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Searching for the sound of premium beer

Paula Almiron [a], Francisco Barbosa Escobar [b,c], Abhishek Pathak [d], Charles Spence [e], Carlos Velasco [b,*]

[a] AZTI, Food Research, Basque Research and Technology Alliance (BRTA), Parque Tecnológico de Bizkaia, Astondo Bidea, Edificio 609, 48160 Derio, Bizkaia, Spain
[b] Centre for Multisensory Marketing, Department of Marketing, BI Norwegian Business School, Nydalsveien 37, 0484 Oslo, Norway
[c] Department of Food Science, Faculty of Science and Technology, Aarhus University, Agro Food Park 48, 8200 Aarhus, Denmark
[d] School of Business, University of Dundee, Nethergate, Dundee, Scotland DD1 4HN, UK
[e] Crossmodal Research Laboratory, Department of Experimental Psychology, Oxford University, UK

A B S T R A C T

One common definition of premiumness is as a higher quality and more expensive variant of a product than other members of the category or reference class. Premiumness can effectively be conveyed by means of different sensory cues (e.g., colours, sounds, weight). However, to date, research linking the sound of a product's packaging with premiumness is sparse. In the present study, we demonstrate for the first time that consumers associate different levels of beer premiumness with the sounds of opening and pouring of bottles and cans. We report the results of two online experiments. Experiment 1 explored the effect of two sound properties associated with beer can and bottle opening and pouring (sound pressure and frequency) on the perception of premiumness. Experiment 2 used semantic differential scales (e.g., bad-good, passive-active) to evaluate the meanings people tend to associate with different auditory cues. The analyses revealed that participants perceived: 1) bottle sounds to be more premium overall than can sounds, 2) pouring sounds as more premium than opening sounds, and 3) higher pressure sounds as more premium than lower pressure sounds. Additionally, premiumness was positively correlated with semantic differentials of dead-alive, and the evaluative terms of sad-happy, awful-nice, and bad-good, which highlights the perceived quality and premium character of a beer when conveyed auditorily.

1. Introduction

Sonic cues can provide a rich, if often neglected, source of information concerning the attributes of a product (e.g., its temperature, viscosity, and perhaps even its quality; see Spence & Zampini, 2007; Velasco & Spence, 2019a; Wolkomir, 1996). For example, Velasco, Jones, King, and Spence (2013) demonstrated that people can discriminate the temperature of a drink solely on the basis of the sound it makes when poured into a receptacle. Similarly, Zampini and Spence (2004) demonstrated that the perceived crispness/freshness of crisps (or potato chips) could be modified by manipulating the frequencies of sonic cues (while a participant bites into them). Importantly, auditory cues can also be used to prime specific brand associations. For instance, the speech sounds contained within spoken brand names, are distinguishable in terms of their premium vs basic associations. Pathak, Calvert, and Velasco (2017) demonstrated that certain speech sounds (e.g., /sh/ as in **Sh**aron) are considered more premium than others (e.g., /p/, /b/). Pathak and his colleagues indicated that phonemes (i.e., sounds

contained within words) acquired late in life require more effort and time to distinguish (as compared to those phonemes acquired early in life), making these rarer in languages. When these phonemes are used in brand names, consumers link the phonemic rarity present in names with the premium appeal of the associated brand.

Furthermore, Pathak, Calvert, and Velasco (2017) suggest that, in some case, consumers perceive brand names in non mother-tongue languages as more premium, which might sometimes be compounded by later-acquired phonemes. Such linguistic sound associations may be an important part of the associative learning, and illustrate how product-extrinsic product-sonic cues associated with a brand can affect its premiumness.

Given the importance of sonic cues to designers and marketers, a large industry has understandably sprung up around the sounds that products make. This area of research comes under the umbrella term of psychoacoustics as well as sonic branding (e.g., Byron, 2012; Spence & Zampini, 2006). For instance, auditory cues are regularly used by automobile manufacturers for enhancing brand distinctiveness. Harley-

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Davidson includes the engine sounds of its motorbikes in their catalogue as a selling point to attract consumers. Similarly, Lexus highlights the quietness of the interior of its cars to provide consumers with a distinctive experience, in which they can enjoy the silence or else listen to music (Lyon, 2003; see also Beckerman & Gray, 2014). Mercedes-Benz launched and marketed its AMG series of cars mainly on the basis of the sounds its engines make. This brand is also currently working on developing artificial sonic cues to reduce the auditory contamination of their vehicles, while still engaging with their premium consumers (Fallah, 2019). Moreover, there are ringtones with the sound of their AMG-series engines available to download on their website, which highlights the importance given to such auditory cues by these premium brands (Mercedes-Benz, n.d.; see also Ho & Spence, 2013; Sendra-Nadal & Carbonell-Barrachina, 2017). Similarly, to enhance the consumer experience, BMW uses active sound design to evenly distribute the engine sound across the interior of their vehicles (Goodwin, 2011).

Consumers associate some product sound cues with the perception of better quality. For instance, in the case of vacuum cleaners, higher sound levels are taken to signal a higher suctioning power (Spence & Zampini, 2006; Wolkomir, 1996). The role of auditory cues is more prominent, and hence understandable, for those products such as cars or vacuum cleaners, where sounds are more strongly integrated with the product's functionality (e.g., consumers can often judge the make of a car by the sound of its engine). But how do the sounds associated with products and brands contribute to the perception of more abstract brand associations such as premiumness?

In a product category such as beer, where auditory cues are not as closely integrated with the product performance, can a sonic cue communicate product quality? This is a relevant question, especially in today's cluttered and competitive market for beer (MarketWatch, 2020). For an average consumer, the typical beer consumption sounds are presumably the opening sound of the bottle/can and the pouring sound of the beer in a receptacle (e.g., glass, mug). To this, one might also want to consider the sound of foam, bubbles, and the sound of liquid moving/sloshing around inside the drinking receptacle (on the crossmodal interaction between bubble size and pouring sounds, see Roque, Lafraire, & Auvray, 2020). The interaction of a consumer with the sonic attributes of a beer is therefore, both brief and perhaps subtle, but potentially important (Betancur, Motoki, Spence, & Velasco, 2020). Here, we demonstrate that both the opening and pouring sounds associated with a beer can influence its premium appeal (at least when other variables remain equal given they may have interactive effects). Furthermore, opening sounds may play a special role in the beer experience inasmuch as they are heard first, and set product-related expectations that may then anchor a subsequent tasting experience (Spence & Wang, 2015; Wang & Spence, 2019).

First, we conceptualize premium brands and how brand premiumness may be perceived via multiple senses and present the research that has been published on the topic so far. Thereafter, we report two experiments designed to explore whether the opening and pouring sounds of beers can influence beer premiumness associations (Experiment 1), and the possible underlying semantic mechanisms which may explain this (Experiment 2).

1.1. Multisensory premiumness

In today's competitive marketplace, several brands use multiple sensory cues in order to stand out and differentiate themselves (Velasco & Spence, 2019a; Wiedmann, Hennigs, Klarmann, & Behrens, 2013). Whilst many brands have traditionally relied on visual cues (e.g., visual logo and visually-attractive packaging) in order to convey the appeal of luxury (van Rompay, van Hoof, Rorink, & Folsche, 2019), with the changing market place and technology, many are now trying to woo consumers by means of multisensory engagement instead (e.g., sonic, interactive, animated logos). A multisensory product design communicates the core brand message in a more powerful way and provides a

memorable experience to consumers, based on the consistent brand message through the different senses. Often premium brands capitalize on this advantage given that they have more means to do so, compared to commodity brands (Spence, 2016). For these reasons, both researchers and practitioners have become increasingly interested in the area of multisensory packaging design (see Velasco & Spence, 2019b), especially in the premium category (Sung, Crawford, Teah, Stankovic, & Phau, 2020). Relevant to the present study, there is some interest in how sonic cues may be used to differentiate premium brands (Pathak et al., 2017; Wiedmann et al., 2013). If sonic stimuli can be used to indicate premiumness, what are the properties in the acoustic cues (e.g., frequency, sound pressure levels) that signal it? The current paper explores these in the context of the sounds of beer packaging.

Premium beers are typically described as tasty and as having a distinctive flavour of hops (Gabrielyan, McCluskey, Marsh, & Ross, 2014). Quality and price are also key determinants in the perception of premiumness in beers and are linked to the composition of the beverage (Jacoby, Olson, & Haddock, 1971; Thomé, da Mata Pinho, Fonseca, & Soares, 2016). Relevant here, Thomé et al. (2016) reported a survey with 474 respondents focused specifically on the Brazilian market for luxury beer perception (adapted from the concept of luxury value perception or LVP). They found that financial value (FiV), functional value (FuV), Individual value (IV), and social value affected the perception of beer luxury. The authors stated a high correlation between FiV and IV, which is based on individual hedonism, as a personal utility, and interpersonal value. Furthermore, the correlations between FiV and FuV are interpreted by the authors in two ways: higher quality implies a higher price; and a higher price hints at the possibility of higher quality.

1.2. Sonic branding in food and beverages

In the absence of literature linking packaging sonic cues with beer perception[1], research from other product categories, in particular wine, may help understand how such sounds may influence product and brand perception (see Spence & Wang, 2015, for a review on sensory expectations based on packaging sounds).

When it comes to the sounds of opening and, where relevant, closure, Reynolds, Rahman, Bernard, and Holbrook (2018) studied the effect of the type of wine closure (natural, screw, synthetic, or glass) on the perception of wine quality (including the content of a wine and its container). The authors exposed participants to a wine tasting from four different opened bottles, which were sourced only from two different wines. Each of the four bottles were associated with a picture of a specific wine closure (natural cork, artificial cork, screwcap, and glass vinoseal). These researchers found that consumers tended to evaluate those wines having a cork closure more positively than wines under other closures. However, it should be noted that this study used taste and visual stimuli rather than auditory stimuli, as used in the current paper.

Cartiere (2004, as cited in Marin, Jorgensen, Kennedy, & Ferrier, 2007) reported that consumers perceive alternative wine closures to cork as cheaper, and that for the majority of their participants, screwcaps decreased the perceived price of wine (see also Marin & Durham, 2007; Marin et al., 2007, for studies with visual stimuli). It must be highlighted that when a plastic corked bottle is opened, it does not make the same sound as a natural cork, which appears to cause the perceived price differences. None of the previously cited studies used auditory stimuli (e.g., cork opening sounds) though, apart from Spence and Wang

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[1] There are anecdotal reports of the role of sound cues on beverage perception: "When Vietnamese people open a bottle of liquor or soda, they expect to hear a popping sound—like a muted version of a champagne bottle opening. The noise tells them that the liquid is good, and listening for it is part of Vietnamese drinking culture. "The 'pop' is important," a scientist in a white lab coat explains to me while holding a can of Jim Beam Cola, a product that the bourbon maker has developed for Asian markets." (Mitenbuler, 2015, p. 274).

(2017).

The consumer interaction with different wine closures, as a main component of wine packaging, varies dramatically at both the haptic and auditory levels. Indeed, the explosive sound of both types of cork (natural and synthetic) has been shown to promote a celebratory atmosphere (Spence & Wang, 2017). The participants in the above-mentioned study, tasted similar but different Argentinian Malbec wines, associated with the sounds of cork closure or screwcap. Interestingly, the popping sound of the wine cork was found to prime notions of quality and celebration appropriateness in participants. However, no significant differences were found in terms of the perceived wine intensity. Furthermore, after the pulling of the cork, the participants had a more positive mood and a preference for the wine that appeared to be under cork closure. Such results highlight the importance of a wine bottle opening sound, at least when this attribute is stressed, either because visual branding cues are not available, or else when prices are not known.

But what specific sonic properties of products may explain whether a product or a brand is considered as more premium than others? Are there innately premium sounds or is it all merely a matter of associative learning? On multisensory associative learning see Barenholtz, Lewkowicz, Davidson, and Mavica (2014) and Connolly (2014). To the best of our knowledge, little research has been conducted on this. However, one of the few studies that may help to shed some light on this issue comes from Lageat, Czellar, and Laurent (2003), which, although it does not focus on beer, does relate sonic properties with the concept of luxury. Lageat et al. (2003) linked sound cues and luxury hedonic perception in the clicking sounds made by cigarette lighters. The authors characterized the sound of lighters through seven descriptors, which can be categorized in two sets: sound pressure ("intense", "matte" and "resonant") and pitch ("high-pitch", "clicking", "fast", "even"). The participants perceived luxury as incorporating either a subtle clicking sound (with homogenous, matte, and low pitch sounds) or a 'flashy' clicking (strident or audible). The subtle clicking sound was compounded by a homogeneous and matte sound frequency. By contrast, the 'flashy' clicking was based on a higher sound pressure level (thus, louder), and heterogeneous sound frequencies. The authors' findings concerning the perception of luxury expressed through lighter sounds emphasise the importance of sound pressure and frequency in the development of sonic cues, and how these can affect the product design and the subsequent consumer experience. Lageat et al. (2003) provide an initial reference on those sound features that may shape the sound construction of premiumness.

2. The present research and overview of experiments

The notion of premiumness refers to a consumer's perception of the value of a product or service, based on numerous factors, such as quality, scarcity, and price (Lyons & Wien, 2018; Quelch, 1987). The concept of premiumness can sometimes be ambiguous and holds different meanings for different brands, product categories, and, perhaps, even cultures (Ko, Costello, & Taylor, 2019; Vigneron & Johnson, 2004). Though premiumness appears to be context-dependent, with cultural, social, and individual factors playing a role (Marin & Durham, 2007; Velasco & Spence, 2019a; Vigneron & Johnson, 1999, 2004), a general characteristic of premium brands is that they tend to command a higher price, promising the benefit of higher quality (Pombo & Velasco, 2019).

In the present study, we assessed the perception of beer premiumness as a function of packaging format (bottle vs can), interaction (opening vs. pouring sounds), and sound properties (sound pressure and frequency). Experiment 1 was designed to assess whether opening and pouring sounds, at different sound pressure levels (SPLs) and frequencies would influence participants' ratings of expected beer premiumness. We conducted a 2 (packaging format: can vs. bottle) × 2 (interaction: opening vs. pouring) × 2 (sound pressure: higher vs. lower) × 2 (frequency: higher vs. lower) within-participants

experimental design. Experiment 2 was formulated to evaluate the semantic space of the sounds (via semantic differentials) and thus, the underlying meaning associated with different sound cues.

We expected that frequency (higher vs lower) and sound pressure (higher vs lower) would influence the perception of brand premiumness considering their overall contribution to sound quality, as well as the underlying semantic associations which these attributes carry (Haverkamp, 2019; Ma, Wong & Mak, 2018). Frequency, sound pressure, among others, serve to construct what is defined by Lyon (2003) as sound quality. From the consumers' perspective, sound quality has been defined as "the acceptability of product sounds" (Lyon, 2003, p. 18).

We also expected that bottle-opening sounds would be perceived as more premium than can opening sounds considering the differences in terms of enjoyment that are associated with these formats (Barnett, Velasco, & Spence, 2016). However, we did not have any specific expectations in terms of which interaction with the beverage (opening or pouring) would be perceived as more premium.

2.1. Experiment 1

2.1.1. Methods

2.1.1.1. Participants. A total of 197 participants with normal hearing (140 females and 57 males) between the ages of 18 and 77 years (M = 35.75, SD = 12.81) took part in the study. The participants were recruited from Prolific Academic (https://www.prolific.co/) and were remunerated with £1 for taking part. The study was designed on Qualtrics (https://www.qualtrics.com), and lasted approximately 10 min. Both experiments were conducted following the Helsinki Declaration and the ethical guidelines at BI Norwegian Business School.

2.1.1.2. Apparatus and materials. Asahi Breweries (Tokyo, Japan) provided the pouring and opening sounds of both a beer can and a bottle. We manipulated relative frequency (-6 semitones, half-steps, for the lower frequency sounds) and sound pressure (−15 dB for the softer sounds) with the Audacity software (https://www.audacityteam.org/), of both opening and pouring beer sounds. A total of 16 auditory stimuli were created for the experiments (the stimuli can be accessed at: https://osf.io/ve3ap/).

The participants had to evaluate each sound (opening and pouring) on four attributes associated with the concept of premiumness: (1) quality, (2) authenticity, (3) premiumness, and (4) willingness to pay a premium price. In addition, we measured (5) liking. All dimensions were presented as 5-point Likert scale, anchored with "Strongly disagree" and "Strongly agree". Note that items (2) and (5) were reverse coded in order to check attentiveness.

2.1.1.3. Design and procedure. The participants were exposed to one stimulus at a time. They were instructed to play each sound from a standard audio control, with which they could control the volume, and they had to indicate to what extent they agreed with each of the mentioned statements corresponding to the five attributes of premiumness. Both the stimuli and the order of the statements were randomized. At the end of the experiment, the participants were asked whether they thought that they could identify whether a beer was premium, based on the sound cues alone, on a continuous scale (anchored with 'definitely not' to 'definitely yes').

2.1.2. Analysis

We conducted a 2 (packaging format: can vs. bottle) × 2 (packaging interaction: opening vs. pouring) × 2 (sound pressure: higher vs. lower) × 2 (frequency: higher vs. lower) repeated measures analysis of variance (ANOVA) to examine the effect of different variables on the premiumness and liking ratings. The analyses were performed in R statistical software (R Core Team, 2019).

2.1.3. Results

All the participants were regular beer drinkers, reported having a normal sense of hearing and passed the sound check (correctly typing in the word "carbonation" presented aurally). On average, the participants were relatively regular beer consumers ($M = 2.61$, $SD = 1.49$, where $2 =$ once a month, and $3 = 2$–3 times a month). At the end of the study, the participants reported that they were not sure whether they could tell whether a beer was premium or not based on its associated sounds ($M = 2.56$, $SD = 1.06$, where $2 =$ probably not and $3 =$ might or might not). As mentioned earlier, Velasco, Jones, King, and Spence (2013) demonstrated that participants in their study could distinguish the temperature of a drink on the sound alone, but the participants were not sure they could.

The premiumness items were aggregated to perform the analyses (Cronbach's Alpha = 0.86, lower = 0.85 and upper 0.87, 95% confidence boundaries). Then, we proceeded to study the effect of the sounds on the premiumness index and the liking ratings. The results are reported in Table 1 and Fig. 1.

The main effects of packaging format, interaction, and sound pressure were significant for both the premiumness index and the liking

Table 1
ANOVA results of Experiment 1. We present the F and p values, and the generalized eta square (ges) as a measure of effect size (Bakeman, 2005) for the premiumness index and the liking ratings. Significant results are highlighted in bold.

Factors	Premium			Liking		
	F	p	ges	F	p	ges
Packaging format	**180.01**	**<0.001**	**0.088**	**83.32**	**<0.001**	**0.033**
Interaction	**99.98**	**<0.001**	**0.064**	**41.26**	**<0.001**	**0.018**
Sound pressure	**13.30**	**<0.001**	**0.006**	**10.16**	**0.002**	**0.002**
Frequency	0.56	0.456	<0.001	1.47	0.227	<0.001
Packaging format: Interaction	**8.28**	**0.004**	**0.005**	0.06	0.812	<0.001
Packaging format:Sound pressure	0.90	0.345	<0.001	**4.14**	**0.043**	**0.001**
Interaction: Sound pressure	3.61	0.059	0.001	1.99	0.160	<0.001
Packaging format: Frequency	0.27	0.606	<0.001	0.73	0.393	<0.001
Interaction: Frequency	0.27	0.607	<0.001	0.17	0.683	<0.001
Sound pressure: Frequency	0.92	0.338	<0.001	1.84	0.177	<0.001
Packaging format: Interaction: Sound pressure	3.23	0.074	0.001	1.72	0.191	<0.001
Packaging format: Interaction: Frequency	0.36	0.548	<0.001	0.00	0.981	<0.001
Packaging format:Sound pressure: Frequency	0.35	0.556	<0.001	0.61	0.438	<0.001
Interaction: Sound pressure: Frequency	**6.79**	**0.010**	**0.001**	0.41	0.525	<0.001
Packaging format: Interaction: Sound pressure: Frequency	0.24	0.628	<0.001	1.06	0.304	<0.001

ratings. The participants evaluated the bottle sounds as more premium, and liked them more, than the can sounds. Additionally, they considered the pouring sounds as more premium, and liked them more, than the opening sounds. The higher-pressure sounds were rated as more premium, and were also liked more, than those with lower pressure.

In addition to these main effects, a 2-way interaction between packaging format and packaging interaction and a 3-way interaction between packaging interaction, sound pressure, and frequency on the premiumness ratings, were observed. In terms of the first, the results followed the main effects such that pouring sounds were considered as more premium than opening sounds for both bottle and package ($ps < 0.001$). As for the three-way interaction, we ran two independent 2-way repeated ANOVAs, one for opening sounds and one for pouring sounds. The results revealed a significant main effect of sound pressure for opening sounds, $F(1, 393) = 24.71$, $p < .001$, $ges = 0.010$, and a significant interaction between sound pressure and frequency for the pouring sounds, $F(1, 393) = 5.61$, $p = .018$, $ges = 0.002$. When the participants were presented with the lower pressure pouring sounds, those with a higher pitch were considered as more premium than those with lower pitch ($p = .017$). This was not the case for the higher pressure sounds in this condition ($p = .284$).

Finally, there was also a 2-way interaction between packaging format and sound pressure for the liking ratings. When the participants were presented with the sounds of a beer can being opened, higher pressure sounds were liked more than those lower pressure sounds ($p < .001$). This was not the case of the sounds of beer bottles ($p = .173$).

Participants evaluated the bottle sounds as more premium than the can sounds. This result is consistent with prior literature on the taste of beer as a function of packaging format (bottles or cans), the consumers' preference for bottles (Barnett et al., 2016), and possibly a reluctance towards aluminium cans amongst at least some consumers (Lefebvre & Orlowski, 2019). When it comes to the role of pouring sounds, it appears as consumers can derive information regarding the packaging material from the packaging interaction sounds (Spence & Zampini, 2006). In terms of the results of sound pressure analysis, these are relatable to those of Lageat et al. (2003), who, in their study of the perception of luxury associated with the sounds of lighters, found that some participants described luxury as relatively louder and clearer. Notably, we did not find evidence in our data in support of the idea that packaging sound frequency influences premium beer associations.

2.2. Experiment 2

To explore the semantic mechanisms underlying the associations between sound pressure, frequency, and premiumness, a second experiment was conducted. In this study, the participants had to evaluate the sounds on several semantic differentials, following the semantic differential approach (Osgood, 1964; Velasco, Woods, Marks, Cheok & Spence, 2016). The semantic differentials in the experiment evaluated aspects related to premiumness: conspicuousness, hedonism, and quality (Czellar, 2001; Vigneron & Johnson, 1999, 2004).

2.2.1. Methods

2.2.1.1. Participants. A total of 123 participants (35 males and 88 females) between the ages of 18 and 67 years ($M = 39.90$, $SD = 12.43$) took part in the study. The participants were recruited from Prolific Academic (https://www.prolific.co/) and were remunerated with £1 for their participation. The study was designed and conducted on Qualtrics (https://www.qualtrics.com) and lasted approximately 10 minutes.

2.2.1.2. Apparatus, materials, and procedure. The participants listened to the same stimuli used in Experiment 1. Each stimulus was evaluated using the semantic differential technique (SDT), which measures the connotative meaning of objects and concepts using a variety of polar
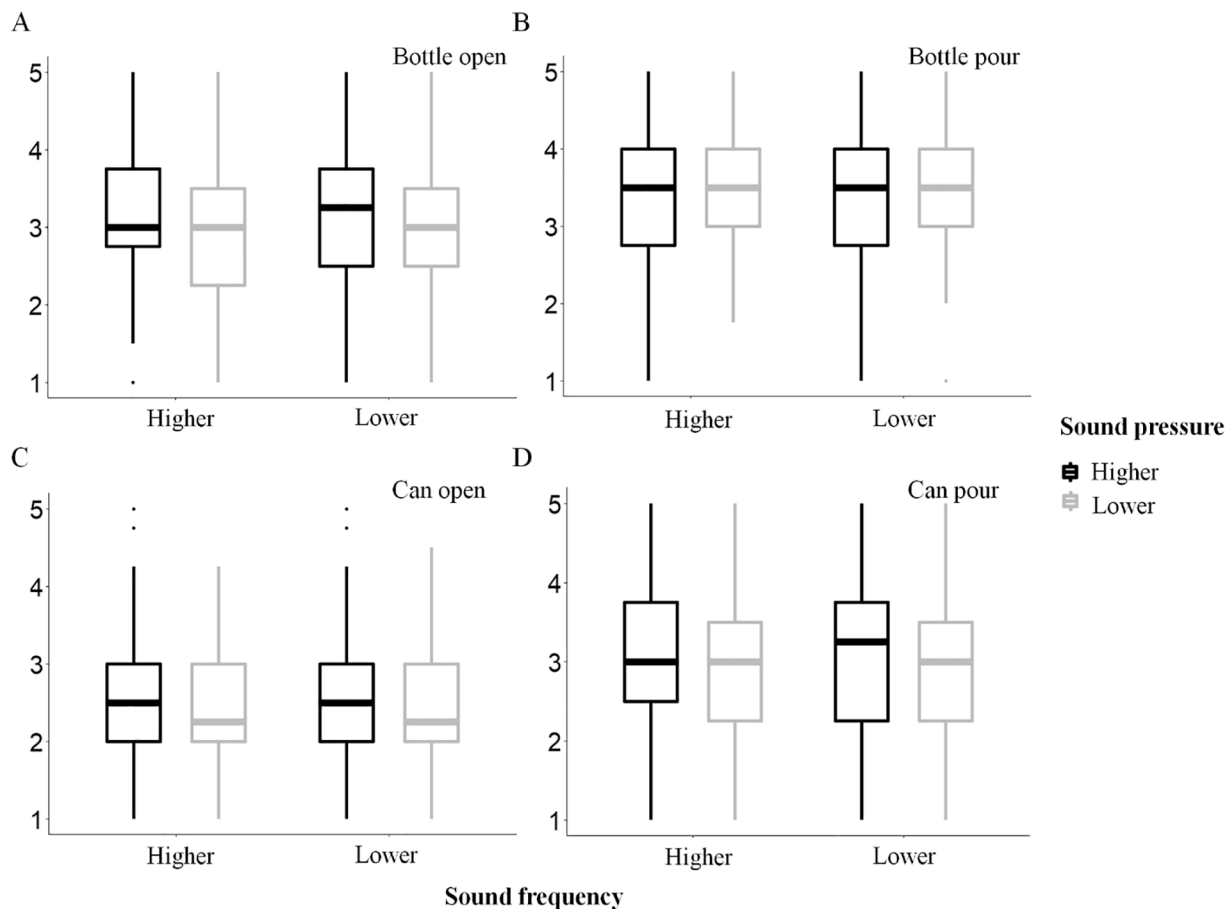
Fig. 1. Boxplots representing the premiumness ratings (5-point Likert scale, anchored with "Strongly disagree" and "Strongly agree") as a function of packaging (bottle in upper panels, and can in lower panels), interaction (opening in left panels, and pouring in right panels), as well as sound frequency (x axis) and pressure (colour coded) in Experiment 1.

scales. Based on previous research (e.g., Doyle & Bottomley, 2006; Fewster, Bostian, & Powers, 1973; Osgood, 1964), the present experiment used twelve pairs of polar adjectives for evaluation (1) nice-awful, (2) good-bad, (3) mild-harsh, (4) happy-sad; regarding potency (5) powerless-powerful, (6) weak-strong, (7) light-heavy, (8) shallow-deep; and regarding activity (9) slow-fast, (10) quiet-noisy, (11) passive-active, and (12) dead-alive.

Participants rated each stimulus on a visual analogue scale (VAS) ranging from 0 to 100, in 1-point intervals (Hayes, 1921). The scale was initially positioned at the middle (50 points). The stimuli and the polar-adjectives were randomized. Adjectives (1), (2), and (9) were reversed to check that the participants were responding attentively.

The procedure was similar to that of Experiment 1.

2.2.2. Analyses

A Varimax-rotated principal component analysis (PCA) was performed to identify key dimensions arising from the semantic differentials as a function of the stimuli. The analyses were conducted with IBM SPSS v. 25, and the PCA visualizations were created in the R Statistics' package {FactoMineR} (see http://factominer.free.fr/).

2.2.3. Results

The participants were regular beer drinkers (M = 3.06, SD = 1.45, where 3 = 2–3 times a month), and they stated that they were not sure whether they could tell whether a beer was premium or not based on its associated sounds (M = 2.29, SD = 1.06, where 2 = probably not, and 3 = might or might not).

The principal component analysis (PCA, see Fig. 2) revealed that two

components had eigenvalues over Kaiser's criterion of 1 and, in combination, explained 91.63% of the variance. Kaiser's rule support that the components with eigenvalues above 1 should be preserved since they have a greater explanatory power of the variance. The first and second components accounted for 80.74% and 10.89% of the variance, respectively.

The Varimax-rotated component matrix (see Table 2) indicates that most of the items were associated with the first dimension, whereas slow-fast, and to a lesser degree harsh-mild, were associated with the second dimension.

To further explore the possible meanings of the sounds that are related to premiumness, we considered the relationship between the premium ratings of the sounds obtained in Experiment 1 and the semantic differential ratings from Experiment 2 and conducted Kendall Tau's correlations (see Table 3).

In general, the more that a sound was associated with premiumness, the more alive, good, nice, and happy the participants evaluated it. This potentially suggests that valence may be a key element associated with the extent to which a sound may signal premiumness.

3. Discussion

Though brands recognize the importance of sonic branding, the research in this area is still relatively sparse (Graakjær & Bonde, 2018; Spence & Wang, 2015; Wang & Spence, 2019). A large body of research has explored the link between music/sound and taste attributes (e.g., Crisinel & Spence, 2009, 2010). However, to the best of our knowledge, research on the influence of sounds associated with the interaction with
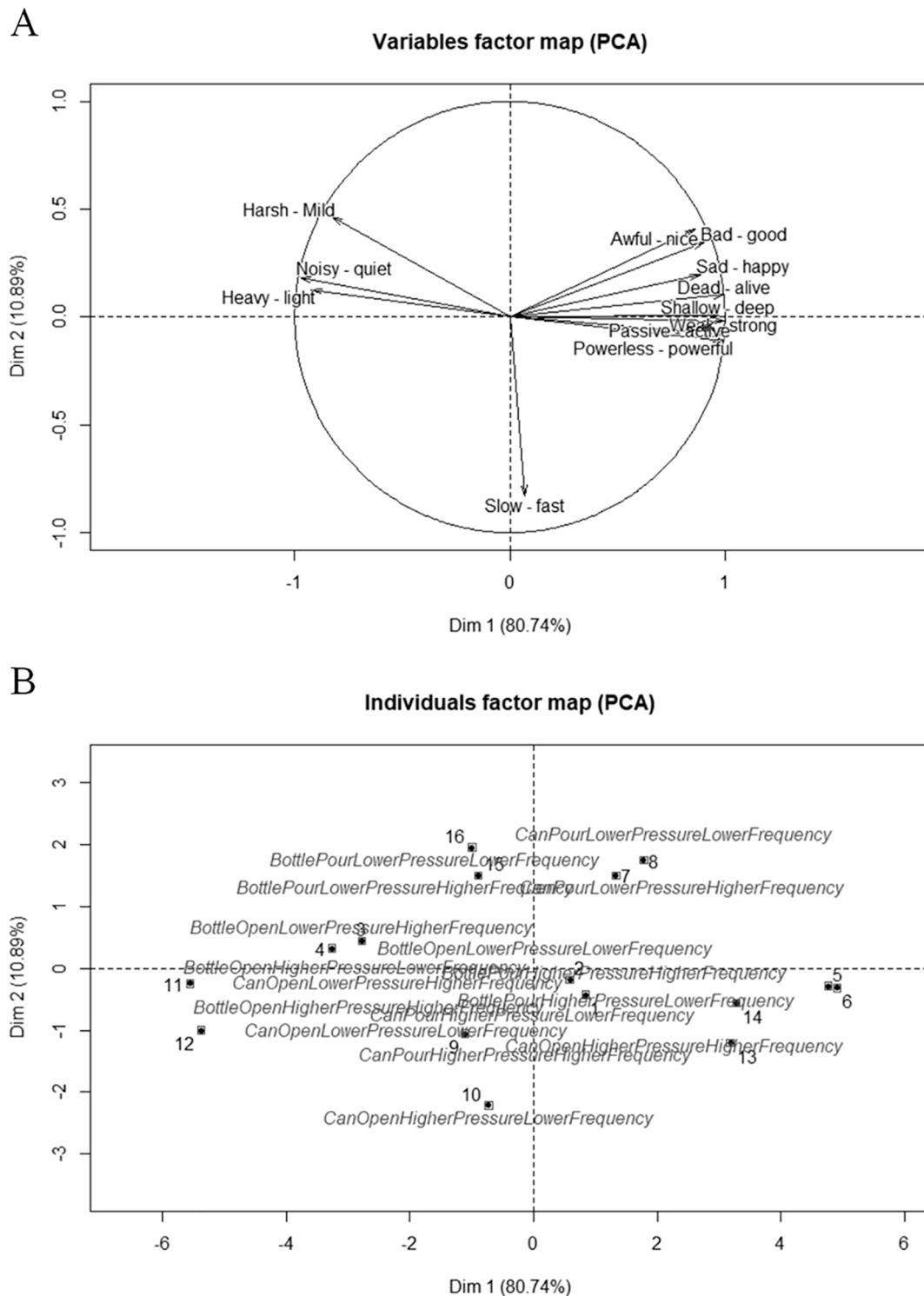
A

Variables factor map (PCA)

B

Individuals factor map (PCA)

Fig. 2. (A) Unrotated factor map of the semantic differentials and (B) unrotated factor map for the packaging sounds in Experiment 2.

beer packaging (e.g., opening and pouring sounds) and receptacles on premiumness perception is limited (Velasco & Spence, 2019b).

Opening and pouring sounds directly link a beer with a consumer at the time of consumption and are important ways in which brands can design consumer experiences. This is undoubtedly an under-researched area, especially in the context of beer packaging and, as such, would likely benefit from further exploration.

In the present research, participants in neither experiment reported that they thought that they would be able to discriminate the level of premiumness of a beer on the basis of sound alone. However, the results show which sonic cues they associate with premiumness. In summary, the participants perceived: 1) the opening sounds of bottles to be more premium than cans; 2) the pouring sounds to be more premium than the opening sounds (for both, cans and bottles); 3) the louder sounds as more premium than the quieter opening sounds. Altogether, these results indicate ways in which brands can different as premium through different touchpoints (e.g., packaging, ads) that involve a sonic component.

Table 2

Varimax-rotated component matrix in Experiment 2. Note that only one end of the scale (ascending) is presented.

Semantic differentials	Component	
	1	2
Dead - alive	0.997	−0.014
Passive - active	0.986	−0.134
Weak - strong	0.975	−0.196
Powerless - powerful	0.973	−0.225
Shallow - deep	0.961	−0.109
Noisy - quiet	−0.942	0.297
Bad - good	0.936	0.237
Awful - nice	0.903	0.304
Heavy - light	−0.901	0.235
Sad - happy	0.900	0.090
Harsh - mild	−0.765	0.558
Slow - fast	−0.027	−0.832

Table 3

Kendall Tau's correlations between the premiumness ratings from Experiment 1 and the semantic differentials from Experiment 2. Note that the Bonferroni correction was used at the value of 0.0042 ($p = 0.05/12$) and numbers in bold highlight the correlations that were significant following this threshold.

Semantic differentials from Experiment 2	Premium ratings from Experiment 1 – Kendall's Tau	Sig. (2-tailed)
Passive - active	0.517	0.0052
Dead - alive	**0.600**	**0.0012**
Shallow - deep	0.517	0.0052
Bad - good	**0.733**	**0.0001**
Harsh - Mild	−0.233	0.2074
Heavy - light	−0.350	0.0586
Awful - nice	**0.733**	**0.0001**
Noisy - quiet	−0.467	0.0117
Powerless - powerful	0.483	0.0090
Sad - happy	**0.600**	**0.0012**
Slow - fast	−0.017	0.9283
Weak - strong	0.483	0.0090

Packaging material (e.g., cork, glass, plastic) influences the perceived quality of beverages (Reynolds et al., 2018). The perceived quality has a high impact on consumers' willingness to pay (Marin & Durham, 2007), which is found to be lower with canned beverages (Lefebvre & Orlowski, 2019). In the present study, bottle sound cues were considered more premium than can sounds, consistent with what has been reported previously in the literature (Barnett et al., 2016; Spence & Wang, 2017). However, prior research has mostly used visual stimuli (rather than auditory) and wine (rather than beer) as a product (Spence, 2020). Moreover, we used real auditory stimuli provided by a beer manufacturer and manipulated the key auditory properties (frequency and pressure of bottle vs cans opening and pouring sounds) to arrive at these conclusions.

Although we take support from the studies conducted with wine, there are key differences between the perception of a wine vis-à-vis a beer (see Marin & Durham, 2007; Marin et al., 2007; Reynolds, Rahman, Bernard & Holbrook, 2018; Spence, 2020; Spence & Wang, 2017). For example, beer is considered a more social, youthful, happy, affordable, and group-oriented drink, whereas wine is perceived as a more sophisticated, classic, sacred, pleasant, and quality drink (Betancur et al., 2020; Marinelli et al., 2014). Due to these differences, the findings on wine bottles and receptacles may not be applicable to the beer market, and the results of the current paper may be more reflective of a beer consumer.

The higher perception of premiumness in the sound of bottles may relate to consumers' past experiences (e.g., social events with beer) and their corresponding sensory associations. The visual perception of packaging is one of the well-trodden paths to help establish an 'image mold', that is, an association between an arbitrary packaging shape and a brand or product category. For example, a Sapporo beer can or a Brahma beer bottle have become effective image molds for their respective brands (Barnett et al., 2016; Spence & Piqueras-Fiszman, 2012).

Premiumness was related to the semantic differentials of dead-alive, and the evaluative terms sad-happy, awful-nice, and bad-good. These results highlight the role of sound in valence and perceived quality. The pouring sounds, which may be some of the most frequent and longer sound interactions that drinkers have with beer, were in the space of positively-valenced concepts.

The carbonation of the beer when pouring is similar to other fermented beverages associated with celebration and special occasions (e. g., champagne or sparkling wines, Spence & Zampini, 2006; Spence & Wang, 2017). Celebration as a concept coincides with some of the values associated with premiumness, such as exclusive, expensive, and of higher quality. Furthermore, a beer opening with higher sound pressure, augments the perception of premiumness. Nevertheless, it has to be considered how sounds relate to visual cues, and how the latter may dominate under actual beer drinking situations.

Why should consumers associate the opening sounds as more premium? The reason may not be evident with the research that is currently available. However, consumers have been shown to associate the sound of a cork stoppered bottle popping as a sign of celebration (Spence & Wang, 2017) which provides an additional cue to consumers to 'like' such sounds more than the can opening sounds. Research also suggests that over time, consumers associate specific sounds with certain products, hence, consumers learn, connect and identify auditory cues with particular brands or goods. The prominent example of a company that has used such sonic associations with its brand is Coca-Cola. Coca-Cola has managed to establish a distinctive sequence of bottle opening, ice clinking and pouring sounds (Bronner & Hirt, 2007), which links to the brand in a highly competitive market. Similarly, consumers associate the pop of a cork with better taste and quality (vs a corkscrew opening, Spence & Wang, 2017), and it is likely that consumers use the same association (i.e., cork opening sound = better quality) for connecting the bottle opening (vs. the can opening sounds) with premiumness. Consistent with the prior literature, sonic cues are an essential part of the consumers' experience of luxury (Wiedmann et al., 2013) and can provide information about brand attributes (e.g., higher quality) (Spence & Zampini, 2007; Velasco & Spence, 2019a).

In this study, we also highlighted the critical role of sound valence on the perception of beer premiumness, and in the longer consumer interaction with the product (pouring). Consistent with prior literature, sonic cues related to packaging, its materials, and components have been found essential in the perception of premiumness (Pathak et al., 2017; Spence, 2016; Sung et al., 2020; Wiedmann et al., 2013).

At the practical level, how can brands utilize the results of the present study? Beer brands have multiple ways in which they can use sound to differentiate themselves in the marketplace. For example, they may change the thickness, form, and material of the aperture of bottles and cans, which will vary the opening and pouring sounds. Such sounds are part of both consumer-product interactions, as well as audio and audiovisual advertisements.

4. Limitations and future research

Both of the experiments reported here were conducted online. Though online experimental research using auditory stimuli is becoming increasingly common (e.g., Woods, Velasco, Levitan, Wan, & Spence, 2015), it nonetheless has potential limitations that should be acknowledged (e.g., there may be noise or unrelated stimuli in the background, though this is, of course, in some sense more ecologically-valid than assessing packaging sounds in silence). The experiment used only sound cues, excluding other perceptual stimuli which are often experienced in the real world, such as visual, taste and smell cues.

Considering that age is a key variable in sensory perception (Doets &

Kremer, 2016), future research may aim to evaluate the role of a person's age in sound-based brand associations. Another potential limitation is that some of the participants in our study could also be wine (or other beverage) drinkers, and it is possible that their associations are based on the sounds of other specific beverages or the category more broadly.

Beer sounds are not limited to those studied here. Other sounds that are part of beer branding include jingles, music, or sound references in advertising (including print advertisements with linguistic sound references) associated with beer brands. Similarly, some other dimensions of sound quality (e.g., perceived sound loudness, annoyance value, and amenity value, see Lyon, 2003) have not been studied. It has to be highlighted that there may be differences between expert and non-expert beer drinkers (Van Doorn, Watson, Timora & Spence, 2020).

Future research may test sustainable packaging beer designs, their sound construction, and perceived premiumness (e.g., glass bottle packaging, innovative bottle-closures with lower environmental impact).

5. Conclusions

We explored the importance of auditory cues associated with beer packaging in the perceived premiumness of beer. Our study provides evidence in support of the idea that packaging sounds can differentiate the premium beer brand. Key communications that focused on positioning the brand as premium, may capitalize on these findings by manipulating bottle and pouring sounds. A multisensory construct of beer premiumness, which emphasizes sonic cues associated with product-consumer interaction, is recommended to provide a fuller, higher value, product-brand experience. Brands may want to look for cues in different senses that allow them to design multisensory beer premium experiences (Spence, 2019; Velasco & Obrist, 2020). Hence, understanding how sounds associated with beer help to convey brand associations such as premiumness can be a key to differentiate in an ever-growing competitive market.

CRediT authorship contribution statement

Paula Almiron: Writing - original draft, Writing - review & editing. **Francisco Barbosa Escobar:** Investigation, Methodology, Writing - original draft, Writing - review & editing. **Abhishek Pathak:** Methodology, Writing - review & editing. **Charles Spence:** Methodology, Writing - review & editing. **Carlos Velasco:** Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization, Supervision, Project administration, Funding acquisition.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Asahi Breweries Ltd. partially funded this research.

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