency such as either too much or not enough are likely due to the different  
453 subject groups participating in the experiment. Wong et al. (2023b) commented that a  
454 possible reason is the different cluster groups participating in their study. Four cluster groups  
455 were identified from their study, and different defining traits such as age, alcoholic

456 consumption patterns, and different degrees of subjective and objective wine knowledge were  
457 observed.

458

#### 459 **4. Study 2: Results and Discussion**

460 Statistical significance was observed for two environmental questions including  
461 appropriateness to consuming *makgeolli* ( $F$ -value = 13.03;  $p$  = <0.001) and how subjects  
462 were compelled to consume the rice wine in the specific environments ( $F$ -value = 4.12;  $p$ -  
463 value = 0.02) including Asian restaurant, home, and laboratory using one-way ANOVA in  
464 Study 2. For appropriateness, Tukey's HSD test showed both Asian restaurant ( $6.97 \pm 1.94$ )  
465 and home ( $6.96 \pm 1.43$ ) environments are not statistically significant to each other indicating  
466 both environments are appropriate for consuming *makgeolli*, however, both are statistically  
467 significant to laboratory ( $4.91 \pm 2.54$ ). The effect size was measured using Cohen's  $d$ ,  $d$  =  
468 0.993 between home and laboratory and  $d$  = 0.909 between laboratory and Asian restaurant.  
469 Both Cohen's  $d$  value indicated that the effect size was large. This finding showed similarities  
470 with Study 1 where subjects indicated that Asian restaurant and home environments were  
471 more appropriate to consume *makgeolli* than no context.

472 For the question regarding how compelled subjects were to consume rice wine, Asian  
473 restaurant ( $6.20 \pm 2.14$ ) is significantly different to home ( $4.70 \pm 2.43$ ) but not laboratory  
474 ( $4.91 \pm 2.22$ ). Cohen's  $d$  was measured to determine the effect size, and Cohen's  $d$  value  
475 indicates that the effect size was moderate with  $d$  = 0.65 between home and Asian restaurant  
476 and  $d$  = 0.58 for laboratory and Asian restaurant. Statistical significance was not observed  
477 between home and laboratory in Tukey's HSD test. Subjects in Study 2 may felt as though  
478 they were compelled to consume *makgeolli* due to external factors such as situational or the  
479 cultural setting (Köster, 2009) as the Asian restaurant is a natural environment for customers

480 to purchase and consume their meals. In terms of overall liking of consuming *makgeolli* in  
481 different environments, no statistical significance was observed in both Study 1 and Study 2.  
482 This result is consistent with other researchers as they concluded that the environment is  
483 unlikely to impact the overall liking of food products (Dorado et al., 2016; Torrico et al.,  
484 2020).

485 The only environment that observed statistical difference for mood changes was Asian  
486 restaurant, specifically in calmness from  $25.17 \pm 22.61$  to  $38.92 \pm 20.09$  with a measured  
487 change of +13.75 as shown in **Table 5**. Cohen's *d* indicates the effect size for the mood  
488 change of calmness in Asian restaurant was moderate ( $d = 0.70$ ). **Table 6** shows the  
489 emotional terms cited by subjects after consuming *makgeolli* in the three environmental  
490 contexts. From the subject's responses between Asian restaurant, home, and laboratory, only  
491 *excited* ( $\chi^2$ -value = 6.30;  $p$ -value = 0.04) and *restless* ( $\chi^2$ -value = 1.52;  $p$ -value = <0.001)  
492 were statistically significant. For *excited*, 37% of subjects cited this emotional term while  
493 consuming *makgeolli* at an Asian restaurant and 13% of subjects cited being *excited* at home.  
494 Surprisingly, 26% of subjects cited the term *excited* while consuming *makgeolli* in the  
495 laboratory environment. This finding may explain the change of mood in subjects from a  
496 calm state to a rather heightened state on the Bond-Lader mood scale.

497 For the emotional term *restless*, 40% of subjects cited this emotional term in the  
498 laboratory environment while both home and Asian restaurant were relatively low with 8%  
499 and 3% citing this term respectively. The results show that subjects were more *restless* in the  
500 laboratory environment after consuming *makgeolli* compared to Asian restaurant and home.  
501 The results on *restless* were consistent with Danner's (2016) observation as they observed  
502 that participants were more fearful/anxious while consuming red wine in the laboratory than  
503 home and restaurant. Like Study 1, Study 2 observed that environmental context  
504 appropriateness is likely to affect the consumers' emotional responses to food products

505 (Danner et al., 2016; Desmet et al., 2008; Piqueras-Fiszman et al., 2014). The positive and  
506 negative emotions are associated with the environmental appropriateness of consuming  
507 *makgeolli*. Positive emotion such as *excited* is cited more in Asian restaurant and home, while  
508 negative emotion such as *restless* is cited more in the laboratory environment.

509 **Table 7** summarizes the penalty analysis of Study 2 for the just-about-right (JAR)  
510 attributes. Four attributes including fruitiness, smoothness, sourness, and sweetness were  
511 identified as either being too-much or not-enough which likely impacted the overall hedonic  
512 rating of *makgeolli* in different environments in Study 2. The highest penalty score was not-  
513 enough fruitiness ( $1.24 \pm 0.38$ ;  $p$ -value = 0.001) followed by not-enough sweetness ( $1.14 \pm$   
514  $0.37$ ;  $p$ -value = 0.002). The results from Study 2 differed slightly from Study 1 which can be  
515 explained by the location where *makgeolli* was consumed. A possible explanation is that  
516 subjects applied more penalty scores in the laboratory than in natural environments, due to  
517 being more analytical while doing the sensory evaluation in a laboratory environment (Shi et  
518 al., 2021).

519

## 520 **5. General discussion and limitations**

521 This research extends our understanding of *makgeolli* and investigates whether  
522 different environmental contexts change the overall acceptance (e.g., overall liking) of  
523 *makgeolli* and whether there is a more appropriate location to consume *makgeolli*. From  
524 Study 1 and Study 2, measurable attribute differences such as consumption appropriateness,  
525 mood, emotions, taste, and flavor were observed in different evoked context scenarios and  
526 environments. The findings from both studies somewhat suggest that consumption  
527 appropriateness may play an important role in food decision or selection rather than the  
528 subjects' overall liking of the food product. The emotional and mood differences between

529 evoked context scenarios and environments were not surprising in both studies, as previous  
530 studies show that perceived physical environments impact the individual's emotions which  
531 subsequently affects their behavior (Liu & Jang, 2009; Ryu & Jang, 2007). Mehrabian and  
532 Russell (1974) state that emotions can be characterized into three states (e.g., pleasure,  
533 arousal, and dominance) and this determines the individuals' approach or avoidance  
534 responses within the environment. Both studies demonstrate mood and emotion changes in  
535 some environments. Most notably mood and the emotions selected in Study 1 (e.g.,  
536 *comforted, curious, energetic, and free*) and Study 2 (e.g., *excited and restless*) are likely to  
537 be associated with consumption appropriateness. Piqueras-Fiszman et al. (2014) stated that  
538 positive emotions were evoked more when participants deemed the consumption context  
539 appropriate, while more negative emotions were evoked when the consumption context was  
540 considered less appropriate. Therefore, positioning *makgeolli* in restaurants would be  
541 beneficial as subjects deemed Asian restaurants as an appropriate environment for the  
542 consumption of *makgeolli* while evoking positive emotions.

543         While both studies yielded interesting results that are consistent with the scientific  
544 literature on evoked context and consumption environment, this research has several  
545 limitations that should be addressed. First, both studies have relatively small sample sizes.  
546 Due to the COVID-19 outbreak in 2020, the experimental parameters were shifted to  
547 accommodate the situation. Sensory researchers provided various solutions to reduce the  
548 spread of COVID-19, including remote testing, driven-in booths, and at home testing, also  
549 referred to as home use testing (Dinnella et al., 2022; Park et al., 2023; Seo et al., 2021).  
550 Given the circumstances, the researchers in this study opted to employ an evoked context to  
551 simulate different consumption environments rather than utilizing physical settings, which  
552 posed a risk to the subjects and was not feasible in 2020.

553           During Study 1, the experiment ended after two and a half weeks due to the Auckland  
554 regional lockdown that occurred in August 2020 (Taylor, 2020). To help overcome some of  
555 the limitations associated with a smaller sample size, non-parametric statistics were  
556 employed. Non-parametric statistics such as Kruskal-Wallis  $\chi^2$  test do not assume normal data  
557 distribution and are less sensitive to outliers, thus considered acceptable for analyzing Study  
558 1 data. Other researchers with low subjects have also utilized non-parametric methods or  
559 applied statistical adjustments in their analysis (Crofton et al., 2021; Rousta et al., 2021;  
560 Zulkarnain et al., 2024). Therefore, we deemed this an appropriate approach to data analysis  
561 considering the circumstances.

562           In Study 2, Auckland City experienced several weather events during the first half of  
563 2023, such as the Auckland Anniversary storm, Cyclone Gabrielle, and the May storm event  
564 (Johnson, 2023). The lower participation rate of subjects from the restaurant environment can  
565 be attributed to the lower consumer turnout at restaurants in Auckland City during this period.  
566 In light of the situation, power analysis showed a moderate to large effect size for factors that  
567 showed statistical significance. This indicates practical significance (e.g., the meaningfulness  
568 of the observed data) from both studies which can be applied to real-world situations (Kirk,  
569 1996; Peeters, 2016).

570           Although we used a combination of field and laboratory studies to examine different  
571 environmental contexts impact on the consumption of *makgeolli* and Study 2 had a larger  
572 sample than Study 1, future research should replicate the findings of our studies with larger  
573 samples.

574           While Study 2 displayed a more balanced age distribution compared to Study 1, a  
575 limitation of our research lies in its concentration on the perceptions of *makgeolli* and the  
576 environmental appropriateness among younger consumers. The younger sample is likely due

577 to the nature of the experiment relying on a convenience sampling method. Also, given the  
578 lack of evidence regarding the primary consumer demographics of *makgeolli* in the Western  
579 context, it remains challenging to ascertain whether the inclusion of a younger sample  
580 restricts the scope of our research. Consequently, future work with *makgeolli* could determine  
581 the age groups most attracted to the consumption and purchase of *makgeolli*, with additional  
582 studies recruiting more subjects over the age of 30.

583 Another limitation was the methods used for measuring mood and emotions.  
584 Currently, there is no standardized measure for mood and emotions in food product testing,  
585 therefore, both scales (e.g., Bond-Lader scale and the BE survey) were borrowed from  
586 psychology and wine research. Finally, some supplementary information was not collected in  
587 Study 2 that may be useful for other researchers such as the time of day that the *makgeolli*  
588 experiment was conducted and whether the subjects were completing the experiment as an  
589 individual or group. Future research within consumption environments should collect this  
590 information as part of the sensory survey to identify potential biases and to control for these  
591 potential confounds.

592

## 593 **6. Conclusion**

594 This study demonstrated that different environments both scenario and natural  
595 environments are likely to evoke different moods and emotions while consuming *makgeolli*.  
596 While no statistical differences were observed in overall liking for both studies, it was  
597 evident that subjects considered consuming *makgeolli* in Asian restaurants to be more  
598 appropriate. Another interesting observation was the association between environmental  
599 appropriateness versus mood and emotions. There is likely a positive association between  
600 environmental appropriateness and positive emotions. Negative emotion terms were selected

601 more in environments that subjects deemed inappropriate to consume the *makgeolli*. Overall,  
602 this research enhances our understanding of how different environments including evoked  
603 context and real environments impact our understanding of mood and emotions while  
604 consuming *makgeolli*.

605

606

## 607 **7. Implications for gastronomy**

608

609 The experiments from both Study 1 and Study 2 show that subjects' attitudes, behavior,  
610 and perception are likely to change dependent on the environment. Although we did not  
611 notice statistical differences in overall liking in different scenarios and environments, both  
612 studies show that context-appropriate matter of where *makgeolli* should be consumed.  
613 Therefore, it would be advantageous to position *makgeolli* in restaurant settings. Another  
614 aspect of scientific inquiry that should be investigated is the consumer perception of taste and  
615 flavor in different scenarios and environments. More attributes e.g., sweetness, sourness,  
616 smoothness, and astringency were noted to be either too-much or not-enough in laboratory  
617 settings than in natural environments. It is possible that subjects became more analytical  
618 when it came to evaluating *makgeolli* in the sensory laboratory, therefore the subjects became  
619 hypersensitive. If taste and flavor results were hypersensitive then the results from sensory  
620 laboratories may not be reflective in natural environments where consumers are likely to  
621 consume the food and beverage. More research is needed to understand to what magnitude  
622 the hypersensitive results are translatable to natural consumer settings.

623 **References**

- 624 Bond, A., & Lader, M., 1974. The use of analogue scales in rating subjective feelings. *Br. J. Med.*  
625 *Psychol.* 47 (3), 211-218. <https://doi.org/10.1111/j.2044-8341.1974.tb02285.x>
- 626 Boutrolle, I., Arranz, D., Rogeaux, M., & Delarue, J., 2005. Comparing central location test and home  
627 use test results: Application of a new criterion. *Food Qual. Prefer.* 16 (8), 704-713.  
628 <https://doi.org/10.1016/j.foodqual.2005.03.015>
- 629 Crofton, E., Murray, N., & Botinestean, C., 2021. Exploring the effects of immersive virtual reality  
630 environments on sensory perception of beef steaks and chocolate. *Foods.* 10 (6), 1154.  
631 <https://doi.org/10.3390/foods10061154>
- 632 Danner, L., Johnson, T. E., Ristic, R., Meiselman, H. L., & Bastian, S. E., 2020. Consumption context  
633 effects on fine wine consumer segments' liking and emotions. *Foods.* 9 (12), 1798.  
634 <https://doi.org/10.3390/foods9121798>
- 635 Danner, L., Ristic, R., Johnson, T. E., Meiselman, H. L., Hoek, A. C., Jeffery, D. W., & Bastian, S. E., 2016.  
636 Context and wine quality effects on consumers' mood, emotions, liking and willingness to  
637 pay for Australian Shiraz wines. *Food. Res. Int.* 89, 254-265.  
638 <https://doi.org/10.1016/j.foodres.2016.08.006>
- 639 de Andrade, J. C., Nalério, É. S., Giongo, C., de Barcellos, M. D., Ares, G., & Deliza, R., 2016. Influence  
640 of evoked contexts on rating-based conjoint analysis: Case study with lamb meat. *Food Qual.*  
641 *Prefer.* 53, 168-175. <https://doi.org/10.1016/j.foodqual.2016.06.013>
- 642 Desmet, P. M., & Schifferstein, H. N., 2008. Sources of positive and negative emotions in food  
643 experience. *Appetite.* 50 (2-3), 290-301. <https://doi.org/10.1016/j.appet.2007.08.003>
- 644 Dinnella, C., Pierguidi, L., Spinelli, S., Borgogno, M., Toschi, T. G., Predieri, S., Lavezzi, G., Trapani, F.,  
645 Tura, M., & Magli, M., 2022. Remote testing: Sensory test during Covid-19 pandemic and  
646 beyond. *Food Qual. Prefer.* 96, 104437. <https://doi.org/10.1016/j.foodqual.2021.104437>

- 647 Dorado, R., Chaya, C., Tarrega, A., & Hort, J., 2016. The impact of using a written scenario when  
648 measuring emotional response to beer. *Food Qual. Prefer.* 50, 38-47.  
649 <https://doi.org/10.1016/j.foodqual.2016.01.004>
- 650 Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A., 2007. G\* Power 3: A flexible statistical power analysis  
651 program for the social, behavioral, and biomedical sciences. *Behav. Res. Methods.* 39 (2),  
652 175-191. <https://doi.org/10.3758/BF03193146>
- 653 Hein, K. A., Hamid, N., Jaeger, S. R., & Delahunty, C. M., 2010. Application of a written scenario to  
654 evoke a consumption context in a laboratory setting: Effects on hedonic ratings. *Food Qual.*  
655 *Prefer.* 21 (4), 410-416. <https://doi.org/10.1016/j.foodqual.2009.10.003>
- 656 Hein, K. A., Hamid, N., Jaeger, S. R., & Delahunty, C. M., 2012. Effects of evoked consumption contexts  
657 on hedonic ratings: A case study with two fruit beverages. *Food Qual. Prefer.* 26 (1), 35-44.  
658 <https://doi.org/10.1016/j.foodqual.2012.02.014>
- 659 Hersleth, M., Monteleone, E., Segtnan, A., & Næs, T., 2015. Effects of evoked meal contexts on  
660 consumers' responses to intrinsic and extrinsic product attributes in dry-cured ham. *Food*  
661 *Qual. Prefer.* 40, 191-198. <https://doi.org/10.1016/j.foodqual.2014.10.002>
- 662 Holthuysen, N. T., Vrijhof, M. N., de Wijk, R. A., & Kremer, S., 2017. "Welcome on board": Overall  
663 liking and just-about-right ratings of airplane meals in three different consumption  
664 contexts—laboratory, re-created airplane, and actual airplane. *J. Sens. Stud.* 32 (2), e12254.  
665 <https://doi.org/10.1111/joss.12254>
- 666 Jaeger, S. R., & Porcherot, C., 2017. Consumption context in consumer research: Methodological  
667 perspectives. *Curr. Opin. Food Sci.* 15, 30-37. <https://doi.org/10.1016/j.cofs.2017.05.001>
- 668 Johnson, K. (2023). Auckland storm event 9 May 2023, rapid analysis.  
669 [https://knowledgeauckland.org.nz/publications/auckland-storm-event-9-may-2023-rapid-](https://knowledgeauckland.org.nz/publications/auckland-storm-event-9-may-2023-rapid-analysis/)  
670 [analysis/](https://knowledgeauckland.org.nz/publications/auckland-storm-event-9-may-2023-rapid-analysis/)

- 671 King, S. C., & Meiselman, H. L., 2010a. Development of a method to measure consumer emotions  
672 associated with foods. *Food Qual. Prefer.* 21 (2), 168-177.  
673 <https://doi.org/10.1016/j.foodqual.2009.02.005>
- 674 King, S. C., Meiselman, H. L., & Carr, B. T., 2010b. Measuring emotions associated with foods in  
675 consumer testing. *Food Qual. Prefer.* 21 (8), 1114-1116.  
676 <https://doi.org/10.1016/j.foodqual.2010.08.004>
- 677 Kirk, R. E., 1996. Practical significance: A concept whose time has come. *Educ. Psychol. Meas.* 56 (5),  
678 746-759. <https://doi.org/10.1177/0013164496056005002>
- 679 Köster, E. P., 2003. The psychology of food choice: some often encountered fallacies. *Food Qual.*  
680 *Prefer.* 14 (5-6), 359-373. [https://doi.org/10.1016/S0950-3293\(03\)00017-X](https://doi.org/10.1016/S0950-3293(03)00017-X)
- 681 Köster, E. P., 2009. Diversity in the determinants of food choice: A psychological perspective. *Food*  
682 *Qual. Prefer.* 20 (2), 70-82. <https://doi.org/https://doi.org/10.1016/j.foodqual.2007.11.002>
- 683 Köster, E. P., & Mojet, J., 2015. From mood to food and from food to mood: A psychological  
684 perspective on the measurement of food-related emotions in consumer research. *Food. Res.*  
685 *Int.* 76, 180-191. <https://doi.org/10.1016/j.foodres.2015.04.006>
- 686 Kukutai, T., & Callister, P., 2009. A “main” ethnic group? Ethnic self-prioritisation among New Zealand  
687 youth. *Soc. Policy J. N. Zeal.* 36, 16-31.
- 688 Kwak, H. S., Ahn, B. H., Kim, H. R., & Lee, S. Y., 2015. Identification of sensory attributes that drive the  
689 likeability of Korean rice wines by American panelists. *J. Food Sci.* 80 (1), S161-S170.  
690 <https://doi.org/10.1111/1750-3841.12739>
- 691 Le, S., & Husson, F., 2008. Sensominer: A package for sensory data analysis. *J. Sens. Stud.* 23 (1), 14-  
692 25. <https://doi.org/10.1111/j.1745-459X.2007.00137.x>
- 693 Lee, C. W., & Lves, M. (2022, January 21). This Ancient Brew has Retro appeal in South Korea. *The*  
694 *New York Times*, 4. [https://www.nytimes.com/2022/01/20/world/asia/south-korea-](https://www.nytimes.com/2022/01/20/world/asia/south-korea-makgeolli-rice-wine.html)  
695 [makgeolli-rice-wine.html](https://www.nytimes.com/2022/01/20/world/asia/south-korea-makgeolli-rice-wine.html)

- 696 Lee, S. J., & Lee, K. G., 2008. Understanding consumer preferences for rice wines using sensory data.  
697 J. Sci. Food Agric. 88 (4), 690-698. <https://doi.org/10.1002/jsfa.3137>
- 698 Liu, Y., & Jang, S. S., 2009. The effects of dining atmospherics: An extended Mehrabian–Russell  
699 model. Int. J. Hosp. Manag. 28 (4), 494-503. <https://doi.org/10.1016/j.ijhm.2009.01.002>
- 700 Lusk, K. A., Hamid, N., Delahunty, C. M., & Jaeger, S. R., 2015. Effects of an evoked refreshing  
701 consumption context on hedonic responses to apple juice measured using best–worst scaling  
702 and the 9-pt hedonic category scale. Food Qual. Prefer. 43, 21-25.  
703 <https://doi.org/10.1016/j.foodqual.2015.01.007>
- 704 Mehrabian, A., & Russell, J. A., 1974. A verbal measure of information rate for studies in  
705 environmental psychology. Envr. Behav. 6 (2), 233-252.  
706 <https://doi.org/10.1177/001391657400600205>
- 707 Meiselman, H. L. (1996). The contextual basis for food acceptance, food choice and food intake: the  
708 food, the situation and the individual. in H. L. M. Meiselman, H. J. H (Eds.), Food choice,  
709 acceptance and consumption. Springer. pp. 239-263.
- 710 Meiselman, H. L., 2015. A review of the current state of emotion research in product development.  
711 Food. Res. Int. 76, 192-199. <https://doi.org/10.1016/j.foodres.2015.04.015>
- 712 Nijman, M., James, S., Dehrmann, F., Smart, K., Ford, R., & Hort, J., 2019. The effect of consumption  
713 context on consumer hedonics, emotional response and beer choice. Food Qual. Prefer. 74,  
714 59-71. <https://doi.org/10.1016/j.foodqual.2019.01.011>
- 715 Nile, S. H., 2015. The nutritional, biochemical and health effects of makgeolli—a traditional Korean  
716 fermented cereal beverage. J. Inst. Brew. 121 (4), 457-463.  
717 <https://doi.org/https://doi.org/10.1002/jib.264>
- 718 Park, S., Heo, J., Oh, J., Chung, S.-J., & Kwak, H. S., 2023. Consumer testing away from a sensory  
719 facility: Application of home-use test and no-contact home-use test. Food Qual. Prefer. 109,  
720 104905. <https://doi.org/10.1016/j.foodqual.2023.104905>

- 721 Peeters, M. J., 2016. Practical significance: Moving beyond statistical significance. *Curr. Pharm. Teach.*  
722 *Learn.* 8 (1), 83-89. <https://doi.org/10.1016/j.cptl.2015.09.001>
- 723 Piqueras-Fiszman, B., & Jaeger, S. R., 2014. The impact of evoked consumption contexts and  
724 appropriateness on emotion responses. *Food Qual. Prefer.* 32, 277-288.  
725 <https://doi.org/10.1016/j.foodqual.2013.09.002>
- 726 Rousta, N., Hellwig, C., Wainaina, S., Lukitawesa, L., Agnihotri, S., Rousta, K., & Taherzadeh, M. J.,  
727 2021. Filamentous fungus *Aspergillus oryzae* for food: From submerged cultivation to fungal  
728 burgers and their sensory evaluation—A pilot study. *Foods.* 10 (11), 2774.  
729 <https://doi.org/10.3390/foods10112774>
- 730 Ruvio, A., Shoham, A., & Brenčič, M. M., 2008. Consumers' need for uniqueness: short-form scale  
731 development and cross-cultural validation. *Int. Mark. Rev.* 25 (1), 33-53.  
732 <https://doi.org/10.1108/02651330810851872>
- 733 Ryu, K., & Jang, S. S., 2007. The effect of environmental perceptions on behavioral intentions through  
734 emotions: The case of upscale restaurants. *J. Hosp. Tour. Res.* 31 (1), 56-72.  
735 <https://doi.org/10.1177/1096348006295506>
- 736 Seo, H.-S., Buffin, K., Singh, A., Beekman, T. L., & Arroyo, S. E. J., 2021. Stay safe in your vehicle: Drive-  
737 in booths can be an alternative to indoor booths for laboratory sensory testing. *Food Qual.*  
738 *Prefer.* 94, 104332. <https://doi.org/10.1016/j.foodqual.2021.104332>
- 739 Shi, M., Stelick, A., Licker, S., & Dando, R., 2021. On the validity of longitudinal comparisons of central  
740 location consumer testing results prior to COVID-19 versus home use testing data during the  
741 pandemic. *J. Food Sci.* 86 (10), 4668-4677. <https://doi.org/10.1111/1750-3841.15905>
- 742 Silva, A. P., Jager, G., Van Bommel, R., Van Zyl, H., Voss, H.-P., Hogg, T., Pintado, M., & De Graaf, C.,  
743 2016. Functional or emotional? How Dutch and Portuguese conceptualise beer, wine and  
744 non-alcoholic beer consumption. *Food Qual. Prefer.* 49, 54-65.  
745 <https://doi.org/10.1016/j.foodqual.2015.11.007>

- 746 Sinesio, F., Moneta, E., Porcherot, C., Abbà, S., Dreyfuss, L., Guillamet, K., Bruyninckx, S., Laporte, C.,  
747 Henneberg, S., & McEwan, J. A., 2019. Do immersive techniques help to capture consumer  
748 reality? *Food Qual. Prefer.* 77, 123-134. <https://doi.org/10.1016/j.foodqual.2019.05.004>
- 749 Smith, A. P., 2013. Effects of caffeine and alcohol on mood and performance changes following  
750 consumption of lager. *Psychopharmacology.* 227, 595-604. [https://doi.org/10.1007/s00213-](https://doi.org/10.1007/s00213-013-2991-2)  
751 [013-2991-2](https://doi.org/10.1007/s00213-013-2991-2)
- 752 Taylor, P. (2020). 'Here we go again': Auckland fears a long lockdown as coronavirus returns. *The*  
753 *Guardian.* [https://www.theguardian.com/world/2020/aug/13/here-we-go-again-auckland-](https://www.theguardian.com/world/2020/aug/13/here-we-go-again-auckland-fears-a-long-lockdown-as-coronavirus-returns)  
754 [fears-a-long-lockdown-as-coronavirus-returns](https://www.theguardian.com/world/2020/aug/13/here-we-go-again-auckland-fears-a-long-lockdown-as-coronavirus-returns)
- 755 Tian, K. T., Bearden, W. O., & Hunter, G. L., 2001. Consumers' need for uniqueness: Scale  
756 development and validation. *J. Consum. Res.* 28 (1), 50-66. <https://doi.org/10.1086/321947>
- 757 Torrico, D. D., Han, Y., Sharma, C., Fuentes, S., Gonzalez Viejo, C., & Dunshea, F. R., 2020. Effects of  
758 context and virtual reality environments on the wine tasting experience, acceptability, and  
759 emotional responses of consumers. *Foods.* 9 (2), 191. <https://doi.org/10.3390/foods9020191>
- 760 van Zyl, H. (2016). Emotion in beverages. in H. L. Meiselman (Eds.), *Emotion measurement.* Elsevier.  
761 pp. 473-499. <https://doi.org/10.1016/B978-0-08-100508-8.00019-9>
- 762 Watman, A. (2023). An ancient Korean libation gets transformed for the modern drinker. *WIRED.*  
763 [https://www.wired.com/story/makku-](https://www.wired.com/story/makku-makgeolli/#:~:text=An%20Ancient%20Korean%20Libation%20Gets,Koreans%E2%80%94into%20the%20American%20market.)  
764 [makgeolli/#:~:text=An%20Ancient%20Korean%20Libation%20Gets,Koreans%E2%80%94into](https://www.wired.com/story/makku-makgeolli/#:~:text=An%20Ancient%20Korean%20Libation%20Gets,Koreans%E2%80%94into%20the%20American%20market.)  
765 [%20the%20American%20market.](https://www.wired.com/story/makku-makgeolli/#:~:text=An%20Ancient%20Korean%20Libation%20Gets,Koreans%E2%80%94into%20the%20American%20market.)
- 766 Wong, B., Muchangi, K., Quach, E., Chen, T., Owens, A., Otter, D., Phillips, M., & Kam, R., 2023a.  
767 Characterisation of Korean rice wine (makgeolli) prepared by different processing methods.  
768 *Curr. Res. Food Sci.* 6. <https://doi.org/10.1016/j.crfs.2022.100420>
- 769 Wong, B., Owens, A., Phillips, M., & Kam, R., 2023b. Identifying sensory attributes of Korean rice  
770 wine (makgeolli) using sensory evaluation and chemical analysis. *J. Food Sci.* 88, 4247-4261.  
771 <https://doi.org/10.1111/1750-3841.16762>

- 772 Wong, B., Phillips, M., & Kam, R., 2024. Product categorization of Korean rice wine (makgeolli)  
773 compared to beer and wine using sensory evaluation methods. *J. Sens. Stud.* 39 (2), e12904.  
774 <https://doi.org/10.1111/joss.12904>
- 775 Wu, C., Zhu, H., Huang, C., Liang, X., Zhao, K., Zhang, S., He, M., Zhang, W., & He, X., 2022. Does a  
776 beautiful environment make food better-The effect of environmental aesthetics on food  
777 perception and eating intention. *Appetite.* 175, 106076.  
778 <https://doi.org/10.1016/j.appet.2022.106076>
- 779 Yang, J. (2023). Korea's Kooksoondang sees its makgeolli exports surpass \$10 mn mark. *The Korea*  
780 *Economic Daily.* <https://www.kedglobal.com/korean-food/newsView/ked202303210020>
- 781 Zulkarnain, A. H. B., Cao, X., Kókai, Z., & Gere, A., 2024. Self-Assessed Experience of Emotional  
782 Involvement in Sensory Analysis Performed in Virtual Reality. *Foods.* 13 (3), 375.  
783 <https://doi.org/10.3390/foods13030375>

**784 Declaration of competing interest:**

785 We declare that there was no conflict of commercial interest in relation to the work  
786 submitted.

787

**788 Author statement:**

789 Barry Wong: conceptualization, methodology, formal analysis, writing-original draft,  
790 writing-review & editing. Megan Philips: conceptualization, methodology, writing-original  
791 draft, supervision. Rothman Kam: conceptualization, methodology, writing-review & editing,  
792 project administration, supervision.

793

**794 Acknowledgements:**

795 Researchers would like to thank Stephen Lee (Kye Yeon Lee) for allowing Study 2 to take  
796 place at Faro (Auckland CBD restaurant). Thank you so much for being accommodating and  
797 supportive of our research. BW would like to thank Edward Quach and Rowena Goh for their  
798 help and assistance with Study 2. Lastly, BW would like to thank subjects from AUT (staff  
799 and friends) and the Auckland Metropolitan area (especially the Mount Albert residents and  
800 community group) that took part in the study.

801 **Table 1.** Subject's sociodemographic information with percentages including gender, age,  
 802 ethnic background, rice consumption frequency, and alcoholic consumption frequency in both  
 803 studies.

Categories	Different subcategories	Study 1 Sample n (%)	Study 2 Sample n (%)
Gender	Male	35 (58.3%)	48 (42.5%)
	Female	24 (40.0%)	65 (57.5%)
	Not recorded/not disclosed	1 (1.70%)	n/a
Age	18 – 29	31 (51.6%)	51 (45.1%)
	30 – 39	19 (31.7%)	31 (27.4%)
	40 – 49	5 (8.33%)	11 (9.7%)
	50+	4 (6.67%)	20 (17.7%)
	Not recorded/not disclosed	1 (1.70%)	n/a
Ethnicity association	New Zealand European <sup>a</sup>	17 (28.3%)	23 (20.4%)
	East Asian <sup>b</sup>	17 (28.3%)	56 (49.6%)
	South Asian <sup>c</sup>	14 (23.3%)	8 (7.08%)
	African <sup>d</sup>	3 (5.00%)	2 (1.77%)
	Māori/Pasifika <sup>e</sup>	5 (8.33%)	8 (7.08%)
	European <sup>f</sup>	1 (1.7%)	9 (7.96%)
	American <sup>g</sup>	3 (5.00%)	1 (0.88%)
	Middle East	n/a	6 (5.31%)
Rice consumption	More than once week	31 (51.7%)	16 (14.2%)
	At least once a week	12 (20.0%)	6 (5.31%)
	Every second week	3 (5.00%)	12 (10.6%)
	Once a month	3 (5.00%)	21 (18.6%)
	Seldom	10 (16.7%)	57 (50.4%)
	Not recorded/not disclosed	1 (1.70%)	1 (0.89%)
Alcohol consumption	More than once a week	19 (31.7%)	16 (14.2%)

At least once a week	18 (30.0%)	21 (18.6%)
Every second week	10 (16.7%)	23 (20.4%)
Once a month	13 (21.7%)	52 (46.0%)
Not recorded/not disclosed	n/a	1 (0.89%)

804 Note: Study 1 refers to the first study that was conducted using evoked context to simulate  
805 different scenarios (n = 60). Study 2 refers to the second study that used different physical  
806 environmental contexts (n = 113).

807 <sup>a</sup>New Zealand European is defined as individuals who have European ancestry but self-  
808 identify with strong affiliation with New Zealand (e.g., New Zealand citizenship or  
809 permanently residing in New Zealand).

810 <sup>b</sup>East Asians category consists of subjects with East or Southeast Asian ancestry, subjects may  
811 self-identify as Chinese, Korean, Thai, Taiwanese, Filipino, Vietnamese, or Southeast Asian.

812 <sup>c</sup>South Asian category consists of subjects with South Asian ancestry, subjects may self-  
813 identify as Sri Lankan, Nepalese, or Indian.

814 <sup>d</sup>African category consists of subjects from the African continent.

815 <sup>e</sup>Māori/Pasifika category consists of subjects with Māori or Pacific Islander ancestry (e.g.,  
816 Fijian, Samoan, and Tongan).

817 <sup>f</sup>European category consists of subject from the European continent and does not self-identify  
818 as a New Zealand European such as British, French, Slavic, and Ukrainian.

819 <sup>g</sup>American category consists of subjects from Northern, Central, Southern of the Americas  
820 continent.

821 **Table 2.** Subject's verbatim examples from specific evoked contexts with home (left column)  
 822 and Asian restaurant (right column). Verbatim examples were selected at random from  
 823 subjects #4, #5, #7 for both specific evoked contexts for Study 1.

Subject	Evoked context condition: Home	Evoked context condition: Asian restaurant
#4	Several French [friends] came over [to] my house, we sat in the garden, talking and enjoying the afternoon.	I imagine a crowded Asian restaurant with my family sitting here trying this new classic wine bought into the market. As my dad takes the first sip and lets us taste the alcohol later. It is a tradition in my Indian culture for the head of the family to try it first then let the sons or daughters try the alcohol and knowing the fact that we would love the taste of this new wine.
#5	I feel very excited and relaxed, I will get a good time with my friend.	Popping edamame out of the shell - it's salty. Voices are loud and I am pressed into a small table with my husband. Cosy and warm, we have just come inside from the cold. The big main meal is coming - something with tofu and eggplant usually. Edamame bites, and I take a sip of warm sake. I've just poured it from the clay container into the little cup and of course, there is a drip, I mop up with a napkin. The little ceramic cup is warm, feels like a thimble in my hand compared to a big wine glass in some Italian restaurant - and as I sip I close my eyes. The drink is sharp, hot - warm and absorbs the soft from the edamame as it goes down.

I feel the hot sake through my system  
and take a quick second sip as I feel my  
fingers and toes warm. Pure enjoyment.

#7 Having an image of an occasion that occurred last year around April, the surrounding was excellent, food and music were keeping the guest entertained. I can still see how the day went. I was really excited as I was turning "21" big day big number. The only thing I could think of was I am an adult now, I have responsibilities, though I was scared here I am being a graduate paying my own bills and providing for myself.

I like food and I often try different types of cuisines. Once I went to an Asian restaurant in Auckland called Bawarichi Indian Restaurant and ordered a chicken biriyani. The chicken biriyani was very spicy.

---

824 Note: Study 1 refers to the evoked context experiment which simulated the three different  
825 scenarios including at home with friends, Asian restaurants, and no context. Subjects under  
826 no context did not provide a written statement as it was not part of the questionnaire.

827 **Table 3.** Subjects' mean responses with standard deviation to the environmental questions in  
 828 Study 1 using Kruskal-Wallis  $\chi^2$  test for statistical significance (n = 60).

	<u>Significance testing</u>		<u>Evoked context scenarios</u>		
	$\chi^2$ value	<i>p</i> -value	Asian	Home	No context
			Restaurant (n = 20)	(n = 20)	(n = 20)
Accuracy	1.78	0.41	7.75 ± 1.21 <sup>a</sup>	8.00 ± 0.97 <sup>a</sup>	7.35 ± 1.46 <sup>a</sup>
Appropriateness	6.78	0.03*	8.00 ± 1.26 <sup>a</sup>	6.85 ± 2.13 <sup>b</sup>	6.35 ± 2.10 <sup>b</sup>
Compelled	1.33	0.51	6.40 ± 2.11 <sup>a</sup>	6.45 ± 2.04 <sup>a</sup>	5.80 ± 2.34 <sup>a</sup>
Likelihood of purchase	4.47	0.11	6.70 ± 2.58 <sup>a</sup>	6.00 ± 2.38 <sup>a</sup>	5.55 ± 1.80 <sup>a</sup>
Rating of difficulty	3.78	0.15	8.15 ± 1.09 <sup>a</sup>	7.10 ± 2.25 <sup>a</sup>	7.25 ± 1.55 <sup>a</sup>
Vividness	0.72	0.40	6.15 ± 1.95 <sup>a</sup>	6.50 ± 2.54 <sup>a</sup>	n/a
Willingness to consume	3.90	0.14	6.90 ± 2.17 <sup>a</sup>	7.00 ± 1.78 <sup>a</sup>	6.15 ± 1.68 <sup>a</sup>
Willingness to pay	1.18	0.55	17.75 ± 8.16 <sup>a</sup>	20.10 ± 8.09 <sup>a</sup>	17.50 ± 6.58 <sup>a</sup>
Overall liking	0.96	0.62	6.80 ± 1.96 <sup>a</sup>	6.50 ± 1.64 <sup>a</sup>	6.90 ± 1.84 <sup>a</sup>

829 Note: Study 1 refers to the evoked context experiment which simulated the three different  
 830 scenarios including at home with friends, Asian restaurants, and no context. Statistical  
 831 significance between different environments is expressed as letters in the column using the  
 832 Mann-Whitney U test for Post hoc testing. Environmental question regarding vividness was  
 833 not asked for subjects participating in no context for Study 1.

834 <sup>n.s</sup> Environmental questions that did not reach statistical significance set at 0.05.

835 \* Statistical significance level  $p < 0.05$  Kruskal-Wallis  $\chi^2$  test

836 \*\* Statistical significance level  $p < 0.01$  Kruskal-Wallis  $\chi^2$  test

837 \*\*\* Statistical significance level  $p < 0.001$  Kruskal-Wallis  $\chi^2$  test

838 **Table 4.** Subjects' mean responses with standard deviation to the environmental questions in  
 839 Study 2 using one-way ANOVA test for statistical significance (n = 113).

	<u>Significance testing</u>		<u>Environmental contexts</u>		
	<i>F</i> - value	<i>p</i> -value	Asian		
			Restaurant (n = 30)	Home (n = 48)	Laboratory (n = 35)
Accuracy	0.53	0.59 <sup>n.s.</sup>	7.07 ± 1.76 <sup>a</sup>	7.30 ± 1.59 <sup>a</sup>	6.91 ± 1.79 <sup>a</sup>
Appropriateness	13.03	<0.001 <sup>***</sup>	6.97 ± 1.94 <sup>a</sup>	6.96 ± 1.43 <sup>a</sup>	4.91 ± 2.54 <sup>b</sup>
Compelled	4.12	0.02 <sup>*</sup>	6.20 ± 2.14 <sup>a</sup>	4.70 ± 2.43 <sup>b</sup>	4.91 ± 2.33 <sup>ab</sup>
Likelihood of purchase	1.14	0.32 <sup>n.s.</sup>	5.03 ± 2.20 <sup>a</sup>	4.30 ± 2.32 <sup>a</sup>	4.91 ± 2.49 <sup>a</sup>
Rating of difficulty	0.39	0.68 <sup>n.s.</sup>	6.93 ± 1.84 <sup>a</sup>	6.74 ± 2.20 <sup>a</sup>	6.49 ± 2.01 <sup>a</sup>
Willingness to consume	1.36	0.26 <sup>n.s.</sup>	5.07 ± 2.30 <sup>a</sup>	4.49 ± 2.42 <sup>a</sup>	5.34 ± 2.42 <sup>a</sup>
Willingness to pay	2.38	0.10 <sup>n.s.</sup>	11.37 ± 7.53 <sup>a</sup>	8.86 ± 4.66 <sup>a</sup>	11.33 ± 5.75 <sup>a</sup>
Overall liking	2.11	0.13 <sup>n.s.</sup>	5.20 ± 1.95 <sup>a</sup>	5.81 ± 1.94 <sup>a</sup>	6.17 ± 1.84 <sup>a</sup>

840 Note: Study 2 refers to the physical environmental contexts including home, Asian restaurant,  
 841 and laboratory.

842 <sup>n.s.</sup> Attributes did not reach statistical significance set at 0.05 from the one-way ANOVA.

843 \* Statistical significance level  $p < 0.05$  one-way ANOVA

844 \*\* Statistical significance level  $p < 0.01$  one-way ANOVA

845 \*\*\* Statistical significance level  $p < 0.001$  one-way ANOVA

846

847

848 **Table 5.** Summary of subjects' responses for both Study 1 (n = 58) and Study 2 (n = 113) on their mood changes based on the Bond and Ladar  
 849 Scale for different environment contexts.

Study 1 (n = 58)							
Environmental contexts	Mood	<i>t</i> -value	df	<i>p</i> -value	Pre-experiment	Post-experiment	Change
Asian restaurant (n = 20)	Alertness	0.919	19	0.370 <sup>n.s</sup>	26.46 ± 16.41	29.84 ± 18.19	3.38
	Contentedness	-0.332	19	0.743 <sup>n.s</sup>	27.25 ± 18.87	26.02 ± 14.28	-1.23
	Calmness	1.156	19	0.262 <sup>n.s</sup>	40.73 ± 24.25	48.40 ± 22.81	7.68
Home (n = 18)	Alertness	3.671	17	0.002**	21.74 ± 9.14	35.94 ± 18.27	14.20
	Contentedness	0.148	17	0.884 <sup>n.s</sup>	31.53 ± 15.58	32.20 ± 14.38	0.67
	Calmness	0.504	17	0.621 <sup>n.s</sup>	33.44 ± 18.65	36.36 ± 21.83	2.92
No context (n = 20)	Alertness	0.281	19	0.782 <sup>n.s</sup>	28.38 ± 14.85	29.14 ± 13.22	0.76
	Contentedness	-6.832	19	<0.001***	40.74 ± 11.98	27.88 ± 13.70	-12.86
	Calmness	1.783	19	0.091 <sup>n.s</sup>	34.25 ± 19.75	41.28 ± 14.20	7.03
Study 2 (n = 113)							
Environmental contexts	Mood	<i>t</i> -value	df	<i>p</i> -value	Pre-experiment	Post-experiment	Change

Asian restaurant (n = 30)	Alertness	0.454	29	0.653 <sup>n.s</sup>	25.78 ± 18.87	27.05 ± 13.63	1.28
	Contentedness	-0.852	29	0.401 <sup>n.s</sup>	25.96 ± 15.49	24.21 ± 16.02	-1.76
	Calmness	2.865	29	0.008**	25.17 ± 22.61	38.92 ± 20.09	13.75
Home (n = 48)	Alertness	1.151	47	0.256 <sup>n.s</sup>	30.51 ± 16.70	32.80 ± 16.09	2.29
	Contentedness	1.443	47	0.156 <sup>n.s</sup>	26.38 ± 13.05	29.29 ± 15.84	2.91
	Calmness	0.582	47	0.563 <sup>n.s</sup>	25.77 ± 16.76	27.09 ± 18.70	1.32
Laboratory (n = 35)	Alertness	-0.911	34	0.368 <sup>n.s</sup>	37.45 ± 16.57	35.50 ± 13.14	-1.94
	Contentedness	-0.178	34	0.860 <sup>n.s</sup>	32.94 ± 16.58	32.54 ± 10.09	-0.40
	Calmness	0.032	34	0.975 <sup>n.s</sup>	36.61 ± 18.27	36.70 ± 17.66	0.09

850

851 Note: Study 1 refers to the first study that was conducted using evoked context to simulate different scenarios (n = 60). Study 2 refers to the  
852 second study that used different physical environmental contexts (n = 113). Two subjects were removed from Study 1 in evoked context scenario  
853 of home due to incomplete survey.

854 <sup>n.s</sup> Statistical significance was reached with alpha set at 0.05 for the Paired student *t*-test.

855 \* Statistical significance level  $p < 0.05$  Paired student *t*-test

856 \*\* Statistical significance level  $p < 0.01$  Paired student *t*-test

857 \*\*\* Statistical significance level  $p < 0.001$  Paired student  $t$ -test

Journal Pre-proof

858 **Table 6.** Summary of subject's responses for both Study 1 (n = 60) and Study 2 (n = 113) on their emotional term selection for different  
 859 environment contexts.

Emotional terms	Study 1					Study 2				
	Significance testing		Environmental contexts			Significance testing		Environmental contexts		
	$\chi^2$ value	<i>p</i> -value	Asian Restaurant (n = 20)	Home (n = 20)	No context (n = 20)	$\chi^2$ value	<i>p</i> -value	Asian Restaurant (n = 30)	Home (n = 48)	Laboratory (n = 35)
Adventurous	0.62	0.735 <sup>n.s.</sup>	0.35	0.35	0.25	1.03	0.596	0.33	0.25	0.34
Amused	0.75	0.689 <sup>n.s.</sup>	0.30	0.20	0.20	1.41	0.493	0.27	0.40	0.37
Calm	1.67	0.435 <sup>n.s.</sup>	0.30	0.40	0.50	2.31	0.316	0.27	0.44	0.37
Comforted	6.45	0.040*	0.25	0.55	0.20	3.26	0.196	0.10	0.25	0.14
Curious	13.75	0.001**	0.40	0.30	0.85	1.72	0.422	0.47	0.56	0.63
Disappointed	n/a	n/a <sup>n.s.</sup>	0	0	0	3.17	0.205	0.10	0.15	0.03
Energetic	6.89	0.032*	0.40	0.05	0.25	1.63	0.442	0.07	0.04	0.11
Excited	0.00	1.000 <sup>n.s.</sup>	0.30	0.30	0.30	6.30	0.043*	0.37	0.13	0.26
Exuberant	5.67	0.059 <sup>n.s.</sup>	0	0.05	0.20	2.25	0.325	0	0	0.03
Free	11.85	0.003**	0.40	0.55	0.05	1.57	0.457	0.03	0.10	0.11
Friendly	3.75	0.153 <sup>n.s.</sup>	0.50	0.60	0.30	4.41	0.111	0.37	0.17	0.31
Good	0.94	0.626 <sup>n.s.</sup>	0.55	0.40	0.45	4.21	0.122	0.33	0.40	0.57
Grumpy	2.03	0.362 <sup>n.s.</sup>	0	0.05	0	1.37	0.505	0	0.02	0
Happy	1.20	0.549 <sup>n.s.</sup>	0.55	0.55	0.4	1.60	0.449	0.33	0.23	0.34

Joyful	0.95	0.622 <sup>n.s.</sup>	0.45	0.50	0.35	0.20	0.904	0.20	0.17	0.20
Pleased	1.21	0.546 <sup>n.s.</sup>	0.50	0.50	0.35	1.82	0.403	0.37	0.31	0.46
Relaxed	0.48	0.788 <sup>n.s.</sup>	0.75	0.70	0.65	5.94	0.051	0.70	0.56	0.40
Restless	2.03	0.362 <sup>n.s.</sup>	0	0	0.05	1.52	<0.001***	0.03	0.08	0.40
Sad	n/a	n/a <sup>n.s.</sup>	0	0	0	1.37	0.505	0	0.02	0

860

861 Note: Study 1 refers to the first study that was conducted using evoked context to simulate different scenarios consisting of home with friends,  
 862 Asian restaurant, and no context (n = 60). Study 2 refers to the second study that used different physical environmental contexts consisting of  
 863 home, Asian restaurant, and laboratory (n = 113).

864 <sup>n.s.</sup> Emotional terms that did not reach statistical significance set at 0.05 using the  $\chi^2$  test.

865 \* Statistical significance level  $p < 0.05$   $\chi^2$  test

866 \*\* Statistical significance level  $p < 0.01$   $\chi^2$  test

867 \*\*\* Statistical significance level  $p < 0.001$   $\chi^2$  test

868

869 **Table 7.** Just-about-right (JAR) information from Study 1 and Study 2. Information displays the penalty score  $\pm$  standard deviation and the  $p$ -  
 870 value for statistical significance.

Attributes	Study 1		Study 2	
	Penalty score	$p$ -value	Penalty score	$p$ -value
Alcohol Strength (not enough)	-0.615 $\pm$ 0.526	0.247 <sup>n.s.</sup>	0.277 $\pm$ 0.529	0.602 <sup>n.s.</sup>
Alcohol strength (too much)	-0.657 $\pm$ 0.685	0.329 <sup>n.s.</sup>	0.013 $\pm$ 0.433	0.976 <sup>n.s.</sup>
Astringency (not enough)	1.760 $\pm$ 0.617	0.006**	0.590 $\pm$ 0.591	0.320 <sup>n.s.</sup>
Astringency (too much)	1.470 $\pm$ 0.535	0.008**	0.599 $\pm$ 0.390	0.128 <sup>n.s.</sup>
Colour (not enough)	0.797 $\pm$ 0.759	0.298 <sup>n.s.</sup>	0.638 $\pm$ 0.496	0.201 <sup>n.s.</sup>
Colour (too much)	0.339 $\pm$ 0.517	0.514 <sup>n.s.</sup>	0.248 $\pm$ 0.433	0.568 <sup>n.s.</sup>
Fruitiness (not enough)	0.806 $\pm$ 0.533	0.136 <sup>n.s.</sup>	1.235 $\pm$ 0.375	0.001**
Fruitiness (too much)	0.402 $\pm$ 0.620	0.519 <sup>n.s.</sup>	0.509 $\pm$ 0.587	0.388 <sup>n.s.</sup>
Smoothness (not enough)	1.575 $\pm$ 0.573	0.008**	0.831 $\pm$ 0.388	0.035*
Smoothness (too much)	0.658 $\pm$ 0.615	0.289 <sup>n.s.</sup>	-0.285 $\pm$ 0.647	0.661 <sup>n.s.</sup>
Sourness (not enough)	1.546 $\pm$ 0.774	0.050 <sup>n.s.</sup>	0.074 $\pm$ 0.554	0.893 <sup>n.s.</sup>
Sourness (too much)	1.179 $\pm$ 0.471	0.015*	1.007 $\pm$ 0.386	0.010*
Sweetness (not enough)	2.110 $\pm$ 0.484	<0.001***	1.144 $\pm$ 0.367	0.002**
Sweetness (too much)	-0.132 $\pm$ 0.616	0.831 <sup>n.s.</sup>	0.883 $\pm$ 0.672	0.191 <sup>n.s.</sup>

871 Note: Study 1 refers to the first study that was conducted using evoked context to simulate different scenarios consisting of home with friends,  
 872 Asian restaurant, and no context (n = 60). Study 2 refers to the second study that used different physical environmental contexts consisting of  
 873 home, Asian restaurant, and laboratory (n = 113).

874

875 <sup>n.s</sup> Attributes did not reach statistical significance set at 0.05 from the penalty analysis.

876 \* Statistical significance level  $p < 0.05$  penalty analysis

877 \*\* Statistical significance level  $p < 0.01$  penalty analysis

878 \*\*\* Statistical significance level  $p < 0.001$  penalty analysis

879

Journal Pre-proof



880

881 Figure 1 Photo illustration of fermentation base being poured into the steamed glutinous rice.

882 Once fermentation base was fully incorporated into the glutinous rice creating a glutinous

883 rice mash, the mash was then distributed into different vessels for fermentation.



884

885 Figure 2 Photo illustration of the 2SF *makgeolli* sample. Korean rice wine mash was filtered

886 and discarded; the remaining liquid is 2SF *makgeolli*.

887

888

889



890

891 Figure 3 A photo illustration of the Asian restaurant used in Study 2. A local Korean  
892 restaurant in the Auckland CBD.

**Highlights:**

- *Makgeolli* was examined in different scenarios and environmental contexts.
- Study 1 used evoked context method for providing different scenarios to subjects.
- Study 2 compared subjects' sensory behaviour and perception between CLT and HUT.
- Appropriateness was an important factor for *makgeolli* consumption.
- Asian restaurant was most appropriate location to consume *makgeolli*.

## Implications for gastronomy

The experiments from both Study 1 and Study 2 show that subjects' attitudes, behavior, and perceptions are likely to change depending on the environment. Although we did not notice statistical differences in overall liking in different scenarios and environments, both studies show that context-appropriate matter of where *makgeolli* should be consumed.

Therefore, it would be advantageous to position *makgeolli* in restaurant settings. Another aspect of scientific inquiry that should be investigated is the consumer perception of taste and flavor in different scenarios and environments. More attributes e.g., sweetness, sourness, smoothness, and astringency were noted to be either too-much or not-enough in laboratory setting than natural environments. It is possible that subjects became more analytical when it came to evaluating *makgeolli* in the sensory laboratory, therefore the subjects became hypersensitive. If taste and flavor results were hypersensitive then the results from sensory laboratories may not be reflective in natural environments where consumers are likely to consume the food and beverage. More research is needed to understand to what magnitude the hypersensitive results are translatable to natural consumer settings.

**Declaration of interests**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Journal Pre-proof