RUNNING HEAD: EXPERIMENTAL ATMOSPHERICS: A MULTISENSORY PERSPECTIVE

Experimental Atmospherics: A Multisensory Perspective

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ABSTRACT

Atmospherics is undoubtedly a multisensory concept, despite mostly being studied on a sense-by-sense basis by architects, sensory marketers, and urban designers alike. Our experience is nearly always the result of crossmodal/multisensory interactions between what we see, hear, smell, and feel in a given space. As such, it is critical that researchers study the senses in concert. The few empirical studies that have attempted to assess the impact of deliberately combining the senses in a retail/healthcare environment have typically failed to deliver the multisensory boost to experience (or sales) that the multisensory science predicts ought to be observed. Invoking notions of processing fluency, sensory overload, and sensory (in-)congruency in the field of multisensory atmospherics may help to explain what happened (or went wrong) in such cases.

KEYWORDS: MULTISENSORY ATMOSPHERICS; CONGRUENCY; SENSORY OVERLOAD; SENSORY MEANING; MULTISENSORY MARKETING; PROCESSING FLUENCY.

1. Introduction

It is almost half a century now since Philip Kotler published his seminal article on atmospherics. In a short review, the influential North American marketer outlined a number of cues/dimensions of sensory experience that he believed could potentially be individually optimized in order to deliver the 'total experience' rather than just the 'tangible experience'. Kotler's paper was heavy on anecdote and illustrative example from the marketplace (e.g., Anon., 1965; Rooney, 1970), but short on rigorous peer-reviewed empirical research. What is more, the approach was also very much sense-by-sense, with little, if any, consideration given to how the senses might interact, one with another. Nevertheless, the publication of Kotler's article undoubtedly helped to galvanize a generation of marketing researchers to investigate the impact of store atmospherics on consumer behaviour (e.g., (Alexander & Nobbs, 2016; and see Roschk, Loureiro, & Breitsohl, 2017; Spence, Puccinelli, Grewal, & Roggeveen, 2014, for reviews).

Over the years that followed, many marketing researchers published findings documenting the effect of a range of unisensory cues on sales/impression formation in various retail settings: These included the beneficial effects of lighting/colour (Biswas, Szocs, Chacko, & Wansink, 2017; Chebat & Morrin, 2007; and nowadays, also shape; e.g., Liu, Bogicevic, & Mattila, 2018; Spence, 2020e), sound (though more often music; see Knoeferle & Spence, 2021, for a review), and scent (e.g., Minsky, Fahey, & Fabrigas, 2018; Morrin, 2010; Nassauer, 2014; Smiley, 2014). Touch has typically attracted less research interest though, a literature is now starting to emerge on in-store touch (both interpersonal and object-based) as well as the effect of thermal cues on consumer behaviour (e.g., see Gallace & Spence, 2014; Heschong, 1979; Salkin, 2005). Kotler (1974) also discussed the potential role of atmospherics in the context of travel agencies and psychiatrists' offices. However, empirical atmospherics research in healthcare settings has only really started to appear very recently (e.g., Fenko & Loock, 2014; Spence, 2021; Spence & Keller, 2019).

1.1. The experience economy

It takes more than merely atmosphere (see Böhme, 2017, of the theme of felt atmospheres), be it multisensory or otherwise, to create a retail environment that boosts sales significantly. Pine and Gilmore (1998, 1999) promoted the benefits of the 'experience economy' in this regard,

going so far as to suggest that customers should be willing to pay for the privilege of entering those stores that are capable of delivering the best experience (think Starbucks and the Disney Store). However, the danger, as has on occasion become all too apparent, is that customers may sometimes visit the store in order to soak-up the experience, but leave without necessarily buying anything, as Abercrombie & Fitch found to their cost a few years ago (Elliott, 2014). One other issue that has often been neglected by research on atmospheric is the potentially important role played by the social interaction between those individuals who happen to be co-present in a given space, be it a sporting venue or a restaurant (see Hill, Canniford, & Eckhardt, 2022; Rosenbaum & Massiah, 2011; see also Steadman, Roberts, Medway, Millington, & Platt, 2021).

2. Questioning the 'meaning' of marketing studies involving atmospheric interventions

Challenges to the interpretation of the empirical findings that have been published in the decades since Kotler's (1974) paper appeared in print come from several directions. As one looks back (i.e., in the era of the replication crisis in science), many of the classic studies now appear chronically underpowered (Brysbaert, 2019; Button, Ioannidis, Mokrysz, Nosek, Flint, Robinson, & Munafò, 2013). Certainly, few contemporary researchers have managed anything like the scale of data collection achieved by Milliman (1982, 1986) in his classic early studies of the impact of musical tempo on customer behaviour in the supermarket and restaurant setting. For example, North, Hargreaves, and McKendrick's (1997, 1999) classic study of the impact of French vs. German music on wine sales in a British supermarket (first published in top science journal *Nature*), was based on just 82 transactions/customers (44 of whom agreed to be interviewed about why they had chosen the wine that they had after leaving the tills; see also Hultén, 2012, for another very small sample store study). The latest research demonstrated similar crossmodal effects of French vs. German background music on online wine sales (Damen, van Hest, & Wernaart, 2021).

Of course, there may sometimes be unintended (and potentially undesirable) consequences of sensory interventions. This was documented in one supermarket study in which the sounds of the sea were presented by the fish counter in order to try and increase sales of fish (i.e., a healthy product). The atmospheric intervention worked admirably, with sales of seafood and fish increasing significantly. At the same time, however, sales of red meat declined (Spence, 2021),

thus suggesting that one may need to be careful what one asks for. One group of individuals who are rarely discussed in studies of experimental atmospherics are the employees (though see Bitner, 1992, for an exception). In a number of such cases, there is a very real danger that those atmospheres that may do the most to help to promote sales (such as playing loud fast music) may be unhealthy for those who work there, such as the staff in bars and restaurants that often exceed 100 dB on noise (Spence, 2015).

What is more, despite the publication bias, null results have been reported in several studies, suggesting contextual dependencies on sensory atmospherics/marketing that are only now being worked out (e.g., see Morrin & Tepper, 2021; Roschk & Hosseinpour, 2020; Smeets & Dijksterhuis, 2014). Of course, given the bias in the literature toward publishing significant results (i.e., over null results), there is likely to be a file drawer problem (Rosenthal, 1979) in the field of experimental atmospherics research, just as there is elsewhere in experimental psychology/science. It is, though, something of a philosophical question as to whether the failure to replicate a particular experimental result today necessarily means that an effect wasn't real at the time and place where it was first observed (see Iso-Aloha, 2017, 2020).

The meaning, and hence the likely influence, of music or, for that matter, scent likely depends on culture (e.g., Ayabe-Kanamura, Schicker, Laska, Hudson, Distel, Kobayakawa, & Saito, 1998; Trivedi, 2006), and presumably changes as the decades go by. After all, yesteryear's contemporary hit music may be today's nostalgia music (e.g., see Barrett, Grimm, & Robins, 2010), and the same goes for scent too (cf. Hwanga & Hyun, 2013; Reid, Green, Wildschut, & Sedikides, 2015). Relevant here, those scent marketers worried about how to deal with cross-cultural differences ought to be heartened by the latest research findings to have been published suggesting that vanilla is a universally-liked scent (Arshamian, Gerkin, Kruspe, Wnuk, Floyd, O'Meara, Rodriguez, Lundström, Mainland, & Majid, 2022). At the same time, however, it should also be noted how the 'meaning' (or at least the consumer's/public's interpretation) of a number of popular ambient scents such as, for example, pine have changed as the decades have gone by (see Hickman, 2022; see Spence, submitted-a).

The atmospheric stimuli used in the majority of the research have simply not been adequately specified. For instance, consider here only how yellow hues typically tend to be brighter/lighter than reds and greens. As such, it can be hard to dissociate the impact of hue from that of lightness, say, in much of the early marketing literature (see Wheatley, 1973). Similarly, when it comes to the impact of music, Knöferle, Herrmann, Landwehr, and Spangenberg (2012) have

demonstrated how tempo's influence on consumer behaviour is modulated by the mode of the music. Too often (e.g., as in the studies of Milliman) the tempo manipulation is referenced without there being any mention of the music's mode (or timbral properties, say). Fully describing the olfactory atmosphere is an even more challenging undertaking.

2.1. Establishing the 'meaning' of sensory cues

There is an important question here as to what, exactly, a given sensory cue 'means'. Traditionally, marketers refer to the emotional connotation of colour (Wheatley, 1973). However, there are undoubtedly a range of other meanings, including the connotative (e.g., Mick, 1986; Spence & Van Doorn, 2022). While marketers attach meaning to colour in an abstract context, it may be the contextually-determined meaning that is key (e.g., see Elliott & Maier's, 2012; 'colour-in-context' theory; and see Motoki, Takahashi, & Spence, 2021, for a concrete example). Similarly, the 'meaning' of scents and sounds are rarely fixed and, can change as a function of culture, context, time, etc. For instance, just take the eugenol scent of the dentist's surgery, or the highly desirable 'new car' smell (see Spence, 2021). Exposure to these volatile chemicals can elicit stressful and highly rewarding/pleasurable impressions, respectively. However, these responses are not determined by the molecular structure of the volatile compounds themselves, but rather result from the customer's prior emotive experience when these odorants have been present (i.e., as a result of associative learning/conditioning).

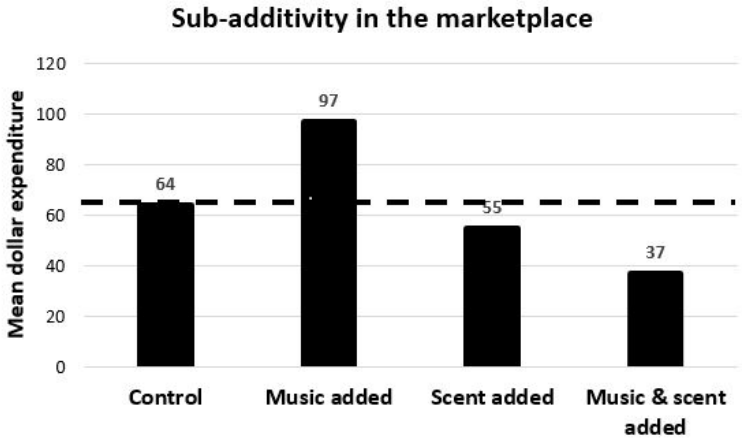
Hence, were we to follow guidelines to mask the smell of eugenol with orange scent in dentist's surgery (Lehrner, Eckersberger, Walla, Pötsch, & Deecke, 2000), then any beneficial effects on stress reduction amongst the patients would likely soon disappear. Similarly, the association between cool temperature and luxury perception can be traced back to the early days of air conditioning in the United States (where only the richer establishments could likely afford the luxury; Heschong, 1979). Note how this explanation of the meaning of this particular atmospheric cue is rather different from the cool-rational thinking account that has been put forward by a number of contemporary researchers (Park & Hadi, 2019; see also Spence, 2021). In summary, therefore, given the changing meanings associated with various atmospheric cues over time, and as a result of culture, it becomes particularly important for those interested in optimizing the atmosphere in a given environment to explore the effects of combing different sensory cues for themselves, rather than simply relying on published research of questionable

relevance, and sometime also robustness (given the small sample sizes that have often been involved).

3. Multisensory atmospherics

'Atmospherics' is nothing if not multisensory (see Spence, 2020a, c), and yet those multisensory experimental studies that have investigated crossmodal interactions in atmospherics are currently few and far between. What is more, empirical research on the theme of in-store atmospherics has often failed to demonstrate the multisensory lift to sales/experience that the literature would seem to predict ought to be there (see Spence, 2021).

For example, just take, Morrin and Chebat's (2005) classic marketing study of customer spending on unplanned purchases by nearly 800 shoppers in a North American mall. Their results suggested that such sales could be increased by as much as 50% simply by playing slow tempo music, harking back to the seminal work of Milliman, mentioned earlier. By contrast, releasing a citrus fragrance led to a small (and non-significant) decline in sales. However, when the music and fragrance were presented in the mall at the same time (to create a multisensory atmosphere), sales dropped significantly (see **Figure**). Fenko and Loock (2014) similarly failed to demonstrate any benefit, in terms of relaxation amongst patients, of engaging sound and scent in a plastic surgeon's waiting room. In other word, the failure to deliver a multisensory boost is not simply restricted to retail environments.



What went 'wrong' in such cases is hard to say without knowing more, but one possibility is that the musical and olfactory stimuli may simply have been incongruent along some dimension

(such as perhaps their arousal value, or semantic associations). Indeed, it is easy to imagine how slow tempo music may have relaxed the shoppers, while the citrus scent might have been arousing instead. As such, combining an arousing scent with relaxing music may have left shoppers confused. People typically find it hard to process incongruent sensory signals. The lack of processing fluency (referring to how easy people find it to process stimuli) associated with mismatching inputs is normally negatively-valenced – meaning people do n0t like it, and hence it doesn't do much for sales, as Morrin and Chebat's (2005) data seemingly implies (see also Doucé, 2022; Yang, Chang, Chen, Lin, & Ross, 2022).

3.1. Multisensory congruency vs. redundancy

So why is it, then, that multisensory atmospheric interventions have so often failed to give rise to the boost to sales that would seem to be predicted by the multisensory science (Morrin & Chebat, 2005; cf. Banks, Ng, & Jones-Gotman, 2012; Fenko & Loock, 2014)? There is a separate question here about how, exactly, congruency should be defined (e.g., Bosmans, 2006; Lin, 2010; Mattila & Wirtz, 2001).[1] One way of establishing congruency in such cases has been to use the semantic differential technique (Osgood, Suci, & Tannenbaum, 1957). According to the literature, the latter approach allows visual, auditory, and even olfactory cues to be aligned based on their connotative meaning (e.g., Dalton, Maute, Oshida, Hikichi, & Izumi, 2008).

Over the last half century or so, atmospheric congruency has often been framed in terms of Mehrabian and Russell's (1974) environmental psychology framework of Pleasure, Arousal, and Dominance (PAD; see Jang & Namkung, 2009; Liu & Jang, 2009). That said, it is interesting to note how the theory of crossmodal correspondences (Spence, 2012), is now starting to provide an intriguing complementary, or possibly alternative framework in which to consider how to choose and align sensory impressions in a manner that is almost (though importantly is not) synaesthetic (e.g., Biswas, Lund, & Szocs, 2019; Motoki, Saito, Nouchi, Kawashima, & Sugiura, 2019; Motoki, Takahashi, Velasco, & Spence, 2022).

The danger, though, is that crossmodal congruency (no matter what form it takes) might give rise to pleonacy, mere repetition in scent, for example, of what may already be shown visually

[1] One might, of course, also need to consider not only the congruency between sensory cues, but also the perceived congruency between atmospheric sensory cues and brand image (e.g., Errajaa, Legoherel, & Daucé, 2018).

(e.g., see Banes, 2001). Alternatively, however, combining the senses may also give rise to sensory overload, typically defined as too much sensory input, likely giving rise to detrimental consequences (e.g., Doucé & Adams, 2020; Malhotra, 1984; Pikó, 2017). There may, though, be an intriguing territory here in terms of individual differences in the amount of sensory stimulation that different groups of consumers appreciate (cf. Dragutinovich, 1987). Certainly, it is noticeable how the multisensory atmospheric onslaught of stores such as Lush or Abercrombie & Fitch (Hollister) appears more acceptable to some customers but not others (who complain of sensory overstimulation).

The multisensory atmosphere may operate more in the background of perceptual experience, than in the foreground (see Spence, 2020c). As such, it is possible that the rules of multisensory integration that have been worked out for objects and events (i.e. for attended foreground stimuli) may simply not necessarily work in quite the same way for those sensations that normally reside in the background of experience (i.e., such as unattended atmospheric cues). As such, the congruency of the background sensory elements may simply be less relevant than many multisensory researchers have come to expect. Certainly, many of the atmospheric cues that are combined are, in some sense incongruent, though that seems not to matter in quite the way that the 'processing fluency' account might lead one to believe (see Doucé, 2022; Spence, 2020c). Consider here only how the auditory virtual reality of a band playing music that contemporary recorded music offers can be easily manipulated without any concomitant changes in any of the other atmospheric sensory cues. There is, in other words, often no obvious connection between the different senses contributing to our experience of the multisensory atmosphere.

4. Science-based decision making vs. gut feel

Over the last decade or so, I have spoken to a wide range of brand managers at a number of the world's largest clothing retail brands. I have also advised a number of hotel groups on the theme of multisensory atmospherics (cf. Spence, submitted-b; Wiedmann, Labenz, Haase, & Hennigs, 2016). Very often, the audience nods politely, sometimes even enthusiastically, as I review the evidence concerning the boost to sales that can be expected by engaging in multisensory atmospherics/sensory marketing. Disappointingly, however, they then seemingly do nothing, or, at best, perhaps just focus on the lighting/refreshing the colour scheme as they

have always done. Whether this reflects the ubiquity of visual dominance (see Hutmacher, 2019; Spence, Ranasinghe, Velasco, & Obrist, 2017) or rather, uncertainty over the ecological validity, or rather contemporary relevance, of some of the findings (e.g., see Hirsch, 1990) can be hard to say.

Oftentimes, marketing/brand managers end-up relying on gut feel or intuition rather than hard data (Spence, 2020b). Of course, when one's job is on the line, it can be hard to go against one's intuitions. Given such inaction, the challenge, at least as I see it, is not to publish yet another (possibly underpowered) empirical study demonstrating that this or that scent, sound, or other sensory cue helps to increase sales (in the short-term), but rather to demonstrate long-term effects in an ecologically-valid multisensory context that merit the likely investment that such marketing interventions would likely require (see Spence, 2020b). Here, I am reminded of the phenomenally expensive, and ultimately unsuccessful, multisensory design undertaken by Helm Bank in Bogota, Colombia (Blakey, 2010). The substantial cost associated with engaging the senses to deliver multisensory atmospherics in a retail context can be hard to justify, unless the return-on-investment (ROI) can be convincingly demonstrated.

My advice is to take the evidence as proof-of-principle, but that need to experiment to determine which particular cues/combination of sensory attributes deliver the desired atmosphere (i.e., one that boosts sales, or encourages repeat custom). Of course, the challenge is that consumers typically want to know what to expect from a brand/retail experience and may not like the idea that they are being 'experimented on'. The range of experimental stimuli therefore likely needs to be fairly narrowly constrained (e.g., not classical music versus death metal, but rather lower versus higher beats per minute (bpm) popular music, say). I believe is that big data analysis linked to store sales will likely help (see Kühn, Strelow, & Gallinat, 2016). For instance, I am currently working with an Italian start-up that is developing a music app that connects hyperdirectional loudspeakers to the tills. This technical solution will hopefully allow for large-scale data collection concerning the impact of specific music choices on consumer choice and, more importantly, sales (see Wiggers, 2019, for another example of the benefits of analysing 1.6 billion fidelity card transactions). I am firmly of the belief that experimentation is key given how little awareness any of us have of atmospheric influences over our perception/behaviour.

5. Conclusions: Crossmodal influences on atmospherics

Ultimately, it is important to recognize the ubiquitous crossmodal influences on multisensory atmospherics. In fact, it may not be going too far to consider crossmodal influences as the rule, rather than the exception. For instance, sound frequency influences consumer responses to color lightness (Hagtvedt & Brasel, 2016), thermal comfort is influenced by the use of warm vs. cool ambient colour schemes (see Spence, 2020d, for a review), and the perceived safety of public spaces (such as underground car-park or metro station) can be enhanced by the presence of the appropriate ambient sound (Sayin, Krishna, Ardelet, Decré, & Goudey, 2015). Given the ubiquity of such crossmodal, or multisensory, interactions, one might question just how meaningful it is to study the senses in isolation. At the same time, however, it is also striking how studies of multisensory influences on people's perception of urban space can soon end up delivering a bewildering array of multisensory interactions that can prove hard for even the most committed multisensory researcher to interpret (e.g., see Ba & Kang, 2019a, b). At the same, it is also important to deal with the question of crossmodal congruency and be sensitive to the problem of sensory overload.

Ultimately, the spatially and temporally extended nature of our experience of multisensory atmosphere (Steadman et al., 2021), is something that much of the research in experimental atmospherics (introduced by the seminal early research of Kotler, 1974) has often failed to acknowledge (see also Coffin & Chatzidakis, 2021). And, given the various issues outlined in this review, it would make sense for anyone interested in optimizing the multisensory environment, no matter whether they are working in the retail or healthcare setting, to find out for themselves what the effects of modifying the visual, auditory, olfactory, and/or tactile attributes of the environment might be.

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