**Expert Journal of Marketing,** Volume 11, Issue 2, pp. 91-117, 2023
 ISSN 2344-6773
http://Marketing.ExpertJournals.com

# Sounds like Branding: Cognitive Principles and Crossmodal Considerations for the Design of Successful Sonic Logos

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*The field of sonic branding has grown rapidly in recent years. While the majority of the developments in this area have thus far been led by practitioners, it is important to understand the cognitive principles underlying the appropriateness and efficacy of sonic branding in order to help develop design principles and practical guidelines that will help to move the field forward, particularly where a brand's distinctive sonic assets are concerned. This narrative historical review focuses on design considerations for one of the most common sonic assets, namely the sonic logo. Crucially, the question of how these sonic logos come to be associated with brands, and the extent to which their perceptual and affective qualities ought to match the attributes and personality of the brand, are experimentally tractable research questions. Principles drawn from the cognitive (neuro-)sciences, including the emerging field of research on crossmodal correspondences, are explored, providing actionable insights for those wanting to design successful sonic brands. The use of the semantic differential technique is also discussed as a means of systematically assessing the connotative alignment between a product, company, or brand and the distinctive sonic assets which together comprise the brand's sonic identity as a whole.*

***Keywords:*** *sonic logo, sound design, sonic branding, crossmodal correspondences, sound symbolism, semantic differential technique*

***JEL Classification****: M31, M32*

## 1. Introduction

There has been an explosive growth of interest in the subject of sonic branding, in the two decades since the publication of Daniel Jackson's (2003) seminal volume on the topic (e.g., Ballouli and Heere, 2015; Ciccarelli, 2019; Groves, 2009; Gustafsson, 2015; Powers, 2010; Ritson, 2021; Wong, 2019). Numerous volumes have been published in the intervening years, written primarily by practitioners working in the field (e.g., Beckerman and Gray, 2014; Minsky and Fahey, 2017; Groves, 2011; Treasure, 2007). The rise of

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Article History:
Received 19 May 2023 | Accepted 14 August 2023 | Available online 8 September 2023

Cite Reference:
Keller, S. and Spence, C., 2023. Sounds like Branding: Cognitive Principles and Crossmodal Considerations for the Design of Successful Sonic Logos. *Expert Journal of Marketing, 11*(2), pp.91-117.

professional organizations has also contributed to the recognition of sonic branding as a discipline in its own right. For instance, the Audio Branding Academy (ABA), founded in Hamburg in 2009 (http://audio-branding-academy.org/), is an internationally-recognized professional networking and research organization, offering semi-annual conferences where researchers and practitioners come together, discuss best practice, and reflect on the rapid evolution of the field. Sonic branding has further been legitimized by its appearance in marketing texts, where entire chapters have been devoted to the subject (e.g., Romaniuk, 2018; Wright, 2019), and in recent academic publications, perhaps most notably in The Oxford Handbook of Music and Advertising (Deaville, Tan, and Rodman, 2021). The rise of sonic branding categories in advertising/design awards shows speaks not only to the growing number of brands that have chosen to invest in creating sonic identities, but in the recognition that the design and use of sonic brands is an endeavour which can aspire to excellence as judged by a panel of industry experts. In 2023, WPP (one of the largest global advertising holding companies) acquired AMP, a Munich-based sonic branding agency, clearly signaling that sonic branding is now considered "serious business" (WPP, 2023).

Advancements in audio-only/audio-first technologies are another driver of the adoption and perceived importance of sonic branding in recent years. The rapid emergence of voice-activated devices such as Alexa and Siri have undoubtedly helped to focus the attention of companies on the question of what their brands sound like (or more importantly, what their brands should sound like), given that the consumer's interaction with brands in these digital environments is primarily driven by sound rather than sight (e.g., Argo, Popa, and Smith, 2010; Farinella, 2009; Hein, 2006; Ogilvy Consulting, 2019; Pickup, 2017; Volker and Milton, 2019).

### 1.1. Defining 'Sonic Branding' and 'Distinctive Brand Assets'

Inevitably, the question of what a brand should "sound like" has led to a focus on the design principles that are used to create a sonic brand. Cognitive researchers and marketing practitioners alike would do well to acknowledge the role of cognitive associations and perception in seeking to answer that question. If a brand is not simply what a company tells their consumers that it is, but is rather what the consumer perceives it to be (Neumeier, 2015), then branding (and by extension, sonic branding) can be framed as an exercise in perception management that attempts to align company propositions with the experiences of the consumer. In other words, "…the consumer meaning of a brand is manifested as an integrated perception that is derived from experience with, and messages about, the brand (Franzen and Moriarty, 2015, p. 5)." It therefore follows that a consumer's sonic experience of a brand also plays an important role in helping to shape their perception of, and about, the brand as a whole. If, as Neisser (1976) once suggested, perception is where cognition meets reality, then brands really need to recognize that the sounds they use (and hence are associated with), and the resulting impact that their cognitive associations can have on the consumer, play a vital role in brand building.

The emphasis here when building a sonic brand is on the design of sonic experiences (note the plural) that can occur at multiple points of the consumer's interaction (aka "touch points") with the brand: The music and messaging heard after calling a help-line; the distinctive soundscapes that play in the background in retail establishments; the functional sounds that provide feedback as part of a user interface; the soundtrack and/or voiceover used in an advertisement; the sound that a product makes when used by the consumer. Taken together, and with consistent use over time, these sonic experiences ultimately come to define a sonic brand. As Singh (2014, p. 32) put it: "Sonic branding is more than a piece of music or sound that the brand uses in marketing. When really analyzed, it is everything that the brand stands for in the audio medium". Or, as Bruner (1990, p. 94) put it a little over three decades ago: "Music is not simply a generic sonic mass, but rather a complex chemistry of controllable elements".

One of the goals of branding is to help provide distinctiveness, enabling the brand to capture attention and stand out from its competitors (Romaniuk, Sharp, and Ehrenberg, 2007). Similarly, the goal of sonic branding is to create a "distinctive sound," one that results in not just an experience of the brand, but an experience that is memorable, and which can be uniquely owned by the brand. It's one thing to recognize a familiar brand sound; However, it's quite another to correctly identify the brand that is linked to that sound. Here, a distinction can be drawn between the concepts of "sonic branding" and "distinctive brand assets." The former refers to the process of creating a consistent sonic experience of the brand across multiple consumer touch points, while the latter refers to specific types of bespoke sound stimuli that either alone or in combination contribute to a recognizable sonic identity (Romaniuk, 2018). These distinctive sonic assets can potentially include sonic logos (the aural equivalent of a visual logo; van Leeuwen, 2017), any distinctive product sounds (the sound a product associated with the brand might make), voice (the human or AI-generated

voice used in brand communications; Spence, 2022), functional sounds (sonic cues used as a part of a user interface to provide feedback), brand themes (typically music tracks, anthems, and/or jingles exclusive to the brand), soundscapes (sound or a combination of sounds associated with an environment), and more.

The rise in acceptance and importance of sonic branding in recent years has also led to the growth of those companies specializing in measuring the degree to which distinctive sonic assets reflect brand values and identity, and how the use of these assets might impact other important branding parameters, which can include recall, salience, mental availability, purchase intent, and equity (Allan, 2007; Alpert, Alpert, and Maltz, 2005; Anglada-Tort, Schofield, Trahan, and Müllensiefen, 2022; Bolls and Lang, 2003; Dubé, Chebat, and Morin, 1995; Potter and Dillman Carpentier, 2007; Gustafsson, 2015; Lantos and Craton, 2012; North and Hargreaves, 2008; Rodero, 2015; Vidal-Mestre, Freire-Sánchez, Calderón-Garrido, Faure-Carvallo, and Gustem-Carnicer, 2022). Much of this testing has been focused on sonic logos, as this particular distinctive asset is often considered the cornerstone of a sonic brand. Veritonic and SoundOut (two audio testing companies, based in the US and the UK, respectively) have not only developed several sophisticated explicit methodologies to measure and predict the effectiveness of sonic logos, but also release annual audio logo indexes that use these measures in order to rank sonic logos based on their performance (SoundOut, 2022; Veritonic, 2022).

The field of sonic branding has seen marked and sustained growth over recent years (e.g., Rodero and Larrea, 2021), including the rise of companies dedicated to measuring its effectiveness. However, the evaluation and understanding of the cognitive associations and behavioural/perceptual effects associated with the design of a distinctive sonic asset (and the sonic brand as a whole) has increasingly fallen behind this practice-led field of endeavour (see Graakjær and Bonde, 2018; and Spence, 2011b).

### 1.2. Review Outline

In this narrative historical review, the authors explore the field of sonic branding, focusing on design considerations for the development of distinctive sonic assets and, more specifically, sonic logos. Though sonic branding has grown in recent years, the design of a sonic brand has traditionally been more of an art than a science. Contrasting similarities between visual logo and sonic logo design, we provide a framework for a cognitive neuroscience-based approach to the creation of these distinctive sonic assets. While the success of sonic logos are undoubtedly not dependent on design alone, their construction could undoubtedly benefit from the application of the cognitive principles and crossmodal considerations suggested in this review: namely, the use of melody to build memory structures, testing for brand fit, appeal, recall, and emotional associations. Finally, the semantic differential technique (SDT) is explored as a potentially useful tool with which to assess the cognitive and crossmodal associations that can ultimately help to inform sonic design decisions (such as concerning the efficacy of a sonic logo). We start, though, by taking a closer look at the world of sound design.

## 2. Sonic Branding as Sound Design

### 2.1. Sound Design in Cinema and Theatre

When discussing the distinctive sonic assets that inform and establish a sonic brand, it may be helpful to consider their creation as an exercise in "sound design". The latter phrase is perhaps most strongly associated with contemporary cinema, having first been introduced in 1979 by Walter Murch, a sound editor and mixer, when describing his work in enhancing the sonic experience of the Francis Ford Coppola film, *Apocalypse Now* (Whittington, 2014). Today, the practice of adding sound effects to a performance has become a recognized occupation, with sound designers credited in films and even awarded for their excellence in their craft.

To be sure, this application of sound design to theatre and film performances was in vogue long before the term was coined. For instance, the Italian composer, Luigi Russolo, author of *The Art of Noises* (1913/1986), outlined the importance of abstract sound in music compositions and theatre. To achieve that goal, Russolo created a series of mechanical devices (which he named "intonarumori") for use in performances. The intonarumori were acoustic noise generators that offered the ability to manipulate the pitch and dynamics of the sounds that they created, an early precursor to more sophisticated techniques that would later evolve with the introduction of analogue and digital recordings of sound effects, as well as the use of electronic devices and digital software that allowed for their creation and manipulation. Technology has

allowed sound designers to develop sophisticated techniques that are not only effective in reproducing sounds that are literally associated with their visual counterparts (e.g., hearing footsteps as we observe someone walking), but also to suggest audiovisual metaphors and emotional connections (Fahlenbrach, 2008).

### 2.2. Communicating Emotion through Sound

In his handbook of sound design practices, David Sonnenschein (2001) suggests a framework to help designers create "mental archetypes" capable of conveying emotional and narrative themes. By considering the crossmodal and linguistic metaphors that particular sounds might evoke, as well as *a priori* meaningful symbols that may be associated with certain sounds, a sound designer can not only convey sonic information about what a viewer is seeing, but evoke an emotional context and narrative as well (Cohen, 1993; Görne, 2019). Consider, for example, the analysis of horror movie soundtracks reported by Trevor and colleagues (Trevor, Arnal, and Frühholz, 2020), in which the acoustic profiles of horror films were shown to exhibit a similar sonic profile to that of screams: A high level of auditory roughness is typically perceived as having a negative valence (see also Blumstein et al., 2010; Di Stefano and Spence, 2022). For instance, in a famous scene from Hitchcock's 1963 film, *The Birds*, a horrifying noise was obtained using an early electronic instrument, the 'Trautonium'. According to Wierzbicki (2008), this device provides a rich set of nonlinear auditory characteristics. Noting the affective contrast between speech and noise, one reviewer for the *Christian Science Monitor* observed at the time that the "interplay of brittle humans and predatory birds is developed as a kind of miasmic anti-music, aimed at eye and ear" (Chapin, 1963), while the film critic for the *Los Angeles Times* wrote that the bird noise "scratches you like a fingernail across glass" (Scheuer, 1963).

### 2.3. Product/Brand Name Sound Design

Just as a film or theatrical performance can be enhanced by sound design, brands have come to recognize that the consumer experience with their products and user interfaces can be enhanced through by the use of functional sound and sonic cues (see Spence and Zampini, 2006, for a review). As a result, the field of sound design has become an important consideration when shaping a consumer's experience (and by extension, their perception) of a brand. Over the years, extensive research has been conducted on the design, and meaning, of a wide variety of diagnostic product sounds (e.g., Jekosch, 2005; Lageat, Czellar, and Laurent, 2003; Özcan, 2014; Zampini, Guest, and Spence, 2003). The sounds of packaging have also been studied extensively (see Alexander, 2021; Byron, 2012; Jordan, 2000; Salgado-Montejo, Maya, Velasco, and Spence, 2014; Spence and Wang, 2017; Spence and Zampini, 2007; and Wang and Spence, 2019, for a review). Engine sounds (e.g., for motor vehicles) and the sounds that produce sonic associations with luxury have also been studied extensively by psychoacousticians around the world (e.g., see Alexander, 2021; Hull, 2023).

The assessment of those voice qualities that best represent a brand has also started to attract the attention of researchers (Barcelos, Dantas, and Sénécal, 2018; Chebat, Hedhli, Gélinas-Chebat, and Boivin, 2007; Ciccarelli, 2019; De Keyzer, Dens, and De Pelsmacker, 2017; Dytz, Lima, and Tonetto, 2012; Ho and Spence, 2013; Kurinec and Weaver, 2021; Lehmann, 2008; Lewis, Fretwell, and Ryan, 2012; Martín-Santana, Muela-Molina, Reinares-Lara, and Rodríguez-Guerra, 2015; Motoki, Pathak, and Spence, 2022; Pagani, Racat, and Hofacker, 2019; Strach, Zuber, Franklin Fowler, Ridout, and Searles, 2015; Tonetto and Trevisan, 2012; Westermann, 2008; Wheatley and Brooker, 1994; cf. Leongómez, Mileva, Little, and Roberts, 2017). Additionally, there has been a parallel development of sound symbolism research on the design of brand names (and by extension, the sound of the brand name when spoken; e.g., see Abel and Glinert, 2008; Carnevale, Lerman, and Luna, 2010; Erlich, 1995; Klink, 2000; Van Doorn, Paton, and Spence, 2016; see Motoki, Park, Pathak, and Spence, 2022, for a recent review).

### 2.4. Designing Functional Sounds

The development of a plethora of apps, kiosks, card readers, and digital interfaces has helped to focus more attention on the design of "functional sounds," which include auditory icons, alerts, and warning signals (e.g., Belz, Robinson, and Casali, 1999; Gaver, 1986; Graham, 1999; Ho and Spence, 2005; Lucas, 1995; Oyer and Hardick, 1963). These brief sounds are typically used to capture attention and provide auditory feedback to the user regarding the performance of tasks, often paired with additional haptic and visual cues. These types of functional sounds are judged to be successful to the extent that they achieve their intended use while at the

same time being easily heard and interpreted in sonically-complex operating environments (Baldwin, Spence, Bliss, Brill, Wogalter, Mayhorn, and Ferris, 2012; McKeown, 2005; McKeown and Isherwood, 2007). In addition to ensuring attentional capture and optimizing feedback, functional sound designers should attempt to create sounds that are not only functional, but which also convey meaning to the user (both semantic and affective) through associations and/or behavioural imperatives in an intuitive manner (cf. Ho, Reed, and Spence, 2006). Similar to the way in which sound designers use sound to evoke emotions in the context of a film, evoked emotions are also a primary concern for the designers of sonic experiences, particularly as the emotions elicited by sound may be transferred to a brand by association (Manchón, 2019; Scott, Sheinin, and Labrecque, 2020; Zander and Hartman, 2010; see also Spence and Di Stefano, in press, on the notion of sensory translation).

### 2.5. Designing Brand Sounds

It is no surprise then that the design of the sounds that are used in association with a brand (e.g., packaging, voice, brand names, functional sounds, etc.) all serve to create a perception of the brand in the mind of the consumer. Given the role of perception in brand building, where cognitive/crossmodal design thinking can help align brand intent with consumer perception (Gelici-Zeko, Lutters, ten Klooster, and Weijzen, 2012; Motoki, Park, Pathak, and Spence, in press; Pathak, Velasco, and Spence, 2020; Ridgway and Myers, 2014; Wu, Huang, and Wang, 2010), the design of a sonic brand isn't limited to a preoccupation with aesthetics and/or the functionality of sound, but also to how an intentional approach to design contributes to the creation of a memorable, consistent, distinctive, universal, congruent sonic identity for the brand (Singh, 2014). It is here that an opportunity exists for research within the cognitive sciences to contribute to the design of distinctive sonic assets and to the field of sonic branding as a whole.

As we explore these concepts in more detail, we will turn our attention to design considerations for what is perhaps the most recognized distinctive sonic asset in the sonic branding toolkit: namely, the sonic logo. Coca-Cola's 2006 five note sonic logo was lifted from a brand theme motif developed for their "Happiness Factory" campaign, and later adapted for a variety of consumer touch points. Beyond its use in commercials, Coca-Cola embedded the sonic logo into branded audio content ("Wavin' Flag", the 2010 World Cup anthem by Somalian artist K'Naan, and the Mark Ronson/Katy B anthem, "Anywhere in the World," being just two examples), worked with Dolby to feature the sonic logo in a Dolby Surround Sound trailer played in movie theaters, and even used it at point of sale, where UPC scanners would "beep" the five note motif when it read the barcode on Coca-Cola products. Like Coca-Cola, McDonald's five note sonic logo was drawn from the melody of a brand theme developed as part of a campaign created by Munich based advertising agency, Heye. As part of the worldwide rollout, McDonald's enlisted the help of Justin Timberlake and producer Pharrell to record a version of the theme, which was rolled out as a new single from the artist. The sonic logo (couple with the sung phrase, "I'm lovin' it") has been translated into multiple languages and adapted to thousands of music tracks commissioned by the brand. In 2019, Mastercard heralded the arrival of their new sonic identity, based on a six-note motif which was used to develop an extended brand theme. Beyond the textbook uses of their sonic identity in commercials, across digital channels, and at point of sale (adapted to work as the confirmation tones played when triggered from credit card readers), Mastercard has garnered a reputation for using their sonic logo in a number of interesting ways (e.g., multisensory dining experiences where the brand theme greets diners, and the release of a record album where artists were commissioned to create songs building on the Mastercard sonic logo).

## 3. Visual and Sonic Logos: Contrasts and Comparisons

Emblems, symbols, and signature marks have been used throughout history to identify and differentiate families, tribes, countries, and craftsman. Crests and colours provide early examples of the attempt to differentiate groups, countries, kingdoms, and property by means of the use of visual marks. Indeed, the modern concept of "branding" (i.e., the use of symbols, typography, and other distinctive identifiers to differentiate a product or company) is rooted in the centuries-old practice of marking property with unique symbols so as to identify the owner (Moore and Reid, 2008). In fact, the term "brand" is derived from the Old Norse word "brandr," meaning "to burn," referring to the practice of making a mark with a hot iron to show ownership or quality of property (Online Etymology Dictionary, n.d.).

Nowadays, brands often go to great lengths to design, protect, and promote their own distinctive brand assets. Visual logos, in particular, are used to reflect a brand's history and values, and to help consumers quickly and easily recognize and remember the brand in the increasingly-competitive marketplace. In a similar fashion, sonic logos (sometimes referred to as audio logos, sound logos, mnemonics, 'sogos', or 'mogos') are designed to do the same, presenting to the customer's ear what visual logos offer to their eyes: a short sequence of notes, sound effects, and/or vocalizations that, when heard, brings a brand top-of-mind. Sonic logos, just like their visual counterparts, can be legally protected as copyrights and trademarks (Gangjee, 2018; WIPO, 2007a, b). Trademarking visual and sonic assets, and considering them as intellectual property (IP), is common, but it is not a given that every asset can be protected. Consider Cadbury's attempt to trademark their use of purple in their visual marks and packaging (Bowcott, 2013), or the attempts by Harley Davidson to trademark the 'potato-potato-potato' sound of their motorcycles (Sapherstein, 1998; see also Anon., 2021), neither proving especially successful.

Given the similarities, one might consider the evaluation of visual logos as a good starting point when thinking about how to evaluate their auditory counterparts (e.g., Airey, 2010). In the former case, simplicity and elegance of design are often stressed as important characteristics. The ease and extent to which the design captures people's attention, while at the same time helping to distinguish one brand from another, are also considered relevant design features. In addition to distinctiveness and memorability, designers are also concerned with how the semiotics of their visual design communicates key brand attributes, making sure that the resulting logo fits (i.e., is congruent with) the brand (e.g., Bottomly and Doyle, 2006; Jain and Pasricha, 2017; Ranaweera and Wasala, 2020; Wallace, 1991; Yeoh, Han, and Spence, 2023). Like visual logos, successful sonic logos easily capture the listener's attention, build memory structures and distinctive brand associations, communicate brand attributes, and exhibit a high degree of brand congruence (Krishnan and Kellaris, 2021; Mas, Bolls, Rodero, Barreda-Angeles, and Churchill, 2020; Wazir and Wazir, 2015; see also Peters Rit, Croijmans, and Speed, 2019).

Radio provided fertile territory for early research into sonic logos, as demonstrated in McCusker's (1997) case study of Radio Scotland's on-air identity, which can be considered as one of the earliest academic approaches to studying the design an audio logo. Additionally, one of the earliest examples of commercial sonic logos were the "interval signals" that radio broadcasters would use to help establish the broadcaster's identity with the audience who were listening. In the absence of any kind of visual identifier for a radio audience, these interval signals were played at various points during the broadcast, typically consisting of a short series of sounds or tones. Perhaps the most famous example of these interval signals are the NBC (National Broadcasting Company) chimes. Originally a seven-note sequence launched by the network in 1927 (Harris, n.d.), it would later be shortened to three notes: G-E-C. This three-note sequence is still used today, nearly 100 years later, as the sonic signature for the network.

Given that visual logos are an important component of building a recognizable brand, and given the similarities both in form and function of between visual logos and sonic logos, marketers would do well to consider the role these distinctive sonic assets could play in brand building and consumer perception.

## 4. Sonic Logos: Memorability, Emotion, and Sensory Appeal

When it comes to building memory structures, melodies have been found to be quite successful in establishing mental associations, in part due to music's ability to evoke memories (Barrett, Grimm, Robins, Wildschut, Sedikides, and Janata, 2010; Belfi, Karlan, and Tranel, 2015; Olenski, 2014; Salakka, Pentikäinen, Mikkonen, Saari, Toiviainen, and Särkämö, 2021; Schaefer, 2017), and in part due to our susceptibility to "earworms" ("ohrwurms" in German; see Floridou et al., 2012; Jakubowski, Finkel, Stewart, and Müllensiefen 2017). The most iconic sonic logos are melodic, consisting of a short musical motif, typically five to six notes in length, and around three seconds long (see Bonde and Hanson, 2013; May, 2019). The melodic motifs used as sonic logos for Intel, McDonalds, T-Mobile, Coca-Cola, Mastercard, StateFarm, CBS, and Shell are all examples of short, five to six note sonic logos.

As mentioned in Section 2.5, certain of these melodic-based sonic logos were not originally designed as short mnemonic devices, but were rather shortened versions of longer brand themes, as was the case of McDonalds (where the five note sonic logo was "lifted" from the much longer "I'm Lovin' It" brand theme (see Graakjaer, 2019) and Coca-Cola (where the pre-2016 five note sonic logo was part of a longer musical

composition, originally created for their "Happiness Factory" television campaign, and used in a variety of adaptations; see Jackson, Jankovich, and Sheinkop, 2013).

At other times, however, the melodic design of sonic logos has been much more intentional, often taking a cue from other distinctive brand assets. For example, the five notes of the Intel sonic logo (referred to as the "Intel Bong") were designed by Walter Wersowa to reflect the syllables and vocal intonation of the brand's verbal positioning statement, beginning with a downbeat "bong" note, and followed by four notes matching the phrase, "Intel Inside" (Kaufman, 1999). Similarly, Lance Massey took cues from the original 1989 Deutsche Telekom visual logo when designing T-Mobile's sonic logo. He based his choices for notes on an algorithmic approach, where he assigned the musical value of middle C (the tonic) to a grey square in the visual logo, and a musical value of E above middle C (the mediant) to the pink T in the visual logo. Ultimately the visual and sonic logos converged as a pattern of five symbols, represented by five notes: three tonic notes, followed by the mediant, and then ending on the tonic: c-c-c-E-c (Allan, 2022).

Constructing sonic logos to reflect the syllables of a brand name or brand claim (i.e., a slogan or tagline) may also offer another advantage: Namely, the ability to add lyrical content that further helps to cement the association with the brand and the melodic motif. The sonic logos of Expedia.com, Farmers Insurance, Liberty Insurance, and State Farm provide just a few examples that include these lyric identifiers. While this perhaps makes a sonic logo resemble more of a "jingle," and is frowned upon by some sonic branding practitioners (see Fahey, 2022), there appears to be some evidence that including the name of the brand (either spoken or sung) as part of the design of a sonic logo helps to build association and recall in the mind of the customer (Veritonic, 2021), which could be advantageous, at least when introducing a new sonic logo to consumers.

Melodic sonic logo designs also allow for a degree of adaptability in their application. If the memory structure of a sonic logo is tied to the melody, it's possible to maintain the integrity of the association between the brand and the musical motif, while at the same time changing the pitches, timbres, and tonality of instrumentation used to express the melody. This allows for the sonic logo to be adapted to fit the emotional context of the brand communication, or even adapted to suit specific cultural or situational contexts. Note here how AI solutions already exist that can automatically curate user playlists to suit a listener's musical preferences, personality, or emotional/mood states (Anand, Sabeenian, Gurang, Kirthik, and Rubeena, 2021; Ayata, Yasian, and Kamasak, 2018; Lee, Höger, Schönwiesner, Park, and Jacoby, 2021; Li and Hu, 2020). In fact, this approach is used commercially in the recommendation algorithms for music streaming services such as Pandora and Spotify. As such, it's not difficult to imagine a future where, based on listening data, biometrics, and other online behaviours, sonic logos might be modified to match the personality and/or preferences, of the consumer, while at the same time maintaining the recognizability of the motif for anyone else who might be listening (cf. Anderson, Gil, Gibson, Wolf, Shapiro, Semerci, and Greenberg, 2020).

Beyond melody, Mas (2019; Mas, Bolls, Rodero, Barreda-Ángeles, and Churchill, 2020) analysed sonic logos from the point of view of acoustic features, orienting responses, emotions, and brand personality. These researchers tested 18 sonic logos created by crossing (intensity – fade-up, fade-down, or constant, pitch – ascending, descending, or constant, and pace – fast vs. slow pace) in a parametric manner in a laboratory study. Mas et al. documented a significant increase in electrodermal activity associated with fast-paced sonic logos while a decrease in heart rate was associated with slow-paced long sonic logos instead. What is more, fade-up, pitch-ascending fast sonic logos were rated as more exciting while descending-pitch logos were rated as more pleasant (see also Bonde and Hansen, 2013). There is also evidence that the particular sound (i.e. timbre) of the instruments used when creating sonic logos can influence a consumer's perception of the brand's personality (Puligadda and VanBergen, 2022). According to a series of studies conducted by the latter researchers, these auditory effects on perceived brand personality were found to be just as influential as a brand's visual logo design.

Designers also need to consider the extent to which a sonic logo can influence emotional associations with a brand. Here, it may be helpful to consider the phenomenon of emotional transfer – namely that an emotion or feeling that is induced by, and/or associated with, music (see Spence, 2020a) will carry over (i.e., transfer) to influence the customer's perception of whatever else happens to be presented or evaluated at around the same time (e.g., Galmarini, Paz, Choquehuanca, Zamora, and Mesz, 2021; May and Hamilton, 1980; Müller and Kirchgeorg, 2011; Reinoso-Carvalho, Dakduk, Wagemans, and Spence, 2019; Reinoso-Carvalho, Gunn, Molina, Narumi, Spence, Suzuki, ter Horst, and Wagemans, 2020; Reinoso-Carvalho, Gunn, ter Horst, and Spence, 2020; Zander, 2006; Zentner, Grandjean, and Scherer, 2008). The practical implication of this

transfer is that our positive experiences with music (and by extension, sonic logos) can help to improve other experiences we may be having concurrently: The better the beer tastes, the finer the art looks, and the more attractive other people appear, etc. (see Spence, 2020a, for a review, of what is sometimes referred to as the 'beer goggles' phenomenon). The implication here being that the positive appeal of a sonic logo might transfer to deliver positive brand associations. A recent study by Anglada-Tort, Schofield, Trahan, and Müllensiefen (2022) would appear to support that reasoning, demonstrating that pairing a familiar musical cue with a product can have a positive effect on the customer's brand choice.

One other point to note here is related to recent evidence from Scott et al. (2022) showing that happy sonic logos were more effective (in terms of enhancing the consumer attitude toward the brand) when placed at the end of an advert, whereas sad sonic logos should be placed at the start of an advert. In this case, the researchers assessed online adverts for Bluetooth loudspeakers or a Ford automobile, demonstrating that the sonic logo, when appropriately positioned, enhanced the consumer's attitude toward the brand. In terms of theoretical accounts that best explain how emotion is generated and consumer attitudes are prompted, the theory of classical conditioning currently seems as good an explanation as any (Ballouli and Heere, 2015).

## 5. Congruency

Apart from being distinctive, memorable, appealing, attention capturing, and evoking emotion, what else should a successful visual/audio logo do? Normally, it should present a good match (i.e., be congruent) with the brand, both in terms of semantic meaning and affect (see Arning and Gordon, 2006; Kim, 2020; Krishnan and Kellaris, 2021; North, MacKenzie, Law, and Hargreaves, 2004; Oakes and Abolhasani, 2022). There has been extensive research on crossmodal semantic relations between meaningful sounds associated with object events (such as a barking sound and the picture of a dog; Chen and Spence, 2010; Li, Wu, Yu, Wu, Takahashi, Ejima, Yang, and Wu, 2020). However, sonic logos (and other auditory brand mnemonics) are rarely as literal in their associations, instead being more metaphorically, or even arbitrarily, linked to a particular brand. Walker-Andrews (1994) outlined several different classes of relation between sight and sound. As an example of an arbitrary relation, she mentions the sound made by the telephone. Updating the example for the 21st Century, one might also talk about the arbitrary ringtones that many people choose for their mobile devices.

Nevertheless, the link between sound and other object/brand properties is presumably still established by means of associative learning (e.g., Connolly, 2014; see also Wallace, 1991). To help facilitate these learned associations, the logo should be easy to process, demonstrating what is often referred to by experimental psychologists as 'processing fluency' (McKean, Flavell, Over, and Tipper, 2020; Reber, 2012; Reber and Schwarz, 2001; Reber, Schwarz, and Winkielman, 2004; Reber, Winkielman, and Schwarz, 1998; Reber, Wurtz, and Zimmermann, 2004; Song and Schwartz, 2008). The more congruent the sonic logo, the greater the 'processing fluency' (Winkielman, Schwarz, Fazendeiro, and Reber, 2003), and also, presumably, the easier it will be for the consumer to learn/internalize the association between the sonic logo and the brand (cf. Barenholtz, Lewkowicz, Davidson, and Kogelschatz, 2014; Imai, Kita, Nagumo, and Okada, 2008; Imai, Miyazaki, Yeung, Hidaka, Kantartzis, Okada, and Kito, 2015; Sung, Choi, Chung, and Kim, 2011). One way in which to think about congruency is in terms of the semantic differential technique (Osgood, Suci, and Tannenbaum, 1957), which considers congruency in the context of connotative meaning.

Research from Knoeferle, Knoeferle, Velasco, and Spence (2016) demonstrates just how rapidly novel sonic logos and jingles are associated with, and hence prime, whatever it is they happen to be regularly paired with. Thus, presumably through the 'mere exposure effect' (e.g., Cutting, 2006; Monahan, Murphy, and Zajonc, 2000; Harmon-Jones and Allen, 2001; Montoya, Horton, Vevea, Citkowicz, and Lauber, 2017), brands may come to be more familiar, and hence more liked as a result, at least when they are attended to (Lau and Lim, 2012). This can be considered as an example of 'auditory mere exposure' (Bradley, 1971; Hargreaves, 1984; Ishii, 2005; Meyer, 1903; Peretz, Gaudreau, and Bonnel, 1998; Washburn, Child, and Abel, 1927).

After just a few simultaneous presentations of a sonic logo together with the relevant brand–related information, the presentation of the former can lead to the automatic biasing of visual attention in the direction of any brand-relevant visual information in a scene. For example, Knoeferle et al. (2016) conducted a series of studies of customers' online visual search behaviour in the context of store shelves and online shopping websites, demonstrating that novel sonic logos and/or jingles could bias people's visual search behaviour after no more than a handful of pairings of the product and sonic logo. The research showed that even overt visual

search (e.g., the patterns of their participants' eye-movements) were biased by such crossmodal associative learning involving an arbitrarily paired combination of auditory and visual stimuli. Note that an older literature has shown that verbal cues can also bias visual search (Spivey, Tyler, Eberhard, and Tanenhaus, 2001). No wonder then that researchers have demonstrated how getting the music right in the retail or online environment can lead to an increase in sales (Biswas, Lund, and Szocs, 2019; Damen, van Hest, and Wernaart, 2021; see also Capps, 2007; Fulberg, 2003; Lowe, Ringler, and Haws, 2017).

For sonic logos, there is no fundamental relation, or crossmodal correspondence, between sight and sound as in a similar fashion to the case of barking dogs, where the size of the dog can to a certain extent at least be inferred from the pitch of its bark (i.e., given the physical relationship between the size of a body and its resonance frequency; e.g., Faragó, Pongrácz, Miklósi, Huber, Virányi, and Range, 2010; Gallace and Spence, 2006). That being said, it has been suggested that the most successful sonic logos tend to match the relevant brand attributes/personality in some corresponding manner (see also MacInnis and Park, 1991). It is here that the literature on the aforementioned semantic differential technique (Osgood et al., 1957) may be particularly helpful in terms of establishing a match between the connotative meaning of a given product or brand and the sonic logos being considered to represent the so-called brand personality (see Müller and Kirchgeorg, 2010). The emerging literature on the crossmodal correspondences (Motoki, Saito, Nouchi, Kawashima, and Sugiura, 2019; Spence, 2011a, 2012a; Yang, Chang, Chen, Lin, and Ross, 2022) provides a related avenue for thinking about what sonic properties may best match (either perceptually or emotionally) the specific attributes associated with a brand. For example, new research from Zoghaib, Luffarelli, and Feiereisen (in press), demonstrates that using music with an irregular contour or unstable tonality in brand communications can create a perception that the brand is more innovative. However, whether this positively or negatively impacts brand evaluations is contingent upon whether or not the brand communication includes information about brand innovativeness or brand liking.

Given the excitement around neuromarketing (or better said, consumer neuroscience; see Spence, 2020b, on this distinction), one might wonder whether neuroimaging techniques could be used to assess the congruency, or efficacy, of a given sonic logo. However, the only research that would appear to have been published to date that broadly fits the description of neuromarketing of sonic logos, equivalent to what has been done in the field of visual logo design, comes from Sung et al. (2011; though see also Suchman, 2023). Looking to the future, one could imagine neuroimaging being used to determine the association between sonic logos and brand personality/attributes. However, this is just one of the areas where additional research would be beneficial in the rapidly-emerging field of consumer neuroscience research around the design of sonic logos.

While the preponderance of the literature emphasises the importance of congruency, it is worth noting that incongruency might also work for certain brands. According to Sundar and Noseworthy (2016a, b), crossmodal congruency works better for 'sincere' brands, whereas 'innovative and exciting' brands can sometimes get away with playing with incongruency. Importantly, however, in this case, the incongruency was between the seen and felt texture (i.e., it was a perceptual incongruency). Thus, while it is interesting to consider incongruency between a sonic logo and brand attributes, it should be remembered that this would likely be an example of incongruency operating at more of a conceptual/semantic level, as well as between a different pair of senses, and hence additional research is needed.

## 6. Crossmodal Correspondences and Sound Symbolism

Success in creating a distinct and recognisable sonic identity involves having a consistent, coherent presence (and presentation) across multiple auditory touch-points that comprise the totality of a brand's sonic ecosystem. These may include everything from television, radio, and digital audio advertising to user interfaces, retail environments, and on-hold systems (Anon., 2018; Wong, 2019). As such, sonic logos should be designed with these use contexts in mind, which often means considering how a sonic logo will function within a host of other multi-sensory interactions. In fact, the area of multisensory marketing is becoming ever-more popular, and sound design and sonic branding are key components of the multisensory brand experience (see Hilton, 2015; Knoeferle and Spence, 2021; Spence, 2014; Yeoh and Allan, 2020). By building on the emerging literature on crossmodal correspondences (e.g., Spence, 2011a; Spence and Sathian, 2020), not to mention sound symbolism (e.g., Nuckolls, 1999; Shrum, Lowrey, Luna, Lerman, and Liu, 2012; Sidhu and Pexman, 2018; Spence, 2012; Westbury, Hollis, Sidhu, and Pexman, 2018), it may be possible to establish which auditory features best convey a particular brand attribute or association (see also Görne, Kuldkepp, and Troschka, 2021; Oyama, Yamada, and Iwasawa, 1998; Sunaga, 2018), and the extent to which distinctive sonic

assets (including sonic logos) can be designed to be crossmodally congruent with other sensory brand properties, be they visual, tactile, olfactory, or even gustatory.

To date, crossmodal associations have primarily been established with specific auditory parameters such as pitch, timbre, auditory roughness, etc. (e.g., Eitan and Timmers, 2010; Knöferle and Spence, 2012; Knöferle, Woods, Käppler, and Spence, 2015; Melzner and Raghubir, 2023; Sunaga, Moriguchi, Ishii, and Spence, 2021; Techawachirakul, Pathak, Motoki, and Calvert, 2023). Consider the study by Techawachirakul, Pathak, and Calvert (2022) which suggests that sonic logos that use higher frequency sounds are more likely to be matched with those food products that are perceived to be healthy. It may be helpful, then, for designers to take a cue from design methodologies that have been used to uncover "sonic seasonings" (see Spence, Wang, Reinoso-Carvalho, and Keller, 2021, for a review), teasing out crossmodal associations between sound and taste/flavour through a clearly defined empirical process, developed to identify, prototype, and thereafter to test the efficiency of crossmodally congruent sonic stimuli. Rather than testing for correlations between sound and taste/flavour descriptors, designers could instead attempt to identify associations between brand descriptors and sonic parameters (e.g., pitch, tempo, dynamics, articulations, modality, harmony, etc.) that could guide the construction of a sonic logo (see Wang, Keller, and Spence, 2017, 2021, for a more detailed account of the methodology involved).

These crossmodal considerations could be especially important when considering the associations between auditory and visual brand assets (cf. Li, Xu, Fang, Tang, and Pan, 2023). Given that most companies/brands already have a well-established visual identity, the question arises as to the extent to which the sonic logo should in some sense match (i.e., be congruent with) the design of a brand's distinctive visual assets. While there has been little research on this question to date, the research published to date has stressed the relevance/importance of logo-typeface congruency (Salgado-Montejo, Velasco, Olier, Alvarado, and Spence, 2014). *A priori*, it would stand to reason that if both auditory and visual logos are individually congruent with the brand identity, then they would/should probably match each other as well (this a version of the 'transitivity hypothesis'; cf. Deroy and Spence, 2013). Many researchers have established consistent mappings between colours and sounds (see Spence, 2020a; Spence and Di Stefano, 2022, for reviews). The likely existence of other real-world audio-visual interactions might also be taken into consideration (e.g., Bhattacharya and Lindsen, 2016; Gopavaram, Bhide, and Camp, 2020; Hagtvedt and Brasel, 2016; Gabtni and Benrached, 2020; Lowe and Haws, 2017).

The emerging area of so-called "synaesthetic" design (e.g., Haverkamp, 2014; Merter, 2017; Spence, 2012b, 2013, 2015), and the synaesthetic matching of auditory to visual stimuli (Murari, Chmiel, Tiepolo, Zhang, Canazza, Rodà, and Schubert, 2020; Saitis, Weinzierl, von Kriegstein, Ystad, and Cuskley, 2020; Zarczynski, 2020; see Spence and Di Stefano, in press, for a review) could also be of interest here. It could be that the effective paring of visual and auditory brand stimuli might offer opportunities to evoke one sensory association simply through the use of another, a noteworthy example being Coca-Cola's "Try Not To Hear This" campaign (Anon, 2019), which was an attempt to create visually-evoked auditory responses (Freeman, 2020; Proverbio, D'Aniello, Adorni, and Zani, 2011) in viewers. However, describing such an approach to design as "synaesthetic" is, if not fundamentally misleading, then at the very least misguided, given the idiosyncratic nature of the associations between the inducer and the concurrent sensation that are experienced by synaesthetes (see Deroy and Spence, 2013). Note that this contrasts with the consensual cross-sensory mappings that have been identified by crossmodal correspondences research. Consensual crossmodal correspondences would seem likely to be much more useful than the idiosyncratic mappings experienced by synaesthetes.

## 7. The Semantic Differential Technique

The semantic differential technique (SDT) has long provided a means for both basic researchers and applied practitioners to assess the associations that people/consumers hold with specific concepts, or sensory stimuli (e.g., Osgood, 1964). At its core, the SDT approach helps to establish the connotative meaning of a stimulus, be it a word/concept (Osgood, Suci, and Tannenbaum, 1957) or a sensory stimulus (Walker, 2012). While the approach was originally developed to assess the associations that people have with specific concepts (such as 'mother-in-law'), it was soon extended to help assess the connotative meaning of colours (Adams and Osgood, 1973), and thereafter auditory (Chouard and Hempel, 1999; Kang and Zhang, 2010; Walker, 2016), and even olfactory stimuli (Dalton, Maute, Oshida, Hikichi, and Izumi, 2008). This general approach has been successfully incorporated into the Japanese psychological engineering methodology known as Kansei

engineering (Nagamachi, 1989, 1995; Schütte, Eklund, Ishihara, and Nagamachi, 2008). Cognitive neuroscientists have managed to establish the neural substrates underlying the principal dimensions of affective meaning identified by the SDT (Kawachi, Kawabata, Kitamura, Shibata, Imaizumi, and Gyoba, 2011).

The two/three dimensions that emerge out of factor analysis from the various semantic differential scales that are applied are typically preference, arousal, and sometimes also dominance (hence the PAD framework; Mehrabian and Russell, 1974). Environmental psychologists have long found the SDT to provide an effective means of categorizing various atmospheres/environments, and there would seem to be little reason to consider the evaluation of sonic logos to be any different in this regard. The SDT provides a robust means of attributing a range of affective meanings/associations to stimuli/concepts. In fact, it has already been used with some success in quantifying the perceived space between brands and musical pieces in an emotional space (Baker, Trahan, and Mullensiefen, 2016; cf. Palmer, Schloss, Xu, and Prado-León, 2013). Such promising results suggest that the use of the SDT provides a means of aligning brand attributes and personality with the desirable attributes of a sonic logo. Such an exercise might involve the construction of scales designed to reflect both brand attributes and audio parameters together, which could inform the development of a sonic palette for use by the brand. For example, scales might be created for novelty (conventional to unconventional), mood (heavy to light), attitude (excited to relaxed), scale (intimate to grand), instrumentation (organic to synthetic), timbre (dull to bright), pitch (low to high), style (simple to sophisticated), etc. It is interesting to consider that the SDT approach may also provide guidelines for matching, or at least selecting between, relevant auditory and visual stimulus combinations (Kinoshita, Masaki, Muto, Ozawa, and Ise, 2009).

## 8. Conclusions

Sonic branding represents a rapidly-growing area of practice-led design especially given the recent explosive growth of voice-activated digital devices, and the need for brands to be recognized in a digital environment where they may be heard, but not seen. The design of sonic logos is particularly important, considering that these distinctive sonic assets constitute a key component of a brand's sonic identity. The latest cognitive research demonstrates that sonic logos can effectively capture attention and help to direct a consumer's visual attention to the matching product or brand after no more than a handful of pairings (Knoeferle et al., 2016; though see also Potter, Lynch, and Kraus, 2015).

In the past, the development of sonic logos has tended to be more art than science, relying on the creativity of composers and sound designers who approach the task in much the same way they would compose a piece of music or design functional sounds for a user interface. However, as has been argued here, sonic logos are qualitatively different from other kinds of semantically-meaningful auditory stimuli (e.g., auditory warning signals and alerts, or product/packaging sounds). Their construction could benefit from the application of the cognitive principles and crossmodal considerations suggested by the authors, namely by considering: 1) how design approaches to creating visual logos could inform the design of sonic logos; 2) the use of melody to build memory structures; 3) testing for brand fit (i.e., congruency), appeal, recall, and emotional associations; and 4) how the use of a sonic logo in multiple contexts might impact the multisensory experience of the brand as a whole. The use of a semantic differential technique (SDT) could offer researchers and practitioners alike a tool for assessing the associations, both cognitive and crossmodal that will ultimately inform decisions regarding sound design.

While the ultimate success of a sonic logo certainly isn't dependent on design alone (see Romaniuck, 2018), applying science to the art of sonic logo creation (and sonic branding in general) should help to improve the chances of commercial success, not only for the sonic brand alone, but for the brand itself (cf. Weinrich and Gollwitzer, 2016). Get it right, and sonic branding will enhance consumer evaluations of a given brand (Moosmayer and Melan, 2010), and with it, presumably also their willingness to pay (e.g., Krishnan, Kellaris, and Aurand, 2012).

### 8.1. Managerial Implications

The emergence of new technologies presents a range of challenges and opportunities for managers (Hoffman, Moreau, Stremersch, and Wedel, 2021). Advances in the sonic sciences provide managers with the ability to make more science based, objective decisions regarding the design of sonic logos (and other

distinctive sonic assets). In turn, these design parameters can be measured to ensure their effectiveness in producing the desired results (see **Figure 1** for a summary of the measurable parameters of effective sonic logo design referenced in this narrative).


*Figure 1. The Measurable Parameters of Effective Sonic Logo Design.*

While the use of distinctive sonic assets as an expression of a brand's identity offers a number of opportunities to establish emotional connections, build memory structures, and amplify brand salience with consumers (e.g., Costa Gálvez, 2020; Das, Sandhu, and Mondal, 2022; Grünewald-Schukalla, 2019; Meier, 2017; Moreira, Fortes, and Santiago, 2017), it also presents a number of issues for managers to consider (see also Sadoff, 2004). For instance, there are obvious costs associated with the creation and implementation of distinctive sonic assets. The marketing manager might legitimately question how the Return on Investment (ROI) should be determined in such cases (McCullough, 2021; Keller, 2018). Mangers may be tempted to employ a recognized artist, celebrity or composer when developing their brand's sonic identity, thinking that sharing equity with a recognizable talent may provide more exposure and a faster return in the short-term. However, it may be problematic for brands to tie themselves too closely to a particular artist or group, not only because of potential costs over time, but also given the reputational damage (through association) should problems arise (see also Cumming, 2020, for another cautionary example). Additionally, the use of artists and celebrities may impact ownership and copyrights of the assets themselves, which in turn can affect the ability of managers to administer rights and collect the royalties that their distinctive sonic assets might generate (Zhang, 2021). Additionally, there is growing interest in the possibilities associated with using AI to generate sonic logos and/or musical themes at lower costs, rather than commissioning artists or designers to create them. However, it may be some time before AI can generate distinctive sonic assets without human guidance, particularly where emotional intelligence is an important part of the equation (Ameen, Sharma, Tarba, Rao, and Chopra, 2022).

Another consideration is the "wear in" or "wear out" of a brand's sonic identity over time, as consumer tastes may change, and cultural relevancy may wane (see Section 8.2 for further discussion on potential cross-cultural limitations). As a result, it may be necessary for brand managers to regularly evaluate the associations that a particular sonic identity produces within their relevant target market, adapting sonic assets and evolving the brand's sonic identity over time. By the same token, building a recognizable sonic identity for a brand

requires the consistent use of a brand's distinctive sonic assets across multiple channels, which in turn requires the adoption and enforcement of brand standards. As with a brand's visual identity, mangers will need to codify guiding principles, develop sonic style guides, and enforce the adoption of standards to maintain consistency over time. This is particularly important as digital platforms and related technologies have expanded the sonic ecosystem. Whether the brand's sonic identity is experienced in the context of a videogame, through user generated content on social media channels like Instagram or TikTok, in "phygital" spaces that seamlessly blend physical and digital interactions, or via smart speakers or digital assistants, this expanded sonic ecosystem can increase the frequency of consumers' exposure to distinctive sonic assets, To reap the benefits, however, brand managers will need to remain vigilant, working to ensure the consistent sonic expression of their brand whenever, however, and wherever it's heard.

### 8.2. Limitations

One of the questions that often arises when considering music more broadly is the cross-cultural generalizability of the findings (e.g., especially in laboratory studies; e.g., see Lahdelma and Eerola, 2020; Lahdelma and Eerola, 2022). Indeed, while many of the crossmodal correspondences are likely to be shared cross-culturally (Knöferle et al., 2015; see also Motoki, Takahashi, Velasco, and Spence, 2022), there is always the possibility that particular musical styles may have different meanings in different parts the world (e.g., see Yeoh and Spence, 2023, for one recent suggestion along just such lines). One also needs to be aware of the extent to which some academic research on sonic branding has been conducted using samples of non-representative populations (that have been categorized as WEIRD; see Henrich, Heine, and Norenzayan, 2010). Additionally, future research should assess the effectiveness of sonic logos when presented alongside visual logos. Consumers are visually dominant creatures (Gallace, Ngo, Sulaitis, and Spence, 2012; Hutmacher, 2019), and research on the Colavita visual dominance effect shows that people sometimes fail to recognize auditory stimuli if they happen to be presented at the same time as task-relevant visual stimuli (e.g., see Spence, Parise, and Chen, 2012). As a result, sonic logos may be demonstrated to be effective when presented in isolation, but may not be as effective when competing with visual inputs (and/or the visual logo), which is often the case when they appear in media where the content is both visual and auditory (see also Scott et al., 2022, and Li et al., 2023, for additional considerations on possible audio-visual interactions in terms of logo design, and Sadoff, 2004, on the question of whether redundancy of auditory and visual design is necessarily a good thing).

**Author Contributions**: Both authors contributed to the writing of this review.

**Consent for publication**: Both authors confirm their consent to publish the work.

**Conflicts of Interest**: There are no competing interests to declare.

### References

ABA. Audio Branding Academy, 2017. *Audio logo database*. [online] Available at: http://audio-logo-database.com/.

Abel, G.A., and Glinert, L.H., 2008. Chemotherapy as language: Sound symbolism in cancer medication names. *Social Science and Medicine*, 66(8), pp.1863-1869. https://doi.org/10.1016/j.socscimed.2007.12.016.

Adams, F.M., and Osgood, C.E. (1973) A cross-cultural study of the affective meanings of color. *Journal of Cross-Cultural Psychology*, 4, pp.135-156.

Airey, D., 2010. *Logo design love: A guide to creating iconic brand identities*. Berkeley, CA: New Riders.

Alexander, L., 2021. From a Lamborghini's roar to a Moët's pop: How sound became one of luxury's most powerful tools. *Robb Report*, October 15th. [online] Available at: https://robbreport.com/lifestyle/news/sound-of-luxury-1234636968/.

Allan, D., 2007. Sound advertising: A review of the experimental evidence on the effects of music in commercials on attention, memory, attitudes, and purchase intention. *Journal of Media Psychology*, 12(3), pp.1-35.

Allan, D., 2022. Super sonic logos – The power of audio – Tmobile [Audio Podcast Episode]. In *Marketing Musicology*, July 22, 2022. [online] Available at: http://marketingmusicology.com/podcast/super-sonic-logos-the-power-of-audio-tmobile/.

Alpert, M.I., Alpert, J.I. and Maltz, L.N., 2005. Purchase occasion influence on the role of music in advertising. *Journal of Business Research*, 58, pp.369-376. https://doi.org/10.1016/S0148-2963(03)00101-2.

Ameen, N, Sharma, G.D., Tarba, S., Rao, A., and Chopra, R., 2022. Toward advancing theory on creativity in marketing and artificial intelligence. *Psychology & Marketing*, 39(9), pp. 1802-1825. https://doi.org/10.1002/mar.21699.

Anand, R., Sabeenian, R.S., Gurang, D., Kirthika, R. and Rubeena, S., 2021. AI based music recommendation system using deep learning algorithms. *IOP Conference Series: Earth and Environmental Sciences*, 785:012013. Malda, West Bengal: India.

Anderson, I., Gil, S., Gibson, C., Wolf, S., Shapiro, W., Semerci, O. and Greenberg, D.M., 2020. "Just the way you are": Linking music listening on Spotify and personality. *Social Psychological and Personality Science*, 12(4), pp.561-572. https://doi.org/10.1177/1948550620923228.

Anglada-Tort, M., Schofield, K., Trahan, T. and Müllensiefen, D., 2022. I've heard that brand before: The role of music recognition on consumer choice. *International Journal of Advertising*, 41(8), pp.1567-1587. https://doi.org/10.1080/02650487.2022.2060568.

Anon., 2018. I don't care about my brand's sound – no, really. *Marketing Week*, August 31st. [online] Available at: https://www.marketingweek.com/adelphoi-music-audio-branding/.

Anon., 2019. Coca-Cola: Try not to hear this by David. *The Drum*, April. [online] Available at: https://www.thedrum.com/creative-works/project/david-coca-cola-try-not-hear.

Anon., 2021. Attempt by Ardagh to trademark the opening fizz of a drinks can fails. *Can Maker*, July 9th. [online] Available at: https://www.canmaker.com/online/ardagh-attempt-to-trademark-fizz-sound-stilled-by-eu-court/.

Argo, J.J., Popa, M. and Smith, M.C., 2010. The sound of brands. *Journal of Marketing*, 74(4), pp.97-109.

Arning, C. and Gordon, A., 2006. Sonic semiotics: The role of music in marketing communications. *ESOMAR Congress: Foresight.*

Ayata, D., Yaslan, Y. and Kamasak, M.E., 2018. Emotion based music recommendation system using wearable physiological sensors. *IEEE Transactions on Consumer Electronics*, 64(2), pp.196-203. https://doi.org/10.1109/tce.2018.2844736

Baker, D., Trahan, T. and Müllensiefen, D., 2016. Matching music to brand personality: A Semantic Differential tool for measuring emotional space. *Proceedings of the 14th International Conference on Music Perception and Cognition*. San Francisco, CA.

Baldwin, C.L., Spence, C., Bliss, J.P., Brill, J.C., Wogalter, M.S., Mayhorn, C.B. and Ferris, T.K., 2012. Multimodal cueing: The relative benefits of the auditory, visual, and tactile channels in complex environments. *Proceedings of the 56th Human Factors and Ergonomics Society Meeting*, 56, pp.1431-1435.

Ballouli, K. and Heere, B., 2015. Sonic branding in sport: A model for communicating brand identity through musical fit. *Sport Management Review*, 18(3), pp.321-330. https://doi.org/10.1016/j.smr.2014.03.001.

Barcelos, R.H., Dantas, D.C. and Sénécal, S., 2018. Watch your tone: How a brand's tone of voice on social media influences consumer responses. *Journal of Interactive Marketing*, 41(1), pp.60-80. https://doi.org/10.1016/j.intmar.2017.10.0.

Barenholtz, E., Lewkowicz, D.J., Davidson, M. and Kogelschatz, L., 2014. Categorical congruence facilitates multisensory associative learning. *Psychonomic Bulletin and Review*, 21(5), pp.1346-1352. https://doi.org/10.3758/s13423-014-0612-7.

Barrett, F.S., Grimm, K.J., Robins, R.W., Wildschut, T., Sedikides, C. and Janata, P., 2010. Music-evoked nostalgia: Affect, memory, and personality. *Emotion*, 10(3), pp.390-403. https://doi.org/10.1037/a0019006.

Beckerman, J. and Gray, T., 2014. *The sonic boom: How sound transforms the way we think, feel, and buy*. New York, NY: Houghton Mifflin Harcourt.

Belfi, A.M., Karlan, B. and Tranel, D., 2015. Music evokes vivid autobiographical memories. *Memory*, 24(7), pp.979-989. https://doi.org/10.1080/09658211.2015.1061012.

Belz, S.M., Robinson, G.S. and Casali, J.G., 1999. A new class of auditory warning signals for complex systems: Auditory icons. *Human Factors*, 41(4), pp.608-618. https://doi.org/10.1518/001872099779656734.

Bhattacharya, J. and Lindsen, J.P., 2016. Music for a brighter world: Brightness judgment bias by musical emotion. *PLoS ONE*, 11(2), e0148959. https://doi.org/10.1371/journal.pone.0148959.

Biswas, D., Lund, K. and Szocs, C., 2019. Sounds like a healthy retail atmospheric strategy: Effects of ambient music and background noise on food sales. *Journal of the Academy of Marketing Science*, 47(6), pp.37-55. https://doi.org/10.1007/s11747-018-0583-8.

Bolls, P. and Lang, A., 2003. I saw it on the radio: The allocation of attention to high-imagery radio advertisements. *Media Psychology*, 5, pp.33-55. http://dx.doi.org/10.1207/S1532785XMEP0501_2.

Bonde, A. and Hansen, A.G., 2013. Audio logo recognition, reduced articulation and coding orientation: Rudiments of quantitative research integrating branding theory, social semiotics and music psychology. *SoundEffects – an Interdisciplinary Journal of Sound and Sound Experience*, 3(1/2), pp.112-135.

Bottomly, P.A. and Doyle, J.R., 2006. The interactive effects of colours and products on perceptions of brand logo appropriateness. *Marketing Theory*, 6(1), pp.63-83. https://doi.org/10.1177/1470593106061263.

Bowcott, O., 2013. Chocs in the dock: Cadbury loses case. *The Guardian*, October 5th. [online] Available at: http://www.theguardian.com/business/2013/oct/04/cadbury-dairy-milk-purple-trademark-blocked.

Bradley, I.L., 1971. Repetition as a factor in the development of musical preferences. *Journal of Research in Music Education*, 19(3), pp.295-298.

Bruner, G.C., 1990. Music, mood, and marketing. *Journal of Marketing*, 54(4), pp.94-104. https://doi.org/10.2307/1251762.

Byron, E., 2012. The search for sweet sounds that sell: Household products' clicks and hums are no accident; Light piano music when the dishwasher is done? *The Wall Street Journal*. [online] Available at: http://online.wsj.com/article/SB10001424052970203406404578074671598804116.html

Capps, B., 2007. More than just jingles: One shop uses sound to give brands voices. *Advertising Age*, April 16th.

Carnevale, M., Lerman, D. and Luna, D., 2010. Hear is the thing: Auditory processing of novel nonword brand names. In A. Krishna (Ed.), *Sensory marketing: Research on the sensuality of products*, pp. 183-198. New York, NY: Taylor and Francis.

Chebat, J.C., Hedhli, K.E., Gélinas-Chebat, C. and Boivin, R., 2007. Voice and persuasion in a banking telemarketing context. *Perceptual and Motor Skills*, 104(2), pp.419-437. https://doi.org/10.2466/pms.104.2.419-437.

Chen, Y.-C. and Spence, C., 2010. When hearing the bark helps to identify the dog: Semantically-congruent sounds modulate the identification of masked pictures. *Cognition*, 114(3), pp.389-404. https://doi.org/10.1016/j.cognition.2009.10.012.

Chouard, N. and Hempel, T., 1999. Evaluation of interior car sounds with a new specific semantic differential design. *Journal of the Acoustical Society of America*, 105, 1280.

Ciccarelli, D., 2019. If you're going to focus on one thing this year, make it audio branding. *AdAge*. [online] Available at: https://adage.com/article/voices.com/focus-thing-year-make-audio-branding/316418.

Cohen, A.J., 1993. Associationism and musical soundtrack phenomena. *Contemporary Music Review*, 9(1-2), pp.163-178. https://doi.org/10.1080/07494469300640421

Connolly, K., 2014. Multisensory perception as an associative learning process. *Frontiers in Psychology*, 5, p.1095. https://doi.org/10.3389/fpsyg.2014.01095.

Costa Gálvez, L., 2020. 'Audio branding': Spotify en el escenario COVID-19. *COMeIn*, 103(2), pp.14-25. https://doi.org/10.7238/c.n103.2070.

Cumming, E., 2020. How Nespresso's coffee revolution got ground down. *The Guardian*, July 14th. [online] Available at: https://www.theguardian.com/food/2020/jul/14/nespresso-coffee-capsule-pods-branding-clooney-nestle-recycling-environment

Cutting, J.E., 2006. The mere exposure effect and aesthetic preference. In P. Locher, C. Martindale and L. Dorfman (Eds.), *New directions in aesthetics, creativity, and the arts*, pp. 33-46. Amityville, NY: Baywood Publishing.

Dalton, P., Maute, C., Oshida, A., Hikichi, S. and Izumi, Y., 2008. The use of semantic differential scaling to define the multi-dimensional representation of odors. *Journal of Sensory Studies*, 23, pp.485-497. https://doi.org/10.1111/j.1745-459X.2008.00167.x

Damen, M., van Hest, I. and Wernaart, B., 2021. The effect of stereotypical music on the customer selection of wine in an online environment. *Journal of Innovations in Digital Marketing*, 2(2). https://doi.org/10.51300/jidm-2021-35.

Das, S., Sandhu, K. and Mondal, S.R., 2022. Music logos drive digital brands: An empirical analysis of consumers' perspective. *Journal of Strategic Marketing*, pp.1-16. https://doi.org/10.1080/0965254X.2022.2098526.

De Keyzer, F., Dens, N. and De Pelsmacker, P., 2017. Don't be so emotional! How tone of voice and service type affect the relationship between message valence and consumer responses to WOM in social media. *Online Information Review*, 41(7), pp.905-920. https://doi.org/10.1108/OIR-08-2016-0219.

Deaville, J.A., Tan, S. and Rodman, R.W., (Eds.), 2021. *The Oxford handbook of music and advertising*. Oxford, UK: Oxford University Press.

Deroy, O. and Spence, C., 2013. Why we are not all synesthetes (not even weakly so). *Psychonomic Bulletin and Review*, 20, pp.643-664. https://doi.org/10.3758/s13423-013-0387-2.

Di Stefano, N. and Spence, C., 2022. Roughness: A multisensory/crossmodal perspective. *Attention, Perception and Psychophysics*, 84, pp.2087-2114. https://doi.org/10.3758/s13414-022-02550-y.

Dubé, L., Chebat, J.C. and Morin, S., 1995. The effects of background music on consumers' desire to affiliate on buyer-seller interactions. *Psychology and Marketing*, 12(4), pp.305-319. Https://doi.org/10.1002/mar.4220120407.

Dytz, P., Lima, F. and Tonetto, L. M., 2012. Voice and sound logo for the brand Airela. In K. Bronner, R. Hirt and C. Ringe (Eds.), *Audio Branding Academy Yearbook 2011/2012*, pp. 71-80. Baden-Baden, Germany: Nomos.

Eitan, Z. and Timmers, R., 2010. Beethoven's last piano sonata and those who follow crocodiles: Cross-domain mappings of auditory pitch in a musical context. *Cognition*, 114(3), pp.405-422. https://doi.org/10.1016/j.cognition.2009.10.013.

Erlich, J., 1995. Giving drugs a good name. *The New York Times Magazine*, September 3rd, (Section 6), pp.36-37. [online] Available at: https://www.nytimes.com/1995/09/03/magazine/giving-drugs-a-good-name.html.

Fahey, C., 2022. *Please, stop saying sonic logos should sing product names*. [online] Available at: https://www.sixiemeson.com/views-liste/please-stop-saying-sonic-logos-should-sing-product-names/.

Fahlenbrach, K., 2008. Emotions in sound: Audiovisual metaphors in the sound design of narrative films. *Projections*, 2(2), pp.85-103. [online] Available at: https://www.berghahnjournals.com/view/journals/projections/2/2/proj020206.xml.

Faragó, T., Pongrácz, P., Miklósi, Á., Huber, L., Virányi, Z. and Range, F., 2010. Dogs' expectation about signalers' body size by virtue of their growls. *PLoS ONE*, 5(12), p.e15175. https://doi.org/10.1371/journal.pone.0015175.

Farinella, D.J., 2009. Companies seek signature sound. *Variety*, December 4th.

Floridou, G.A., Williamson, V.J. and Müllensiefen, D., 2012. Contracting earworms: The role of personality and musicality. In *Proceedings of the 12th International Conference on Music Perception and Cognition and the 8th Triennial Conference of the European Society for the Cognitive Sciences of Music* (pp. 302-309). Thessaloniki, Greece.

Franzen, G. and Moriarty, S.E., 2015. *The science and art of branding*. New York, NY: Routledge.

Freeman, E.D., 2020. Hearing what you see: Distinct excitatory and disinhibitory mechanisms contribute to visually-evoked auditory sensations. *Cortex*, 131, pp.66-78. https://doi.org/10.1016/j.cortex.2020.06.014

Fulberg, P., 2003. Using sonic branding in the retail environment: An easy and effective way to create consumer brand loyalty while enhancing the in-store experience. *Journal of Consumer Behaviour*, 3(2), pp.193-198. https://doi.org/10.1002/cb.132.

Gabtni, I. and Benrached, K.S., 2020. The impact of non-musical sound of brand on the brand experience and perceived quality imagery, through an exploratory qualitative analysis. Paper presented at the *Conference: 2 éme Journée de Recherche Marketing sur les Pays de l'Afrique*. Lille, France November.

Gallace, A. and Spence, C., 2006. Multisensory synesthetic interactions in the speeded classification of visual size. *Perception and Psychophysics*, 68(7), pp.1191-1203. https://doi.org/10.3758/BF03193720.

Gallace, A., Ngo, M.K., Sulaitis, J. and Spence, C., 2012. Multisensory presence in virtual reality: Possibilities and limitations. In G. Ghinea, F. Andres and S. Gulliver (Eds.), *Multiple sensorial media advances and applications: New developments in MulSeMedia*, pp. 1-38. Hershey, PA: IGI Global.

Galmarini, M.V., Paz, R.J.S., Choquehuanca, D.E., Zamora, M.C. and Mesz, B., 2021. Impact of music on the dynamic perception of coffee and evoked emotions evaluated by temporal dominance of sensations (TDS) and emotions (TDE). *Food Research International*, 150(A), p.110795. https://doi.org/10.1016/j.foodres.2021.110795.

Gangjee, D.S., 2018. *Paying the price for admission: Non-traditional marks across registration and enforcement*. Oxford, UK: Oxford University Press.

Gaver, W.W., 1986. Auditory icons: Using sound in computer interfaces. *Human-Computer Interaction*, 2(2), pp.167-177. https://doi.org/10.1207/s15327051hci0202_3.

Gelici-Zeko, M.M., Lutters, D., ten Klooster, R. and Weijzen, P.L., 2012. Studying the influence of packaging design on consumer perceptions (of dairy products) using categorizing and perceptual mapping. *Packaging Technology and Science*, 26(4), pp.215-228. https://doi.org/10.1002/pts.1977

Gopavaram, S.R., Bhide, O. and Camp, L.J., 2020. Can you hear me now? Audio and visual interactions that change app choices. *Frontiers in Psychology*, 11, p.2227. https://doi.org/10.3389/fpsyg.2020.02227.

Görne, T., 2019. The emotional impact of sound: A short theory of film sound design. In P. Kessling and T. Görne (Eds.), *KLG 2017 (EPiC Series in Technology)*, 1, pp.17-30. https://doi.org/10.29007/jk8h

Görne, T., Kuldkepp, K. and Troschka, S., 2021. Implications of crossmodal effects and spatial cognition on producing in spatial audio. *Audio Engineering Society Convention Paper Presentation at AES 150th Convention,* May 25-28th, pp.1-11.

Graakjær, N.J., 2019. Sounding out *I'm lovin' it* – a multimodal discourse analysis of the sonic logo in commercials for McDonald's 2003–2018. *Critical Discourse Studies*, 16(5), pp.569-582. https://doi.org/10.1080/17405904.2019.1624184.

Graakjær, N.J. and Bonde, A., 2018. Non-musical sound branding – a conceptualization and research overview. *European Journal of Marketing*, 52(7/8), pp.1505-1525. https://doi.org/10.1108/EJM-09-2017-0609.

Graham, R., 1999. Use of auditory icons as emergency warnings: Evaluation within a vehicle collision avoidance application. *Ergonomics,* 42(9), pp.1233-1248. https://doi.org/10.1080/001401399185108.

Groves, J., 2009. A short history of sound branding. In K. Bronner and R. Hirt (Eds.), *Audio branding brands, sound and communication*, pp. 62-75. Baden-Baden, Germany: Reinhard Fischer.

Groves, J., 2011. *Commusication: From Pavlov's dog to sound branding*. Cork, Ireland: Oak Tree Press.

Grünewald-Schukalla, L., 2019. Leslie M. Meier: Popular music as promotion. Music and branding in the digital age. In: M., Ahlers, M., Lücke and M. Rauch (Eds.), *Musik und Straße*. Jahrbuch für Musikwirtschafts- und Musikkulturforschung. Springer VS, Wiesbaden. https://doi.org/10.1007/978-3-658-26101-6_14.

Gustafsson, C., 2015. Sonic branding: A consumer-oriented literature review. *Journal of Brand Management*, 22(1), pp.20-37. https://doi.org/10.1057/bm.2015.5.

Hagtvedt, H. and Brasel, S. A., 2016. Crossmodal communication: Sound frequency influences consumer responses to color lightness. *Journal of Marketing Research*, 53(4), pp.551-562. https://doi.org/10.1509/jmr.14.0414.

Hargreaves, D.J., 1984. The effects of repetition on liking for music. *Journal of Research in Music Education*, 32(1), pp.35-47. https://doi.org/10.2307/3345279.

Harmon-Jones, E. and Allen, J.J., 2001. The role of affect in the mere exposure effect: Evidence from psychophysiological and individual differences approaches. *Personality and Social Psychology Bulletin*, 27(7), pp.889-898. https://doi.org/10.1177/0146167201277011.

Harris, B., n.d. *Three famous notes of broadcasting history – The NBC Chimes*. [online] Available at: https://www.radioremembered.org/chimes.htm

Haverkamp, M., 2014. *Synesthetic design: Handbook for a multisensory approach.* Basel: Birkhäuser.

Hein, K., 2006. Sonic branding firms get increase in sales volume. *Brandweek*, April 3rd.

Henrich, J., Heine, S.J. and Norenzayan, A., 2010. The weirdest people in the world? *Behavioral and Brain Sciences*, 33(2-3), pp.61-135. https://doi.org/10.1017/S0140525X0999152X.

Hilton, K., 2015. Psychology: The science of sensory marketing. *Harvard Business Review*, March, pp.28-31. [online] Available at: https://hbr.org/2015/03/the-science-of-sensory-marketing

Ho, C., Reed, N.J. and Spence, C., 2006. Assessing the effectiveness of "intuitive" vibrotactile warning signals in preventing front-to-rear-end collisions in a driving simulator. *Accident Analysis and Prevention*, 38(5), 989-997.

Ho, C. and Spence, C., 2005. Assessing the effectiveness of various auditory cues in capturing a driver's visual attention. *Journal of Experimental Psychology: Applied*, 11(3), pp.157-174. https://doi.org/10.1037/1076-898X.11.3.157.

Ho, C. and Spence, C., 2013. Affective multisensory driver interface design. *International Journal of Vehicle Noise and Vibration* (Special Issue on *Human Emotional Responses to Sound and Vibration in Automobiles*), 9, 61-74. https://doi.org/10.1504/IJVNV.2013.053817

Hoffman, D.L., Moreau, C.P., Stremersch, S. and Wedel, M., 2021. The rise of new technologies in marketing: A framework and outlook. *Journal of Marketing*, 86(1), pp.1-6. https://doi.org/10.1177/00222429211061636.

Hull, R., 2023. Ferraris will still growl even when they run on batteries: Supercar legend files patent to boom electric drivetrain sounds out via external speakers. *This is Money*, January 24th. [online] Available at: https://www.thisismoney.co.uk/money/electriccars/article-11670111/Ferrari-patent-reveals-supercars-growl-goes-electric.html.

Hutmacher, F., 2019. Why is there so much more research on vision than on any other sensory modality? *Frontiers in Psychology*, 10, p.2246. https://doi.org/10.3389/fpsyg.2019.02246.

Lahdelma, I. and Eerola, T., 2020. Cultural familiarity and musical expertise impact the pleasantness of consonance/dissonance but not its perceived tension. *Scientific Reports*, 10(1), p.8693.

Lahdelma, I., Eerola, T. and Armitage, J., 2022. Is harmonicity a misnomer for cultural familiarity in consonance preferences? *Frontiers in Psychology*, 13, p.802385.

Imai, M., Kita, S., Nagumo, M. and Okada, H., 2008. Sound symbolism facilitates early very learning. *Cognition*, 109(1), pp.54-65. https://doi.org/10.1016/j.cognition.2008.07.015.

Imai, M., Miyazaki, M., Yeung, H.H., Hidaka, S., Kantartzis, K., Okada, H. and Kito, S., 2015. Sound symbolism facilitates word learning in 14-month-olds. *PLoS ONE*, 10(2), p.e0116494. https://doi.org/10.1371/journal.pone.0116494.

Ishii, K., 2005. Does mere exposure enhance positive evaluation, independent of stimulus recognition? A replication study in Japan and the USA. *Japanese Psychological Research*, 47(4), pp.280-285. https://doi.org/10.1111/j.1468-5884.2005.00297.x.

Jackson, D., 2003. *Sonic branding*: *An essential guide to the art and science of sonic branding*. London, UK: Palgrave McMillan.

Jackson, D., Jankovich, R. and Sheinkop, E., 2013. *Hit brands: How music builds value for the world's smartest brands*. London, UK: Palgrave Macmillan.

Jain, K. and Pasricha, D., 2017. Role of color and typography in determining brand personality. *Indian Journal of Marketing*, 47(5), pp.48-62. https://doi.org/10.17010/ijom/2017/v47/i5/114240.

Jakubowski, K., Finkel, S., Stewart, L. and Müllensiefen, D., 2017. Dissecting an earworm: Melodic features and song popularity predict involuntary musical imagery. *Psychology of Aesthetics, Creativity, and the Arts*, 11(2), pp.122-135. https://doi.org/10.1037/aca0000090.

Jekosch, U., 2005. Assigning meaning to sounds – Semiotics in the context of product-sound design. In J. Blauert (Ed.), *Communication acoustics*, pp. 193-221. Berlin, Germany: Springer.

Jordan, P.W., 2000. *Designing pleasurable products: An introduction to the new human factors*. London, UK: Taylor and Francis.

Kang, J. and Zhang, M., 2010. Semantic differential analysis of the soundscape in urban open public spaces. *Building and Environment*, 45, pp.150-157. https://doi.org/10.1016/j.buildenv.2009.05.014.

Kaufman, L., 1999. The man who created Intel's audio 'signature'. *Los Angeles Times*, October 20th. [online] Available at: https://www.latimes.com/archives/la-xpm-1999-oct-20-fi-24321-story.html.

Kawachi, Y., Kawabata, H., Kitamura, M. S., Shibata, M., Imaizumi, O. and Gyoba, J., 2011. Topographic distribution of brain activities corresponding to psychological structures underlying affective meanings: An fMRI study. *Japanese Psychological Research*, 53(4), pp.361-371. https://doi.org/10.1111/j.1468-5884.2011.00485.x.

Keller, S., 2018. Sound business: Improving your audio ROI. *The European Business Review*, April 19th. [online] Available at: https://www.europeanbusinessreview.com/sound-business-improving-your-audio-roi/

Kim, S.G., 2020. Dissecting the sonic identity of brands: Timbre of sonic logo and brand perception. *Wharton Research Scholars*, 208. https://repository.upenn.edu/wharton_research_scholars/208.

Kinoshita, Y., Masaki, Y., Muto, T., Ozawa, K. and Ise, T., 2009. Scenery based Kansei music selection for car audio systems. In *2009 IEEE 13th International Symposium on Consumer Electronics*, pp.94-98. IEEE.

Klink, R.R., 2000. Creating brand names with meaning: The use of sound symbolism. *Marketing Letters*, 11(1), pp.5-20. https://doi.org/10.1023/A:1008184423824.

Knoeferle, K., Knoeferle, P., Velasco, C. and Spence, C., 2016. Multisensory brand search: How the meaning of sounds guides consumers' visual attention. *Journal of Experimental Psychology: Applied*, 22(2), pp.196-210. https://doi.org/10.1037/xap0000084.

Knoeferle, K. and Spence, C., 2021. Sound in the context of (multi-)sensory marketing. In J. A. Deaville, S. Tan and R.W. Rodman (Eds.), *Oxford handbook of music and advertising*, pp. 833-856. Oxford, UK: Oxford University Press.

Knöferle, K.M. and Spence, C., 2012. Crossmodal correspondences between sounds and tastes. *Psychonomic Bulletin and Review*, 19, pp.992-1006. https://doi.org/10.3758/s13423-012-0321-z.

Knöferle, K.M., Woods, A., Käppler, F. and Spence, C., 2015. That sounds sweet: Using crossmodal correspondences to communicate gustatory attributes. *Psychology and Marketing*, 32, pp.107-120. https://doi.org/10.1002/mar.20766.

Krishnan, V. and Kellaris, J.J., 2021. Hearing, remembering, and branding: Setting strategic directions for sonic branding research. In J.A. Deaville, S. Tan and R.W. Rodman (Eds.), *The Oxford handbook of music and advertising*, pp. 674-696. Oxford, UK: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780190691240.013.26.

Krishnan, V., Kellaris, J.J. and Aurand, T.W., 2012. Sonic logos: Can sound influence willingness to pay? *Journal of Product and Brand Management*, 21(4), pp.275-284. https://doi.org/10.1108/10610421211246685.

Kurinec, C.A. and Weaver, C.A., III, 2021. "Sounding black": Speech stereotypicality activates racial stereotypes and expectations about appearance. *Frontiers in Psychology*, 12, p.785283. https://doi.org/10.3389/fpsyg.2021.785283.

Lageat, T., Czellar, S. and Laurent, G., 2003. Engineering hedonic attributes to generate perceptions of luxury: Consumer perception of an everyday sound. *Marketing Letters*, 14, pp.97-109.

Lantos, G.P. and Craton, L.G., 2012. Model of consumer response to advertising music. *Journal of Consumer Marketing*, 29(1), pp.22-42. https://doi.org/10.1108/07363761211193028.

Lau, Y. and Lim, S.W.H., 2012. Attention! Mere exposure effects exposed. *Ipedr*, 40, pp.30-35.

Lee, H., Höger, F., Schönwiesner, M., Park, M. and Jacoby, N., 2021. Cross-cultural mood perception in pop songs and its alignment with mood detection algorithms. In *Proceedings of the 22nd International Society for Music Information Retrieval Conference.*

Lehmann, M., 2008. The voice in brand sound. In K. Bronner and R. Hirt (Eds.), *Audio branding* (pp. 83-87). Baden-Baden, Germany: Nomos Edition Reinhard Fischer.

Leongómez, J.D., Mileva, V.R., Little, A.C. and Roberts, S.C., 2017. Perceived differences in social status between speaker and listener affect the speaker's vocal characteristics. *PLoS ONE*, 12(6), p.e0179407. https://doi.org/10.1371/journal.pone.0179407.

Lewis, C., Fretwell, C. and Ryan, J., 2012. An empirical study of emotional response to sounds in advertising. *American Journal of Management*, 12(1), pp.80-91.

Li, Q., Wu, Q., Yu, Y., Wu, F., Takahashi, S., Ejima, Y., Yang, J. and Wu, J., 2020. Semantic congruency modulates the effect of attentional load on the audiovisual integration of animate images and sounds. *i-Perception*, 11(6), pp.1-24. https://doi.org/10.1177/2041669520981096.

Li, H., Xu, J., Fang, M., Tang, L. and Pan, Y., 2023. A study and analysis of the relationship between visual—auditory logos and consumer behavior. *Behavioral Sciences*, 13, p.613. https://doi.org/10.3390/bs13070613.

Liu, R. and Hu, X., 2020. A multimodal music recommendation system with listeners' personality and physiological signals. *Proceedings of the ACM/IEEE Joint Conference on Digital Libraries in 2020*. https://doi.org/10.1145/3383583.3398623.

Lowe, M., Ringler, C. and Haws, K., 2018. An overture to overeating: The cross-modal effects of acoustic pitch on food preferences and serving behaviour. *Appetite*, 123, pp.128-134. https://doi.org/10.1016/j.appet.2017.12.013.

Lowe, M.L. and Haws, K.L., 2017. Sounds big: The effects of acoustic pitch on product perceptions. *Journal of Marketing Research*, 54(2), pp.331-346. https://doi.org/10.1509/jmr.14.0300.

Lucas, P.A., 1995. An evaluation of the communicative ability of auditory icons and earcons. In G. Kramer (Ed.), *Proceedings of the 2nd International Conference on Auditory Display ICAD '94*, pp. 121-128. Sante Fe: ICAD.

MacInnis, D.J. and Park, C.W., 1991. The differential role of characteristics of music on high-and low-involvement consumers' processing of ads. *Journal of Consumer Research*, 18(2), pp.161-173. https://doi.org/10.1086/209249.

Manchón, L.M., 2019. Sonic logos: An experimental design on sound features and brand personality. *Disertaciones: Anuario Electrónico de Estudios en Comunicación Social*, 12(2), pp.125-141.

Martín-Santana, J.D., Muela-Molina, C., Reinares-Lara, E. and Rodríguez-Guerra, M., 2015. Effectiveness of radio spokesperson's gender, vocal pitch and accent and the use of music in radio advertising. *BRQ Business Research Quarterly*, 18(3), pp.143-160. https://doi.org/10.1016/j.brq.2014.06.001.

Mas, L., 2019. Sonic logos: An experimental design on sound features and brand personality. *Anuario electrónico de estudios en Comunicación Social Disertaciones*, 12(2), 125. https://doi.org/10.12804/revistas.urosario.edu.co/disertaciones/a.6373.

Mas, L., Bolls, P., Rodero, E., Barreda-Ángeles, M. and Churchill, A., 2020. The impact of the sonic logo's acoustic features on orienting responses, emotions and brand personality transmission. *Journal of Product and Brand Management,* 30(5), pp.740-753. https://doi.org/10.1108/JPBM-05-2019-2370.

May, J.L. and Hamilton, P.A., 1980. Effects of musically evoked affect on women's interpersonal attraction toward and perceptual judgments of physical attractiveness of men. *Motivation and Emotion*, 4(3), pp.217-228. https://doi.org/10.1007/BF00995420.

May, T., 2019. The 10 best audio logos and why they work. *Creative Bloq*, August 13th. [online] Available at: https://www.creativebloq.com/features/audio-logos

McCullough, E., 2021. *Brands with recognised sonic logos perceived as 5% more valuable. Dlmdd*, November 9th. [online] Available at: https://dlmdd.com/sonic-logo-roi

McCusker, G., 1997. The audio logo: A case study of Radio Scotland's on-air identity. *Journal of Communication Management*, 1(4), pp.362-373.

McKean, B., Flavell, J.C., Over, H. and Tipper, S., 2020. Three minutes to change preferences: Perceptual fluency and response inhibition. Preference change. *Royal Society Open Science*, 7, p.200766. http://doi.org/10.1098/rsos.200766.

McKeown, D., 2005. Candidates for within-vehicle auditory displays. In *Proceedings of ICAD 05-Eleventh Meeting of the International Conference on Auditory Display*, pp. 182-189. Limerick, Ireland, July 6-9th.

McKeown, J.D. and Isherwood, S., 2007. Mapping the urgency and pleasantness of speech, auditory icons, and abstract alarms to their referents within the vehicle. *Human Factors*, 49(3), pp.417-428. https://doi.org/10.1518/001872007X200067.

Mehrabian, A.R. and Russell, J.A., 1974. *An approach to environmental psychology*. Cambridge, MA: MIT Press.

Meier, M.L., 2017. Popular music as promotion: Music and branding in the digital age. *European Journal of Communication*, 32(5), p.506. https://doi.org/10.1177/0267323117730203g

Melzner, J. and Raghubir, P., 2023. The sound of music: The effect of timbral sound quality in audio logos on brand personality perception. *Journal of Marketing Research*. https://doi.org/10.1177/00222437221135188

Merter, S., 2017. Synesthetic approach in the design process for enhanced creativity and multisensory experiences. *The Design Journal*, 20(sup1), pp.S4519-S4528.

Meyer, M., 1903. Experimental studies in the psychology of music. *The American Journal of Psychology*, 14(3/4), pp.192-214.

Minskey, L. and Fahey, C., 2017. *Audio branding: Using sound to build your brand.* London, UK: Kogan Page.

Monahan, J.L., Murphy, S.T. and Zajonc, R.B., 2000. Subliminal mere exposure: Specific, general and affective effects. *Psychological Science*, 11(6), pp.462-466. https://doi.org/10.1111/1467-9280.00289.

Montoya, R.M., Horton, R.S., Vevea, J.L., Citkowicz, M. and Lauber, E.A., 2017. A re-examination of the mere exposure effect: The influence of repeated exposure on recognition, familiarity, and liking. *Psychological Bulletin*, 143(5), pp.459-498. https://doi.org/10.1037/bul0000085.

Moore, K. and Reid, S., 2008. The birth of brand: 4000 years of branding. *Business History*, 50(4), pp.419-432. https://doi.org/10.1080/0007679080210629

Moosmayer, D. and Melan, M., 2010. The impact of sound logos on consumer brand evaluation. *Enhancing Knowledge Development in Marketing*, 28, pp.1-22.

Moreira, A.C., Fortes, N. and Santiago, R., 2017. Influence of sensory stimuli on brand experience, brand equity and purchase intention. *Journal of Business Economics and Management*, 18(1), pp.68-83. https://doi.org/10.3846/16111699.2016.1252793.

Motoki, K., Park, J., Pathak, A. and Spence, C., 2022. The connotative meanings of sound symbolism in brand names: A conceptual framework. *Journal of Business Research*, 150, pp.365-373. https://doi.org/10.1016/j.jbusres.2022.06.013.

Motoki, K., Park, J., Pathak, A. and Spence, C., in press. Creating luxury brand names in the hospitality and tourism sector: The role of sound symbolism in destination branding. *Journal of Destination Marketing and Management*.

Motoki, K., Pathak, A. and Spence, C., 2022. Tasting prosody: Crossmodal correspondences between voice quality and basic tastes. *Food Quality and Preference*, 100, p.104621. https://doi.org/10.1016/j.foodqual.2022.104621.

Motoki, K., Saito, T., Nouchi, R., Kawashima, R. and Sugiura, M., 2019. A sweet voice: The influence of crossmodal correspondences between taste and vocal pitch on advertising effectiveness. *Multisensory Research*, 32(4-5), pp.401-427. https://doi.org/10.1163/22134808-20191365.

Motoki, K., Takahashi, N., Velasco, C. and Spence, C., 2022. Is classical music sweeter than jazz? Crossmodal influences of background music and taste/flavour on healthy and indulgent food preferences. *Food Quality and Preference*, 96, p.104380. https://doi.org/10.1016/j.foodqual.2021.104380.

Müller, J. and Kirchgeorg, M., 2010. Audio branding in line with brand personality. In K. Bronner, R. Hirt and C. Ringe (Eds.), *Audio Branding Academy Yearbook*, pp. 189-201. Baden-Baden, Germany: Nomos.

Müller, J. and Kirchgeorg, M., 2011. Emotional audio branding in a retailing setting. In K. Bronner, R. Hirt and C. Ringe (Eds.), *Audio Branding Academy Yearbook*, pp. 161-169. Baden-Baden, Germany: Nomos.

Murari, M., Chmiel, A., Tiepolo, E., Zhang, J.D., Canazza, S., Rodà, A. and Schubert, E., 2020. Key clarity is blue, relaxed, and maluma: Machine learning used to discover cross-modal connections between sensory items and the music they spontaneously evoke. In H. Shoji, S. Koyama, T. Kato, K. Muramatsu, T. Yamanaka, P. Lévy, K. Chen and A.M. Lokman (Eds.), *KEER 2020, AISC 1256*, pp. 214-223. Singapore: Springer Nature. https://doi.org/10.1007/978-981-15-7801-4_22.

Nagamachi, M., 1989. *Kansei engineering*. Tokyo: Kaibundo Publishing.

Nagamachi, M., 1995. Kansei engineering: A new ergonomic consumer-oriented technology for product development. *International Journal of Industrial Ergonomics*, 15, pp.3-11.

Neisser, U., 1976. *Cognition and reality: Principles and implications of cognitive psychology*. San Francisco, CA: Freeman.

Neumeier, M., 2015. *The brand flip: Why customers now run companies--and how to profit from it*. Indianapolis, IN: New Riders.

North, A.C. and Hargreaves, D.J., 2008. *The social and applied psychology of music*. Oxford, UK: Oxford University Press.

North, A.C., Mackenzie, L.C., Law, R.M. and Hargreaves, D.J., 2004. The effects of musical and voice "fit" on responses to advertisements. *Journal of Applied Social Psychology*, 34(8), pp.1675-1708. https://doi.org/10.1111/j.1559-1816.2004.tb02793.x

Nuckolls, J.B., 1999. The case for sound symbolism. *Annual Review of Anthropology*, 28, pp.225-252. https://doi.org/10.1146/annurev.anthro.28.1.225.

Oakes, S. and Abolhasani, M., 2021. Musical congruity in advertising: Established and emerging themes. In J.A. Deaville, S. Tan and R.W. Rodman (Eds.), *The Oxford handbook of music and advertising*, pp. 674-696. https://doi.org/10.1093/oxfordhb/9780190691240.013.32.

Ogilvy Consulting, 2019. *The Ogilvy consulting trends*. [online] Available at: https://www.slideshare.net/socialogilvy/whats-next-the-ogilvy-consulting-trends-for-2019.

Olenski, S., 2014. Why music plays a big role when it comes to branding. *Forbes*, February 6th. [online] Available at: https://www.forbes.com/sites/steveolenski/2014/02/06/why-music-plays-a-big-role-when-it-comes-to-branding/?sh=6c6de05d7b6b.

Online Etymology Dictionary, n.d. Brand. In *etymonline.com*. [online] Available at: https://www.etymonline.com/search?q=brand.

Osgood, C.E., 1964. Semantic differential technique in the comparative study of cultures. *American Anthropologist*, 66(3), pp.171-200.

Osgood, C.E., Suci, G.J. and Tannenbaum, P.H., 1957. *The measurement of meaning*. Urbana, IL: University of Illinois Press.

Oyama, T., Yamada, H. and Iwasawa, H., 1998. Synesthetic tendencies as the basis of sensory symbolism: A review of a series of experiments by means of semantic differential. *Psychologia*, 41(3), pp.203-215.

Oyer, J. and Hardick, J., 1963. *Response of population to optimum warning signal*. Office of Civil Defence, Final Report No. SHSLR163. Contract No. OCK-OS-62-182, September.

Özcan, E., 2014. The Harley effect: Internal and external factors that facilitate positive experiences with product sounds. *Journal of Sonic Studies*, 6(1), pp.1-16.

Pagani, M., Racat, M. and Hofacker, C.F., 2019. Adding voice to the omnichannel and how that affects brand trust. *Journal of Interactive Marketing*, 48(2l), pp.89-105. https://doi.org/10.1016/j.intmar.2019.05.002.

Palmer, S.E., Schloss, K.B., Xu, Z. and Prado-León, L.R., 2013. Music-color associations are mediated by emotion. *Proceedings of the National Academy of Sciences of the USA*, 110(22), pp.8836-8841. https://doi.org/10.1073/pnas.1212562110.

Pathak, A., Velasco, C. and Spence, C., 2020. An analysis of the initial phonemes of popular brand names. *Journal of Brand Management*, 27, pp.339-354. https://doi.org/10.1057/s41262-019-00183-5.

Peretz, I., Gaudreau, D. and Bonnel, A., 1998. Exposure effects on music preference and recognition. *Memory and Cognition*, 26, pp.884-902. https://doi.org/10.3758/BF03201171.

Peters Rit, M., Croijmans, I. and Speed, L.J., 2019. High-tempo and stinky: High arousal sound–odor congruence affects product memory. *Multisensory Research*, 32, pp.347-366. https://doi.org/10.1163/22134808-20191410.

Pickup, O., 2017. Shopping with voice tech challenges brands. *Raconteur*, 484, 3.

Potter, R.F. and Dillman Carpentier, F.R., 2007. Effects of music on physiological arousal: Explorations into tempo and genre. *Media Psychology*, 10(3), pp.339-363. http://dx.doi.org/10.1080/15213260701533045.

Potter, R.F., Lynch, T. and Kraus, A., 2015. I've heard that before: Habituation of the orienting response follows repeated presentation of auditory structural features in radio. *Communication Monographs*, 82(3), pp.359-378. https://doi.org/10.1080/03637751.2015.1019529.

Powers, D., 2010. Strange powers: The branded sensorium and the intrigue of musical sound. In M. Aronczyk and D. Powers (Eds.), *Blowing up the brand: Critical perspectives on promotional culture* (pp. 285-306). New York, NY: Peter Lang.

Proverbio, A.M., D'Aniello, G.E., Adorni, R. and Zani, A., 2011. When a photograph can be heard: Vision activates the auditory cortex within 110 ms. *Scientific Reports*, 1(54). https://doi.org/10.1038/srep00054.

Puligadda, S. and VanBergen, N., 2023. The influence of sound logo instruments on brand personality perceptions: An investigation of brand ruggedness and sophistication. *Journal of Business Research*, 156:113531. https://doi.org/10.1016/j.jbusres.2022.113531.

Ranaweera, A.T. and Wasala, K., 2020. Color matters: The impact of logo color on consumer perceived eco-friendliness. *Expert Journal of Marketing*, 8(2), pp.129-139.

Reber, R., 2012. Processing fluency, aesthetic pleasure, and culturally shared taste. In A.P. Shimamura and S.E. Palmer (Eds.), *Aesthetic science: Connecting minds, brains, and experience* (pp. 223-249). Oxford, UK: Oxford University Press.

Reber, R. and Schwarz, N., 2001. The hot fringes of consciousness: Perceptual fluency and affect. *Consciousness and Cognition*, 2(2), pp.223-231. http://dx.doi.org/10.1075/ce.2.2.03reb.

Reber, R., Schwarz, N. and Winkielman, P., 2004. Processing fluency and aesthetic pleasure: Is beauty in the perceiver's processing experience? *Personality and Social Psychology Review*, 8(4), pp.364-382. https://doi.org/10.1207/s15327957pspr0804_3.

Reber, R., Winkielman, P. and Schwarz, N., 1998. Effects of perceptual fluency on affective judgments. *Psychological Science*, 9(1), pp.45-48. https://doi.org/10.1111/1467-9280.000.

Reber, R., Wurtz, P. and Zimmermann, T.D., 2004. Exploring "fringe" consciousness: The subjective experience of perceptual fluency and its objective bases. *Consciousness and Cognition*, 13(1), pp.47-60. https://doi.org/10.1016/S1053-8100(03)00049-7.

Reinoso-Carvalho, F., Dakduk, S., Wagemans, J. and Spence, C., 2019. Not just another pint! Measuring the influence of the emotion induced by music on the consumer's tasting experience. *Multisensory Research*, 32(4-5), pp.367-400. https://doi.org/10.1163/22134808-20191374.

Reinoso-Carvalho, F., Gunn, L., Molina, T., Narumi, T., Spence, C., Suzuki, Y., ter Horst, E. and Wagemans, J., 2020. A sprinkle of emotions vs a pinch of crossmodality: Towards globally meaningful sonic seasoning strategies for tasting experiences. *Journal of Business Research*, 117, pp.389-399. https://doi.org/10.1016/j.jbusres.2020.04.055.

Reinoso-Carvalho, F., Gunn, L.H., ter Horst, E. and Spence, C., 2020. Blending emotions and crossmodality in sonic seasoning: Towards greater applicability in multisensory food experience design. *Foods*, 9, p.1876. https://www.mdpi.com/2304-8158/9/12/1876/pdf.

Ridgway, J. and Myers, B., 2014. A study on brand personality: Consumers' perceptions of colours used in fashion brand logos. *International Journal of Fashion Design, Technology and Education*, 7(1), pp.50-57. https://doi.org/10.1080/17543266.2013.877987

Ritson, M., 2021. If your distinctive brand assets are exclusively visual it's time to come to your (other) senses. *Marketing Week*. [online] Available at: https://www.marketingweek.com/ritson-brand-assets-senses/.

Rodero, E., 2015. The spark orientation effect for improving attention and recall. *Communication Research*, 46(7), pp.965-985. https://doi.org/10.1177/0093650215609085.

Rodero, E. and Larrea, O., 2021. Audio design in branding and advertising. In L. Mas (Ed.), *Innovation in advertising and branding communication* (pp. 69-85). New York, NY: Routledge.

Romaniuk, J., 2018. *Building distinctive brand assets*. Oxford, UK: Oxford University Press.

Romaniuk, J., Sharp, B. and Ehrenberg, A., 2007. Evidence concerning the importance of perceived brand differentiation. *Australasian Marketing Journal*, 15(2), pp.42-54. https://doi.org/10.1016/s1441-3582(07)70042-3.

Russolo, A., 1916. *The art of noises* (English translation). Pendragon Press., Original work published in 1913.

Sadoff, R.H., 2004. Composition by corporate committee: Recipe for cliché. *American Music*, 22(1), pp.64-75. https://doi.org/10.2307/3592967.

Saitis, C., Weinzierl, S., von Kriegstein, K., Ystad, S. and Cuskley, C., 2020. Timbre semantics through the lens of crossmodal correspondences: A new way of asking old questions. *Acoustical Science and Technology*, 41(1), pp.365-368. https://doi.org/10.1250/ast.41.365.

Salakka, I., Pitkäniemi, A., Pentikäinen, E., Mikkonen, K., Saari, P., Toiviainen, P. and Särkämö, T., 2021. What makes music memorable? Relationships between acoustic musical features and music-evoked emotions and memories in older adults. *PLOS ONE*, 16(5), p. e0251692. https://doi.org/10.1371/journal.pone.0251692.

Salgado-Montejo, A., Maya, C., Velasco, C. and Spence, C., 2014. Construya experiencias a partir del sonido del envase. [Create experiences via the sound of the packaging]. *El Empaque + Conversión*, 20(4), pp.C8-C11.

Salgado-Montejo, A., Velasco, C., Olier, J.S., Alvarado, J. and Spence, C., 2014. Love for logos: Evaluating the congruency between brand symbols and typefaces and their relation to emotional words. *Journal of Brand Management*, 21(7), pp.635-649. https://doi.org/10.1057/bm.2014.29.

Sapherstein, M.B., 1998. The trademark registrability of the Harley-Davidson roar: A multimedia analysis. *Boston College Intellectual Property and Technology Forum*. [online] Available at: https://bciptf.org/wp-content/uploads/2011/07/48-the-trademark-registrability-of-the-harley.pdf.

Schaefer, H.-E., 2017. Music-evoked emotions—current studies. *Frontiers in Neuroscience*, 11, p.600. https://doi.org/10.3389/fnins.2017.00600.

Schütte, S., Eklund, J., Ishihara, S. and Nagamachi, M., 2008. Affective meaning: The Kansei engineering approach. In H. N. J. Schifferstein and P. Hekkert (Eds.), *Product experience* (pp. 477-496). London, UK: Elsevier.

Scott, S.P., Sheinin, D. and Labrecque, L.I., 2022. Small sounds, big impact: Sonic logos and their effect on consumer attitudes, emotions, brands and advertising placement. *Journal of Product and Brand Management*, 31(7), pp.1091-1103. https://doi.org/10.1108/jpbm-06-2021-3507.

Shrum, L.J., Lowrey, T.M., Luna, D., Lerman, D. and Liu, M., 2012. Sound symbolism effects across languages: Implications for global brand names. *International Journal of Research in Marketing*, 29(3), pp.275-279. https://doi.org/10.1016/j.ijresmar.2012.03.002.

Sidhu, D.M. and Pexman, P.M., 2018. Five mechanisms of sound symbolic association. *Psychonomic Bulletin and Review*, 25(5), pp.1619-1643. https://doi.org/10.3758/s13423-017-1361-1.

Singh, N., 2014. Sonic branding: An audible brand value. *Journal of Marketing and Communication*, 10(2), pp.28-35.

Sonnenschein, D., 2001. *Sound design: The expressive power of music, voice, and sound effects in cinema*. Saline, MI: Michael Wiese Productions.

SoundOut., 2022. SoundOut announces the US's most effective sonic logos of 2022. *GlobeNewswire News Room*. [online] Available at: https://www.globenewswire.com/en/news-release/2022/04/12/2421385/0/en/SoundOut-Announces-the-US-s-Most-Effective-Sonic-Logos-of-2022.html.

Spence, C., 2011a. Crossmodal correspondences: A tutorial review. *Attention, Perception and Psychophysics*, 73, pp.971-995. https://doi.org/10.3758/s13414-010-0073-7.

Spence, C., 2011b. Sound design: How understanding the brain of the consumer can enhance auditory and multisensory product/brand development. In K. Bronner, R. Hirt and C. Ringe (Eds.), *Audio Branding Congress Proceedings 2010* (pp. 35-49). Baden-Baden, Germany: Nomos Verlag.

Spence, C., 2012a. Managing sensory expectations concerning products and brands: Capitalizing on the potential of sound and shape symbolism. *Journal of Consumer Psychology*, 22, pp.37-54. https://dx.doi.org/10.1016/j.jcps.2011.09.004.

Spence, C., 2012b. Synaesthetic marketing: Cross sensory selling that exploits unusual neural cues is finally coming of age. *The Wired World in 2013*, November, pp.104-107.

Spence, C., 2013. On crossmodal correspondences and the future of synaesthetic marketing: Matching music and soundscapes to tastes, flavours, and fragrance. In K. Bronner, R. Hirt and C. Ringe (Eds.), *(((ABA))) Audio Branding Academy Yearbook 2012/2013* (pp. 39-52). Baden-Baden: Nomos.

Spence, C., 2014. Multisensory advertising and design. In B. Flath and E. Klein (Eds.), *Advertising and design. Interdisciplinary perspectives on a cultural field* (pp. 15-27). Bielefeld: Verlag.

Spence, C., 2015. Book review: Synaesthetic design. *Multisensory Research*, 28(3-4), pp.245-248. https://doi.org/10.1163/22134808-00002476.

Spence, C., 2020a. Assessing the role of emotional mediation in explaining crossmodal correspondences involving musical stimuli. *Multisensory Research*, 33, pp.1-29. https://doi.org/10.1163/22134808-20191469.

Spence, C., 2020b. On the ethics of neuromarketing and sensory marketing. In J. Trempe-Martineau and E. Racine (Eds.), *Organizational neuroethics: Reflections on the contributions of neuroscience to management theories and business practice* (pp. 9-30). Cham, Switzerland: Springer Nature.

Spence, C., 2022. The science of voice branding. In C. Fahey et al. (Eds.). *Voice branding*. Rowman and Littlefield Publishers.

Spence, C. and Di Stefano, N., 2022. Coloured hearing, colour music, colour organs, and the search for perceptually meaningful correspondences between colour and pitch. *i-Perception*, 13(3), pp.1-42. https://doi.org/10.1177/20416695221092802.

Spence, C. and Di Stefano, N., in press. Sensory translation between audition and vision. *Psychonomic Bulletin and Review*.

Spence, C., Parise, C. and Chen, Y.-C., 2012. The Colavita visual dominance effect. In M.M. Murray and M. Wallace (Eds.), *Frontiers in the neural bases of multisensory processes* (pp. 523-550). Boca Raton, FL: CRC Press.

Spence, C. and Sathian, K., 2020. Audiovisual crossmodal correspondences: Behavioural consequences and neural underpinnings. In K. Sathian and V.S. Ramachandran (Eds.), *Multisensory perception: From laboratory to clinic* (pp. 239-258). San Diego, CA: Elsevier.

Spence, C. and Wang, (Q.)J., 2017. Assessing the impact of closure type on wine ratings and mood. *Beverages*, 3:52. https://doi.org/10.3390/beverages3040052.

Spence, C., Wang, Q.J., Reinoso-Carvalho, F. and Keller, S., 2021. Commercializing sonic seasoning in multisensory offline experiential events and online tasting experiences. *Frontiers in Psychology*, 12, p.740354. https://doi.org/10.3389/fpsyg.2021.740354.

Spence, C. and Zampini, M., 2006. Auditory contributions to multisensory product perception. *Acta Acustica united with Acustica*, 92(6), pp.1009-1025.

Spence, C. and Zampini, M., 2007. Affective design: Modulating the pleasantness and forcefulness of aerosol sprays by manipulating aerosol spraying sounds. *CoDesign*, 3 (Supplement 1), 109-123.

Spivey, M.J., Tyler, M.J., Eberhard, K.M. and Tanenhaus, M.K., 2001. Linguistically mediated visual search. *Psychological Science*, 12(4), pp.282-286. https://doi.org/10.1111/1467-9280.00352.

Strach, P., Zuber, K., Franklin Fowler, E., Ridout, T.N. and Searles, K., 2015. In a different voice? Explaining the use of men and women as voice-over announcers in political advertising. *Political Communication*, 32(2), pp.183-205. https://doi.org/10.1080/10584609.2014.914614.

Suchman, P., 2023. Your brain on sound: Marketing and the neuroscience of sonic identity. *Ad Age*, April 17th. [online] Available at: https://adage.com/article/marketing-news-strategy/your-brain-sound-marketing-and-neuroscience-sonic-identity/2486691.

Sunaga, T., 2018. How the sound frequency of background music influences consumers' perceptions and decision making. *Psychology and Marketing*, 35(4), pp.253-267. https://doi.org/10.1002/mar.21084.

Sunaga, T., Moriguchi, T. Ishii, H. and Spence, C., 2021. Assessing multisensory semantic congruence involving instrumental timbre. Oral online presentation at *EMAC 2021 Conference* hosted by ESIC Business and Marketing School on May 25-28th.

Sundar, A. and Noseworthy, T.J., 2016a. When sensory marketing works and when it backfires. *Harvard Business Review*, May 19th. [online] Available at: https://hbr.org/2016/05/when-sensory-marketing-works-and-when-it-backfires.

Sundar, A. and Noseworthy, T.J., 2016b. Too exciting to fail, too sincere to succeed: The effects of brand personality on sensory disconfirmation. *Journal of Consumer Research*, 43(1), 44-67.

Sung, Y.S., Choi, M.J., Chung, S.J. and Kim, C.Y., 2011. Neural responses to sonic branding: An fMRI study. *Science of Emotion and Sensibility*, 14(1), pp.93-100.

Techawachirakul, M., Pathak, A. and Calvert, G.A., 2022. That sounds healthy! Audio and visual frequency differences in brand sound logos modify the perception of food healthfulness. *Food Quality and Preference*, 99, p.104544. https://doi.org/10.1016/j.foodqual.2022.104544.

Techawachirakul, M., Pathak, A., Motoki, K. and Calvert, G.A., 2023. Sonic branding of meat-and plant-based foods: The role of timbre. *Journal of Business Research*, 165, p.114032. https://doi.org/10.1016/j.jbusres.2023.114032.

Tonetto, L.M. and Trevisan, R.B.L., 2012. Testing affective responses to different brand vocal and sound logo stimuli: A case study. In K. Bronner and R. Hirt (Eds.), *Audio Branding Academy Yearbook 2011/2012*, pp. 141-149. Baden-Baden: Nomos.

Treasure, J., 2007. *Sound business*. Oxford, UK: Management Books 2000.

Trevor, C., Arnal, L.H. and Frühholz, S., 2020. Terrifying film music mimics alarming acoustic feature of human screams. *Journal of the Acoustical Society of America*, 147(6), pp.EL540-EL545. https://doi.org/10.1121/10.0001459.

Van Doorn, G., Paton, B. and Spence, C., 2016. Is *J* the new *K?* A failure to replicate Schloss (1981). *Journal of Brand Management*, 23, pp.666-678. https://doi.org/10.1057/s41262-016-0007-3.

van Leeuwen, T., 2017. Sonic logos. In *Music as multimodal discourse. Semiotics, power and protest*, pp. 119-134. London, UK: Bloomsbury Academic.

Veritonic, 2021. Veritonic's fifth-annual audio logo index highlights sonic branding best practices. *Cision PR Newswire*. [online] Available at: https://www.prnewswire.com/news-releases/veritonics-fifth-annual-audio-logo-index-highlights-sonic-branding-best-practices-301300674.html.

Veritonic, 2022. *Audio logo index*. [online] Available at: https://www.veritonic.com/audio-logo-index.

Vidal-Mestre, M., Freire-Sánchez, A., Calderón-Garrido, D., Faure-Carvallo, A. and Gustems-Carnicer, J., 2022. Audio identity in branding and brand communication strategy: A systematic review of the literature on audio branding. *El Profesional De La Información*. https://doi.org/10.3145/epi.2022.sep.04.

Volker, B. and Milton, S., 2019. Why sound and voice are the future on brand experience. Muse by Clio. [online] Available at: https://musebycl.io/music/why-sound-and-voice-are-futurebrand-experience.

Walker, P., 2012. Cross-sensory correspondences and cross talk between dimensions of connotative meaning: Visual angularity is hard, high-pitched, and bright. *Attention, Perception and Psychophysics*, 74, pp.1792-1809. https://doi.org/10.3758/s13414-012-0341-9.

Walker, P., 2016. Cross-sensory correspondences: A theoretical framework and their relevance to music. *Psychomusicology: Music, Mind, and Brain*, 26(2), 103-116. https://doi.org/10.1037/pmu0000130.

Walker-Andrews, A., 1994. Taxonomy for intermodal relations. In D. J. Lewkowicz and R. Lickliter (Eds.), *The development of intersensory perception: Comparative perspectives*, pp. 39-56. Hillsdale, NJ: Lawrence Erlbaum.

Wallace, W.T., 1991. Jingles in advertisements: Can they improve recall? In R.H. Holman and M.R. Solomon (Eds.), *NA – Advances in Consumer Research*, 18, pp. 239-242. Provo, UT: Association for Consumer Research.

Wang, Q.(J.), Keller, S. and Spence, C., 2017. Sounds spicy: Enhancing the evaluation of piquancy by means of a customised crossmodally congruent soundtrack. *Food Quality and Preference*, *58*, pp.1-9. https://doi.org/10.1016/j.foodqual.2016.12.014.

Wang, Q.J., Keller, S. and Spence, C., 2021. Metacognition and crossmodal correspondences between auditory attributes and saltiness in a large sample study. *Multisensory Research*, 34(8), pp.785-805. https://doi.org/10.1163/22134808-bja10055.

Wang, Q.(J.) and Spence, C., 2019. Sonic packaging: How packaging sounds influence multisensory product evaluation. In C. Velasco and C. Spence (Eds.), *Multisensory packaging: Designing new product experiences* (pp. 103-125). Cham, Switzerland: Palgrave MacMillan.

Washburn, M., Child, M. and Abel, T., 1927. The effects of immediate repetition on the pleasantness of music. In M. Schoen (Ed.), *The effects of music*, pp. 199-210. New York, NY: Harcourt, Brace.

Wazir, M.I. and Wazir, O., 2015. Effects of sonic logo on brand recognition of the advertised brand. *City University Research Journal; Peshawar*, 5(2), pp.327-337.

Weinrich, A. and Gollwitzer, A., 2016. Automaticity and affective responses in valence transfer: Insights from the crossmodal auditory-visual paradigm. *Psychology of Music*, 44(6), pp.1304-1307. https://doi.org/10.1177/0305735615626519.

Westbury, C., Hollis, G., Sidhu, D.M. and Pexman, P.M., 2018. Weighing up the evidence for sound symbolism: Distributional properties predict cue strength. *Journal of Memory and Language*, 99, pp.122-150. https://doi.org/10.1016/j.jml.2017.09.006.

Westermann, C.F., 2008. Sound branding and corporate voice – strategic brand management using sound. In T. Hempel (Ed.), *Usability of speech dialog systems: Listening to the target audience* (pp. 147-155). Berlin: Springer.

Wheatley, J.J. and Brooker, G., 1994. Music and spokesperson effects on recall and cognitive response to a radio advertisement. In E. M. Clark, T. C. Brock and D. W. Stewart (Eds.), *Attention, attitude, and affect in response to advertising* (pp. 189-204). Hillside, NJ: Lawrence Erlbaum.

Whittington, W., 2014. Sound design in new Hollywood cinema. In G. Harper, R. Doughty and J. Eisentraut (Eds.), *Sound and music in film and visual media: A critical overview*, pp. 555-568. USA: Bloomsbury Publishing.

Winkielman, P., Schwarz, N., Fazendeiro, T. and Reber, R., 2003. The hedonic marking of processing fluency: Implications for evaluative judgment. In J. Musch and K. C. Klauer (Eds.), *The psychology of evaluation: Affective processes in cognition and emotion*, pp. 189-217. Mahwah, NJ: Erlbaum.

WIPO, 2007a. *Relation of established trademark principles to new types of marks*. Standing committee on the law of trademarks, industrial designs and geographical indications. Seventeenth Session: Geneva, May 7 to 11, 2007. World Intellectual Property Organization, Geneva, Switzerland.

WIPO, 2007b. *Methods of representation and description of new types of marks*. Standing committee on the law of trademarks, industrial designs and geographical indications. Seventeenth Session: Geneva, May 7 to 11, 2007. World Intellectual Property Organization, Geneva, Switzerland.

Wong, H., 2019. Why sonic branding is more than just the McDonald's jingle. *Design Week*, October 9th. [online] Available at: https://www.designweek.co.uk/issues/7-13-october/sonic-branding/.

WPP., 2023. WPP acquires sonic branding agency AMP. *WPP Press Release*, April 20th. [online] Available at: https://www.wpp.com/en/news/2023/04/wpp-acquires-sonic-branding-agency-amp.

Wright, K.D., 2019. *Follow the feeling: Brand building in a noisy world*. Hoboken, NJ: Wiley.

Wu, W.-Y., Fu, C.-S., Huang, H.-S. and Wang, H.-C., 2010. Effects of sound stimuli applied in branding: An empirical study of its antecedents and consequences. *Asian Journal of Business and Accounting*, 3(1), pp.27-54.

Wyn, J.P., 2021. Can anybody hear me? The power of music in advertising. *Kantar*. [online] Available at: https://www.kantar.com/inspiration/advertising-media/can-anybody-hear-methe-power-of-music-in-advertising.

Yang, S., Chang, X., Chen, S., Lin, S. and Ross, W.T. Jr., 2022. Does music really work? The two-stage audiovisual cross-modal correspondence effect on consumers' shopping behaviour. *Marketing Letters*, 33, pp.251-276. https://doi.org/10.1007/s11002-021-09582-8.

Yeoh, J.P.S. and Allan, D., 2020. Sounds like chicken: Sensory marketing and sound effects. *Indian Journal of Marketing*, August – September, pp.19-30.

Yeoh, J.(S.), Han, M.G. and Spence, C., 2023. The impact of musical fit and sound design on consumers' perception of a luxury car ad. *Luxury* (RFLU), 9(2-3), pp.1-20. https://doi.org/10.1080/20511817.2022.2224496.

Yeoh, J. and Spence, C., 2023. Background music's impact on patients waiting in surgery and radiology clinics. *HERD: Health Environments Research and Design Journal*. https://doi.org/10.1177/19375867231161094.

Zampini, M., Guest, S. and Spence, C., 2003. The role of auditory cues in modulating the perception of electric toothbrushes. *Journal of Dental Research*, 82(11), pp.929-932. https://doi.org/10.1177/154405910308201116.

Zander, M.F., 2006. Musical influences in advertising: How music modifies first impressions of product endorsers and brands. *Psychology of Music*, 34(4), pp.465-480. https://doi.org/10.1177/0305735606067158.

Zander, M.F., Apaolaza-Ibáñez, V. and Hartmann, P., 2010. Music in advertising: Effects on brand and endorser perception. *Advances in Advertising Research*, 1, pp.127-140. https://doi.org/10.1007/978-3-8349-6006-1_9.

Zarczynski, A., 2020. Pandora's new playlists elevate the future of everyday music experiences. *Forbes*, October 16th. https://www.forbes.com/sites/andreazarczynski/2020/10/16/pandoras-new-playlists-elevate-the-future-of-everyday-music-experiences/#4e6bcfd32552.

Zentner, M., Grandjean, D. and Scherer, K.R., 2008. Emotions evoked by the sound of music: Characterization, classification, and measurement. *Emotion*, 8(4), pp.494-521. https://doi.org/10.1037/1528-3542.8.4.494.

Zhang, X., 2021. From audio branding to sound trademark: A comparative study in the EU and the US. *Beijing Law Review*, 12, pp.409-424. https://doi.org/10.4236/blr.2021.122023.

Zoghaib, A., Luffarelli, J. and Feiereisen, S., in press. Branding with music: How can music contour and tonality enhance perceived brand innovativeness and brand evaluations?. *Psychology and Marketing.* https://doi.org/10.1002/mar.21875