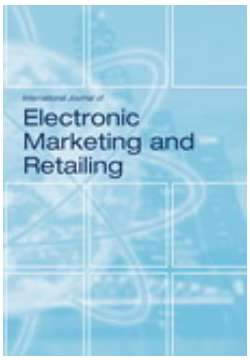

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Beauty in the eyes of the beholder: a meta-analytic review of the effect of design atmospherics on shopping outcomes

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Abstract: Informed by consumer behaviour theories, this study aims to provide a quantitative review of the effect of four selected design atmospherics – colour, lighting, store-layout, and product display – on three shopping outcomes – approach behaviour, behavioural intentions, and emotional states in retail, service, and online settings. Methodologically, 76-independent articles were analysed using both subgroup and meta-analytic regression analyses from 1980–2019. Results showed that product display yields the highest ratings on shopping outcomes (r = 0.28), followed by *colour* (r = 0.24), layout (r = 0.23), and lighting (r = 0.22). Moreover, findings divulged that the aggregate effect of design atmospherics on behavioural intentions (r = 0.32) is larger than on approach behaviour (r = 0.22) and on emotional states (r = 0.21). The moderator analysis unveiled that shopping setting, experimental design, store format, and study design significantly account for between-study variance. These results offer useful insights regarding future research avenues and underline relevant managerial implications for designing and managing physical stores, services, and e-commerce websites.

Keywords: design-atmospherics; shopping-outcomes; meta-analysis.

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1 Introduction

In today's competitive business environment, where both retailers and consumers are remaking and revamping the shopping experience, store design atmospherics play a vital role in impacting shopping outcomes. Many retailers and manufacturers, in response to the environmental developments, are now shifting from the traditional marketing technique to a shopper marketing approach to influence the triggers in the shopping experience cycle (Narayanaswamy and Heiens, 2021). Contemporary retailing innovations and investment in store atmospherics design and store format like store size, layout, product displays, lighting, colour, etc. demonstrate that store performance on these variables significantly influence consumers' perception and retail patronage (Baeka et al., 2018). Empirical evidence reveal that diverse atmospheric design factors can create diverse cognitive or affective responses, which, in turn, influence consumer behaviour (Choi et al., 2018). Store design cue-based atmosphere can stimulate customers' senses, enrich shopping experience, and eventually translates to sales revenue for retailers (Tantanatewin and Inkarojrit, 2016).

In view of this pragmatic recognition of the potential impact of design atmospheric stimuli, researchers have investigated how key interior design elements or stimuli like colour, lighting, display, texture, fixtures, and layout impact shopping outcomes such as arousal, pleasure, satisfaction, and behavioural intentions in the last four decades (e.g., Chang et al., 2011). For instance, colour and light have been found to enhance customers' recognition, space perception and emotion, quality perception, impression, classification, and interpretation (Baeka et al., 2018; Brengman et al., 2012). As well, Hussain and Ali (2015) delineated that lighting, product display, and layout positively influence purchase intention and consumers' perceptions about products, but colour does not.

While the marketing literature shows that atmospherics design factors significantly matter, empirical evidence has yielded mixed and conflicting results, with studies showing a mixture of positive, negative, and non-significant relationships (e.g., Hussain and Ali, 2015; Andersson et al., 2012). Besides, the extant literature has not produced conclusive results in regard to the real strength of the effect of store atmospheric design stimuli, rendering conclusions about the phenomenon daunting for retail and marketing executives. It is against this lacuna that Bitner (1992, p.57) noted, "Managers continually

plan, build, and change an organisation's physical surroundings in an attempt to control its influence on patrons, without really knowing the impact of a specific design or atmospheric change on its users." Earlier qualitative and quantitative reviews of store atmospherics such as Bone and Ellen (1999), Turley and Milliman (2000), Garlin and Owen (2006), De Nisco (2010) and Roschk et al. (2017) have not given specific, concentrated attention to design atmospheric stimuli.

For instance, the study of Turley and Milliman was a narrative review; Garlin and Owen's study, although a quantitative review, was focused on one store ambiance factor, namely music and its impact on pleasure; De Nisco provided a quantitative summary of store ambiance and design factors but was not subject-focused. Moreover, these two early generalised estimates date from more than ten years, which may hardly account for the contemporary theoretical and methodological developments in the field. The meta-analysis of Roschk et al. which is more recent, was limited to music, colour, and scent atmospherics. Consequently, even in the presence of the voluminous scientific production, the conclusions about the prescriptive efficacy of the design atmospherics on shopping outcomes associations in the retailing, online, and service settings remain unexamined, thereby deserving generalisable estimates for clarification.

Against these research deficits, the objective of the present study is two-fold:

1 providing a quantitative summary of the main results regarding the effect of specific design atmospherics – lighting, colour, product display, and store layout – on three shopping outcomes – approach behaviour (e.g., time spent, number of items touched), behavioural intention (e.g., purchase, word of mouth), and emotional states (e.g., pleasure, arousal, satisfaction)

2 exploring and validating the possible methodological characteristics of the studies that may account for heterogeneity (i.e., between-study variance).

The moderators of consideration comprise cues (single versus multi), factorial design (within groups versus between groups), store format (multi-purpose versus specific purpose store), sampling unit (student versus real consumers), shopping setting (online versus store versus service), theory usage (atheoretical versus theoretical), and experimental setting (actual versus fictitious). Meta-analysis – a "quantitative study design used to systematically assess and combine the results of previous multiple scientific studies to derive conclusions about that body of research" [Haidich, (2012), p.12] – is the 'best method to reach consensus' [Combs et al., (2011), p.194] when empirical findings are mixed and inconclusive. Moreover, it permits scholars to generate 'super samples' or 'a sample from many samples' to determine the size, direction, and variance of conceptual associations – estimates scholars can have trust in since they synthesise information across several diverse studies (Jiang et al., 2012). Followingly, we employ this methodological approach of systematic review to calibrate, summarise, and clarify the anecdotal results in this research stream.

In effect, we make the following contributions to retail research and practice. First, we offer aggregated estimates of the mixed results vis-à-vis design atmospherics' effects on shopping outcomes in order to provide useful, fine-tuned, up-to-date insights about the true nature and magnitude of the relationship through a meta-analysis. Thus, the study addresses the extent or degree to which design atmospherics impact shopping outcomes, whether by a large, moderate or small magnitude – something forthcoming in a single primary study. Second, due to the lack of unequivocal information on the nature of the

effects produced and the heterogeneity of survey methodologies and approaches, the study explores the potential theoretical and methodological moderators that might account for between-study variance in the average effect sizes. It is envisaged that this would help identify some of the factors that may either increase or decrease the design atmospherics – shopping outcomes relationship. Third, since the ability to create a unique and superior shopping experience is a vital catalyst for attracting customers and increasing marketing opportunities, the findings of this study is envisaged to offer retail executives and marketing practitioners a reliable, valid, and 'au fait' (up-to-date) insights concerning the true nature and magnitude of 'beauty' on shopping outcomes. We envisage that this would offer useful guidance to them in their budget allocation and in their strategic orientations. Therefore, the study wields both theoretical and pragmatic potentials.

The remaining sections of the study proceed in this order: literature review section addressing the theoretical framework and hypotheses of the study; a methodology section elucidating the procedures applied in the review; analysis section delineating the results; a discussion and conclusion section elaborating the research and practical implications of the findings; and a final section delineating the research limitations and suggestions for future studies.

2 Theoretical framework

The conceptual model of this meta-analysis is shown in Figure 1 together with the variables examined. Our meta-analytic model builds upon the extant literature in employing the stimulus-organism-response (S-O-R) framework (Mehrabian and Russell, 1974).

2.1 Shopping outcomes

At the organism and response levels, the most recurrently examined shopping outcomes comprise behavioural intentions, emotional states or reactions, and approach behaviour. Oliver (2014, p.28) defined behavioural intentions as "a stated likelihood to engage in a behaviour." That is, the tendency or probability that a person will respond favourably or unfavourably to stimuli. According to Zeithaml et al. (1996, p.33), behavioural intentions "signal whether customers will remain or defect from the company." Favourable behavioural intentions that may cause the customer to remain include purchase (Fiore et al., 2000), positive word of mouth, extra spending, paying a premium price, and staying loyal (Turley and Milliman, 2000). In contrast, unfavourable behavioural intentions involve negative word of mouth, customer defection, legal actions, and reduced spending (Ladhari, 2009; Hussain and Ali, 2015). Emotional states or reactions involve the combination of the customer's state of arousal, excitement, pleasure, and satisfaction induced by the sales environment (Mattila and Wirtz, 2001). Approach behaviour describes behaviours and positive consumer attitudes toward the store environment (e.g., time spent in point of sale, items touched, extra-shopping, handling of merchandise).

2.2 Atmospheric design stimuli

Empirical research on atmospherics groups stores atmospheric stimuli into three main factors – ambient factors, social factors, and design factors, but our meta-analysis focuses on the atmospherics design factors. Atmospherics design stimuli or factors involve store environmental variables that are functional, visual, and/or aesthetic in nature than ambient factors (Fiore et al., 2000). According to Kumar et al. (2010), atmospheric design stimuli are those factors in the sales environment that produce theatrical effect, communicate store image, and add personality and beauty to the store environment. In this research stream, some of the main atmospheric design stimuli investigated in the extant literature include store layout (Greenland and McGoldrick, 1994; Joshi and Kulkarni, 2012), colour, architecture, style and materials (Baker et al., 1994), product displays, lighting, decors, signage, fixtures, wall decorations (Koo and Ju, 2010; Turley and Milliman, 2000; Fiore et al., 2000). However, the amalgamation of previous empirical findings into a single framework demands a focus on the most frequently examined atmospheric design stimuli. Among the extensive diversity of explored design atmospheric stimuli, lighting, colour, store layout, and product display stand front and centre, and are thus the emphasis of this review. Followingly, a brief description of these stimuli together with the study's hypotheses are delineated below.

2.2.1 Product displays

As an atmospheric design stimulus, product display involves the conscious and careful classification of products, shelf-space, and the designed presentation of merchandise in a well-defined segment within stores with the goal of stimulating consumers' emotional and approach responses (Cahan and Robinson, 1984). For example, displaying products or merchandise in storefront window or at the end of aisles. From the S-O-R model perspective, product display is a stimulus to induce consumers to make impulse buying (Koo and Ju, 2010; Kumar and Kim, 2014). Empirical evidence examining the comparative effects of product display on emotional reactions, approach behaviour, and behavioural intentions demonstrate that product display induce customers' attention (Prashar et al., 2017; Cahan and Robinson, 1984), movement in the stores (Ward et al., 1992), perception and purchase intention (Hussain and Ali, 2015), evoke consumer positive emotions (Tulipa et al., 2014), and account for one fourth of every retail sale (Mills et al., 1995). According to Fiore et al. (2000), product display generates strong positive impact on approach responses and pleasurable experiences. Thus, in light of the empirical evidence of the efficacy of product display to stimulate shopping outcomes, we hypothesise that:

H1 Product display has a positive effect on
- a approach behaviour
- b behavioural intentions
- c emotional states or reactions of shoppers.

2.2.2 Store layout

Banat and Wandebori (2012) describe store layout as the demarcation of selling area, space used, allocation of floor space, wall decorations, and department allocation to

increase search efficiency, inventory capacity, comfort, and product displays. Empirical evidence reveals that attractive and aesthetic store layout can stimulate consumers to visit a store (Prashar et al., 2017; Seock, 2009), purchase more merchandise, spend extra time shopping, and spend more money (Viera, 2010). According to Jang and Namkung (2009) and Thang and Tan (2013), a store's layout may induce positive emotions and generate memorable shopping experience. A neatly and aesthetically laid-out makes consumers pleased, interested, and comfortable with the experiences of exploring the merchandises (Hussain and Ali, 2015; Ryu and Jang, 2007). Therefore, we propose that:

H2 Store layout has a positive effect on
- a approach behaviour
- b behavioural intentions
- c emotional states or reactions of shoppers.

2.2.3 Lighting

In a retail environment, lighting is a significant environmental stimulus that influences a person's psychological and perceptual responses and changes the atmosphere and appearance of a space (Summers and Hebert, 2001). Successful lighting design can expedite customers' pleasant and efficient shopping experience and visually highlight the space and merchandise (Pae, 2009). Accordingly, some scholars in this research stream have drawn on psychological theories to examine the comparative effects of lighting by comparing shoppers' behavioural intentions and internal dispositions in response to dimmer and higher lighting levels (e.g., Liao, 2011; Wakefield and Baker, 1998) as well as contrast and colour temperature of lighting (e.g., Lin and Yoon, 2015) in a way similar to the absent versus present comparison employed in researches on *colour*, scent and music. Empirical evidence has shown that dimmer lighting can stimulate more pleasure (Custers et al., 2010), whereas some researchers indicate that high intensity lighting rather induce more pleasant emotions (Barlı et al., 2012; Liao, 2011). Lin and Yoon (2015) found that both contrast and colour temperature of lighting induce customers' arousal and attention, but contrast of lighting alone stimulates pleasure and intention. Along the same line of thought, Baker et al. (2002) opined that successful lighting design does not only affect customers' emotions and satisfaction but it can stimulate their shopping desire and approach intention. However, Quartier et al. (2014) noted that lighting does not have a significant effect on behaviour, although it can exert subtle effects on experienced emotions and perceived atmosphere. Despite the mixed finding, we follow the main theoretical perspective of the literature and hypothesise that:

H3 The presence (versus absence) of lighting has a positive effect on
- a approach behaviour
- b behavioural intentions
- c emotional states or reactions of shoppers.

2.2.4 Colour

An atmospheric design stimulus, colour refers to the visual appearance of the retail environment (Bellizzi et al., 1983). Researchers investigating colour effects in the retail consumption environment usually group colours into warm and cool colours based on

their wavelength, that is, from long to short (Crowley, 1993). The warm colours are colours with a longer wavelength such as orange, yellow, and red, while cool colours are those with a short wavelength like violet, blue and green. Studies in the marketing literature show that colour affects customers' marketing outcomes and psychological dispositions (Labrecque et al., 2013). From psychological perspective, research has demonstrated that warm colours stimulate customers' emotional arousal, excitement and distraction (Labrecque et al., 2013) whereas cool colours induce pleasantness, calmness, and relaxation (Bellizzi et al., 1983). Empirical findings in the atmospheric highlight these psychological delineations. For example, studies show that red is emotionally arousal while blue is associated with relaxation and pleasant and enhance purchase intention (Bagchi and Cheema, 2013; Bellizzi and Hite, 1992). In addition, colour has been found to increase time spent in store (Bellizzi and Hite, 1992), induce variety seeking behaviour (Bellizzi et al., 1983), and influence arousal and pleasure (Crowley, 1993). Moreover, research on the effect of colour as a website design factor shows that colour influences online shoppers' perceptions (Wang et al., 2011; Cai and Xu, 2011), reading of product or service information (Cyr et al., 2010), and responsiveness to firm's ads (Cyr and Head, 2013). Notwithstanding these results of the positive effect of colour, the overall empirical findings are mixed, as some studies identified no difference between warm and cool colours or present or absent of colours, while others reveal opposite effects (e.g., Hussain and Ali, 2015; Babin et al., 2003). For instance, Hussain and Ali (2015) found that colour does not influence customers' perception and purchase intention. In spite of the mixed empirical evidence, we draw on the conceptual perspective of the literature that colour can stimulate consumers' psychological and marketing outcomes and hypothesise that:

H4 Colour (cool versus warm) has a positive effect on

- a approach behaviour
- b behavioural intentions
- c emotional states or reactions of shoppers.

2.3 Study moderators

Research designs adopted in store atmospheric studies reveal several contextual methodological diversities and divulgences. Against this background, the second objective of the study was to ascertain and validate the possible existence of moderators related to the methodological and contextual characteristics of the studies that may account for heterogeneity (i.e., between-study variance) in effect sizes. Thus, ten potential moderators were explored: shopping setting (online versus store versus service), store formats (multi-purpose versus specific purpose store), experimental design settings (actual versus fictitious), cues (single versus multi), factorial design (within groups versus between groups), sampling unit (student versus real consumers), and theory usage (atheoretical versus theoretical).

2.3.1 Contextual moderators

2.3.1.1 Shopping setting (retail, online and service)

Regarding the shopping settings, which may account for between-study variance, atmospheric stimuli research identifies three main settings, namely physical service stores, online, and physical retail stores. Bitner (1990) postulated that, unlike products, services are inherently intangible and constitute an instrumental image to communicate attributes and perceived value to customers. However, it has to be noted that self-brand integration may be challenging to be perceived as significant for services (Rios et al., 2020). As such, it is underlined that when tangible product features are absent, environmental cues about services become subtle information that enables customers to deduce what to expect from a particular offering (Booms and Bitner, 1982). Hence, literature opines that customers will depend more on atmospheric stimuli in service setting than in retail setting (De Nisco, 2010). However, studies on digital technologies that now facilitate consumers' online shopping demonstrate that website design factors can largely influence online shoppers' perceptions (Al-Adwan et al., 2020; Narayanaswamy and Heiens, 2021; Nikolaeva et al., 2009; Wang et al., 2011; Cai and Xu, 2011) reading of product or service information (Scharff and Ahumada, 2002). Empirically, Roschk et al. (2017) found that effect sizes in online shopping setting are larger than effect sizes in service and retail settings. This leads us to propose the below hypothesis:

H5 The effect sizes of atmospheric design factors on shopping outcomes are larger in online settings than in service and retail setting; and larger in physical service settings than retail.

2.3.1.2 Store formats (single versus multi-purpose store)

From the perspective of the theory of planned behaviour (TPB), a person's attitudes are partially driven by a behavioural intention, which indicates that a person's attitudes toward retail stores in part influence his or her choice of shopping format or modes. Therefore, a consumers' attitude toward a store type may produce spillover effects on store patronage via affect transfer (Singh et al., 2021; Darley and Lim, 1993) and a direct impact on their store-specific quality perceptions (MacKenzie and Lutz, 1989). Store atmospheric studies show that the store formats such as discount stores, supermarkets, grocery stores, hypermarket, convenience stores, etc. influence customers' choice at different levels (Seock, 2009; Wood and McCarthy, 2014). The empirical study of Marques et al. (2016, p.2) uncovered that "customers perceive differently the importance of each retail atmospheric cue and other marketing variables, when buying in a hypermarket or in a supermarket." For instance, the authors found that the choice of buying from a hypermarket is induced by responsiveness, accessibility and pleasant atmosphere while the choice of buying from a supermarket is influenced by empathy of staff and nice decoration. Thus, we anticipated that the perceived difference in the store formats (specific versus general) may account for between-study variance in effect sizes. Therefore, following a non-directional hypothesis, we propose that:

H6 The effect sizes of atmospheric design factors on shopping outcomes in specific stores differ from multi-purpose stores.

2.3.1.3 Experimental setting (actual versus fictitious)

Analogous to previous meta-analyses, we grouped the experiment settings into actual settings and fictious settings. Fictitious settings or designs are the simulated consumption environment, whose ecological validity has been confirmed in the literature (Bateson and Hui, 1992). However, research highlights that fictitious setting may overestimate effect sizes since it allows researchers to control extraneous elements that may impact the investigated associations (Shadish et al., 2002). The meta-analysis of Roschk et al. (2017), however, did not observe any significant difference between effect sizes in fictitious settings and actual settings. In spite the mixed result, we anticipate that fictitious experimental design may inflate effect sizes. Thus, we propose that:

H7 The effect sizes of atmospheric design factors on shopping outcomes are larger in fictitious settings than actual setting.

2.3.2 Methodological moderators

2.3.2.1 Cues (single versus multi-cues)

With reference to the applicative characteristics of the studies, we grouped the studies into those that focused on one design atmospheric stimulus (single-cue) and those that analysed the joint effect of several stimuli (multi-cue). The general notion of the literature is that studies examining a single atmospheric stimulus may garner higher ratings than multi-cue studies since customers have only one stimulus to rate, which may generate bias in evaluation than in the case of evaluating multiple stimuli (Turley and Milliman, 2000). However, De Nisco (2010) found that multi-cue studies yielded higher effect sizes relative to the studies that focused on a single environmental stimulus. We, however, follow the theoretical perspective of the literature and hypothesise:

H8 The effect sizes of atmospheric design factors on shopping outcomes are larger in single cue studies than in multi-cue studies.

2.3.2.2 Study design (experiment versus survey)

The choice of study design may embody a potential moderator factor. A meticulous conceived experimental design allows the researcher to exercise significant control of sceneries and to assign subjects randomly from different groups of participants, which in turn yields less variance error in the denominator of the correlations and generates larger effect sizes (Wang and Tang, 2008). As well, the elimination of potential confounds might generate more rigorous associations in an experimental study than non-experimental one (Pan and Zinkkhan, 2006). Previous meta-analyses postulate that survey studies sometimes generate low response rates and suffer from self-reported data (Peterson, 2001). However, empirical findings are mixed (De Nisco, 2010; Fern and Moroe, 1996). Therefore, we employ a non-directional hypothesis and propose that:

H9 The effect sizes of atmospheric design factors on shopping outcomes differ between experimental studies and survey studies.

2.3.2.3 Atmospheric design measurement (single versus multi-measure items)

From a methodological perspective, research has shown that the operationalisation modalities of independent variables in a study may account for between-study variance (Szymanski and Henard, 2001). Literature suggests that single-item measures with low reliability can significantly attenuate effect sizes and reduce precision (Fern and Monroe, 1996). Multiple-scale items, in contrast, improve measurement reliability and external validity. This indicates that the use of multiple-scale measures should provide rigorous relationship than single-item scale. Kirca et al. (2005) found that multi-item measures yield higher rating that single-item studies, underlying that multi-item measures capture several facets of complex constructs than single-item measures. However, De Nisco (2010) found no significance between single and multi-item studies. Nevertheless, we envisage that multi-item measure may be linked to higher design atmospheric stimuli – shopping outcomes relationship than single-item measure. Thus, we propose that:

H10 The effect sizes of atmospheric design factors on shopping outcomes are larger in single-item studies than multi-item studies.

2.3.2.4 Sampling unit (students versus real customers)

Research notes that personality development factors may account for differences in real customers and student samples used in a study. Students, for instance, are deemed fragmentary with unstructured preferences (Carlson, 1971), whose usage may overestimate effect sizes and limit the validity of external results (De Nisco, 2010). The study of Peterson (2001) divulged that effect sizes in student samples contrast significantly those obtained from real consumers (non-students), although the authors found no systematic pattern in the effect sizes. Using a non-directional hypothesis, Roschk et al. (2017) found that effect sizes do not differ significantly between students and non-student samples, but De Nisco (2010) confirmed a significant difference. Despite the inconclusive results, we employed the non-directional hypothesis approach and propose that:

H11 The effect sizes of atmospheric design factors on shopping outcomes differ between real customers (non-students) and student samples.

2.3.2.5 Theory usage (theoretical versus atheoretical)

Following Lu et al. (2016) indication that the usage of theory in a study reflects journal quality, we attempted to understand if this positive association between theory adoption and journal quality manifests in effect sizes of the examined relationships. Theoretical studies are studies that used theories to drive hypotheses, models and research questions, while atheoretical stories use the general framework of the independent variable without recourse to theory usage in hypothesis or scale development. Because studies based on well-grounded theories reflect real life-situations (e.g., Zorzini et al., 2015), we envisage they will generate more accurate effect sizes than atheoretical studies. Thus, we propose that:

H12 The effect sizes of atmospheric design factors on shopping outcomes in theoretical studies are larger than atheoretical studies.

2.3.2.6 Sampling technique (probability versus non-probability)

Wang and Yang (2008) hinted that sampling technique employed in a given research may account for between-study variance. Therefore, based on this theoretical or methodological perspective, we explored the validity of this claim by examining the effect sizes in probabilistic and non-probabilistic-based studies. Fern and Moroe (1996) opined that probabilistic sampling reduces random bias of variance and has the potential to generate higher effect sizes than non-probabilistic based samples. Followingly, we propose that:

H13 The effect sizes of atmospheric design factors on shopping outcomes are larger in probabilistic-based samples that non-probabilistic-based samples.

2.3.2.7 Factorial design (between-subjects versus within-subjects)

The number of the different treatment groups used in an experimental study has the potential to influence effect sizes (Roschk et al., 2017). While between-subjects experimental design uses different people to test each condition, such that each individual is exposed to only one interface, within-subjects experimental design uses the same people to test all the conditions. According to Peterson (2001), these varying treatment groups may account for heterogeneities in the hypothesised relationship. Although De Nisco (2010) could not confirm this in his meta-analysis, we use a non-directional hypothesis and propose that:

H14 The effect sizes of atmospheric design factors on shopping outcomes differ between between-subjects and within-subjects experimental groups.

2.4 The meta-analytic model

In Figure 1, we show graphically the meta-analytic conceptual framework that served as the roadmap for the study. The model shows that the four core design atmospherics (i.e., product display, store layout, lighting, and colour) synchronously affect three shopping outcomes, namely

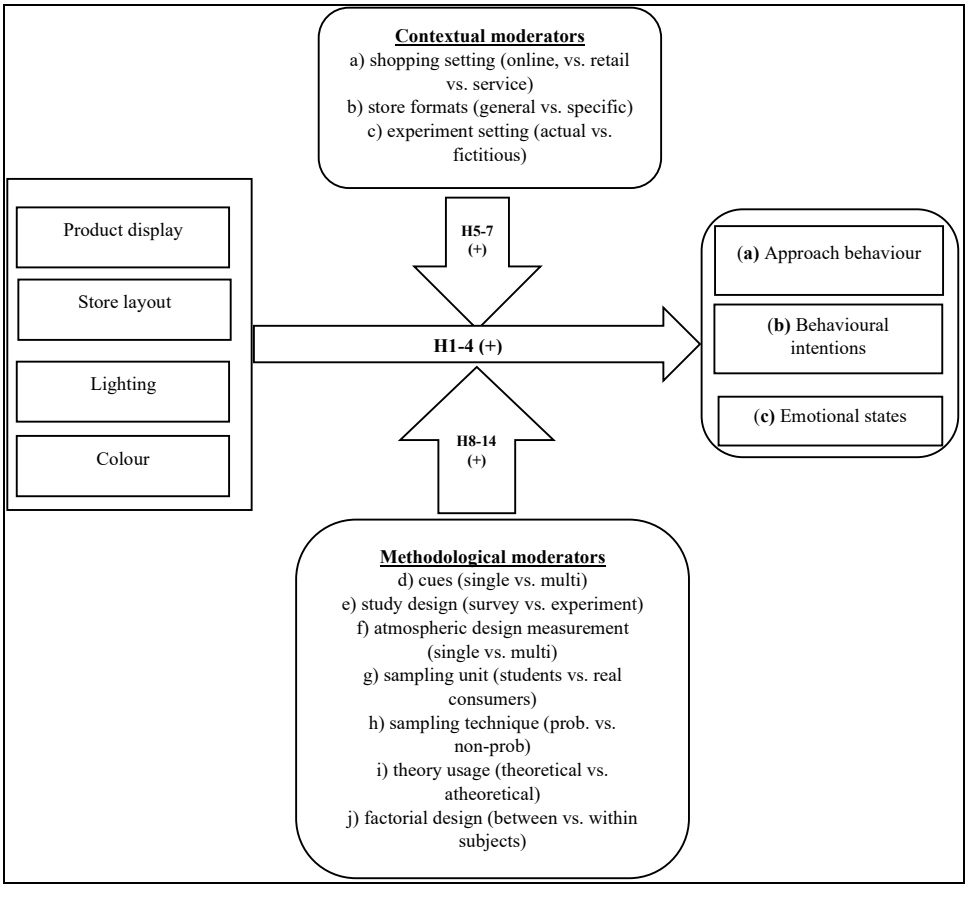
a approach behaviour

b behavioural intentions

c emotional states or reactions of consumers.

Further, numerous moderating variables, both contextual and methodological, are included in the framework to allow for the examination of the factors that may account for between-study variance in the primary studies. With respect to the sign of the focal association, notwithstanding the mixed results in the primary studies, we anticipate that design atmospherics will have a positive effect on shopping outcomes. Moreover, we expect that the moderating variables will positively impact the design atmospherics – shopping outcomes relationships. Thus, this meta-analytic model formed theoretical basis in the formulation of above-discussed hypotheses.

Figure 1 Meta-analytic model of the relationship between atmospheric design stimuli and shopping outcomes, with moderating effects of contextual and methodological factors



3 Methodology

A meta-analysis was performed on a sample of data aggregated across existing literature. Meta-analysis is a quantitative research design, which aims to calibrate and verify, through a statistical analysis of the findings of a group of independent studies, the generalisable (overall) elasticity of the association between predictors and criterion under study and any heterogeneity related to the specific methodological characteristics of the investigated studies (Roschk et al., 2017).

With regards to the selection of articles to be included in the meta-analysis, we conducted a bibliographic keyword search to identify articles that investigated the relationship between design atmospheric factors and shopping outcomes in the following internationally recognised business and management databases: *Emerald Insight*, *Science Direct*, *Google Scholar*, *EBSCO (Business Source Complete)* and *ABI/Inform (Proquest)*. Additionally, we conducted a reference analysis in the previous reviews (e.g., Roschk et al., 2017; De Nisco, 2010) as well as citation analysis of the crucial articles (e.g.,

De Matos et al., 2007; Baker et al., 2002). The amalgamation of previous results into a single framework demands a focus on the most frequently examined atmospheric design stimuli. Among the extensive diversity of explored design atmospheric stimuli, lighting, *colour*, store layout, and product display stand front and centre and are thus the emphasis of this review. In the same vein, frequently investigated shopping outcomes include customer emotional response (pleasure, satisfaction, arousal), behavioural intention, and approach behaviour (Jani and Han, 2015; Ali and Amin, 2014; Baeka et al., 2018).

Consequently, the keywords used in our search were 'store atmospherics', 'store design atmospherics', '*colour*', 'lighting', 'product display', 'store layout', 'store design factors', 'shopping outcomes', 'arousal', 'pleasure', 'time spent', 'items touched', 'satisfaction', 'purchase intention', 'word of mouth', 'emotional states', 'approach behaviour', and 'behavioural intention'. We also used the Boolean operators 'AND', 'OR' and 'NOT' to search the independent variables and dependent variables simultaneously in the title, abstract, and search term fields in the databases to optimise our search reach. The period of the review was set between 1980–2019, as this time interval permits us to include all the relevant studies involving the development of the phenomenon from its early scholarly recognition to the contemporary time. Moreover, 2019 (December) was the terminal year at the time of data or article collection (January 2020). The preliminary output of the search yielded 458 articles across the various databases.

The screening was carried out based on the following four criteria: first, the studies must analyse at least one pair of the design atmospherics mentioned above as the independent variable; second, the measurement items of the dependent variables accurately mirrored our model specification, namely approach behaviour, behavioural intention, and emotion states; third, the study provided an effect size or enough statistical information (i.e., correlation coefficient or its r-contrast specified earlier) of the associations investigated; and fourth, the study must be independent, that is, does not present two different results from the same sample, in which case we selected the sample with detailed information. The inclusion and exclusion criteria yielded a final dataset of 76 independent, peer-reviewed, English language scholarly journal articles, with an aggregated sum of 24,189 respondents and 106 study effects (correlation coefficients).

Accordingly, and drawing from the extant literature and meta-analytic procedures of previous reviews (De Nisco, 2010; Roschk et al., 2017), we coded two theoretical variables and ten contextual and methodological characteristics in this meta-analysis, highlighted below.

1 design atmospherics (colour, lighting, store layout, and product display)

2 shopping outcomes (i.e., approach behaviour, emotional states, and behavioural intention)

3 cues (single cue versus multi-cue)

4 study design (experiment versus survey)

5 experimental design (actual versus fictitious)

6 factorial design (between-subjects versus within-subjects)

7 shopping setting (online store versus physical store versus physical service)

8 store formats (general versus specific)

9 atmospheric design measurement (multi-item versus single item)

10 sampling unit (students versus real consumers)

11 sampling technique (probabilistic versus non-probabilistic)

12 theory usage (atheoretical studies versus theoretica1 studies).

From a methodological standpoint, a meta-analysis could be conducted using one of two models, namely, fixed or random effects (Borenstein et al., 2009). The former assumes homogeneity across studies, attributing variability in the studies to only sampling error, while the latter assumes heterogeneity from the sampling error and other methodological variabilities like operationalisation and external validity elements (Hunter and Schmidt, 2000). This study used the random effect as it accounts for the potential presence of heterogeneity (between-study variance) across the studies, which are conducted within different industry context and with methodological disparities (Zubeltzu-Jaka et al., 2018).

In terms of the effect size metric used in a meta-analysis, a researcher could choose from four options: standard mean difference, odds ratio, correlation coefficient, and risk-ratio (Borenstein et al., 2009). The present study employed the correlation coefficient as the effect-size metric for three reasons:

a it is the generally used meta-analytic index in marketing studies (e.g., De Nisco, 2010; Roschk et al., 2017)

b it is easy to interpret

c it allows for *r-contrast* to be computed in cases where no correlation coefficients are directly reported (Wang and Tang, 2008).

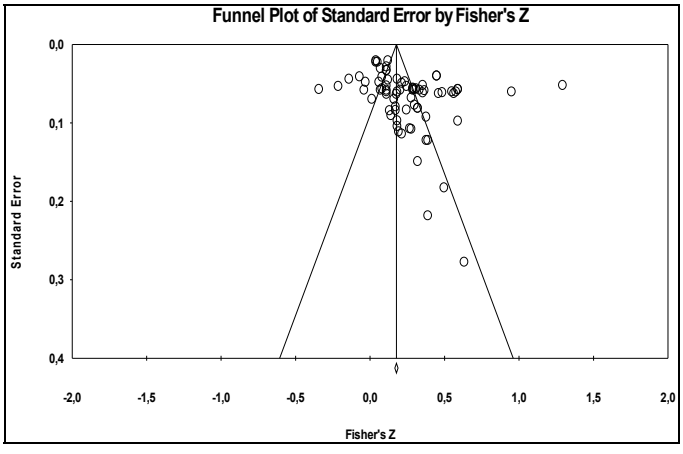
The r-contrast denotes the variants of correlation coefficients (i.e., F-statistics, T-statistic, p-value, etc.) (Rosenthal and DiMatteo, 2001; Rosenthal, 1994) and regression coefficient (Peterson and Brown, 2015).

For the integration of the effect sizes, correlation coefficients were derived at hand directly from the articles or were computed from the r-contrast (t-value, F-test) following the conversion procedures of Rosenthal and DiMatteo (2001), De Matos et al. (2007) and regression coefficients and betas using the formula: $r = 0.98\beta + 0.05\lambda$ with $\lambda = 1$ when $\beta > 0$ and $\lambda = 0$ when $\beta < 0$ (Peterson and Brown, 2005). In some cases, the authors reported only p-values in absolute or in range manner. If this was the case, we applied the conversion procedure suggested by Rosenthal and DiMatteo (2001, p.72) to convert them to correlation coefficients. With respect to the studies that reported non-significant effects, the corresponding effect sizes were set equal to zero. To circumvent bias emanating from the overrepresentation of samples in the studies that reported more than one measure of correlation for the same association by evaluating diverse response measures, we averaged the effect sizes (Hunter and Schmidt, 2004).

The meta-analysis software used for the data analysis was comprehensive meta-analysis (CMA) version 3, a powerful computer program for meta-analysis. The software checks for the sampling and measurement errors across the studies, calculate the homogeneity and heterogeneity indices automatically; and analyses the publication bias and the fail-safe *N* statistic. Figure 2 shows the publication bias results of the analysis.

We examined the publication bias through the funnel plot. As a rule of thumb, if the points on the funnel plot are clustered on each side of the funnel graph and dispersed on top of the funnel, then publication bias is minimal or no threat to the study (Rosenthal, 1979). Based on this theoretical perspective, we can conclude that publication bias is no issue in our data.

Figure 2 Analysis of publication bias



Similar to previous meta-analyses (Rosenbusch et al., 2019; Klier et al., 2017), we used QB index of subgroup analysis (similar to ANOVA) and meta-regression (MARA) to test the significance of the moderating variables. The point is that subgroup analysis helps us to interpret the magnitude and direction of effects in sub-groups while a MARA considers the interdependencies of the association between moderators and variables of interest, thereby allowing for the test of theory. Therefore, following the identified objectives of the study, we provide the *K* (number of effects), r-effects, confidence intervals (CI), z-score, p-values, Q-test (homogeneity), and the fail-safe *N* statistics (i.e., the average number of articles required to refute the significance of the relationships) of the associations, thereby answering objective one. Moreover, our moderator analysis answers objective two of the study. The result of the analysis is shown in the next section.

4 Results of analysis

The aggregate effects of the design atmospherics on shopping outcomes are presented in Table 1. The strength of the effect sizes is interpreted based on Cohen's (1988, p.82) criteria, that an effect size of 0.20 is small, 0.50 is medium, and 0.80 is large. Our results show that the average strength of the effect sizes ranges from small to medium (0.12–0.43). In particular, findings show that, at the aggregate level, the product display design atmospheric yields higher ratings (r = 0.28) compared to the other atmospheric design factors, namely colour (r = 0.24), store layout (r = 0.23), and lighting (r = 0.22). The findings further disclose that the impact of the atmospheric design factors is stronger for behavioural intentions (r = 0.32) than for approach behaviour (r = 0.22) and emotional states (r = 0.21). This connotes that the prescriptive efficacy of the

atmospheric design factors is more manifest in the behavioural intentions of the three shopping outcomes. Overall, the fail-safe *N*, which indicates the average number of discarded null results required to bring the significance of the relationships to alpha (i.e., render them non-significant), disclose that 12,611 unpublished papers will be necessary to refute this finding of the study. Rosenthal (1979) suggests that the obtained fail-safe *N* should be greater than or equal to five times the number of observations plus 10 (denoted as 'required fail-safe *N*').

Table 1 Meta-analytic results of the aggregate effects of design atmospherics on shopping outcomes

Variables	*K*	*r*	*–95% CI*	*+95% CI*	*z-value*	*p-v*	*Q-value*	*QB*	*Fail-safe N*
Aggregate store design stimuli								*23.09**	
Product display	19	0.28	0.19	0.36	5.79	0.00	86.40**		1,805
Layout	20	0.23	0.14	0.31	5.18	0.00	273.60**		1,443
Lighting	20	0.22	0.09	0.35	3.17	0.00	866.08**		1,559
Colour	16	0.24	0.16	0.30	6.39	0.00	289.73**		889
Design (mixed)	31	0.32	0.23	0.39	6.89	0.00	673.86		1,678
Aggregate shopping outcomes								*167.03***	
Approach behaviour	27	0.22	0.15	0.28	6.28	0.00	418.50*		2,700
Behavioural intentions	20	0.32	0.19	0.44	4.55	0.00	441.92*		5,619
Emotional states	28	0.21	0.13	0.29	5.07	0.00	507.44*		706

Notes: *p\0.05; **p\0.01; ***p\0.001: *K* (no. of effects); *r* (transformed and standardised correlations coefficient); Q (homogeneity and variability within group); QB (between-study variance and heterogeneity).

Table 2 Meta-analytic results for the disaggregate/subgroup effects of design atmospherics on shopping outcomes

Variables	*K*	*r*	*–95% CI*	*+95% CI*	*z-value*	*p-v*	*Q-value*	*QB*	*Fail-safe N*
Product display								*84.18***	
→ Approach behaviour	8	0.21	0.09	0.32	3.48	0.00	116.10*		259
→ Behavioural intentions	7	0.17	0.14	0.20	10.05	0.00	5.68*		115
→ Emotional states	12	0.27	0.15	0.37	4.53	0.00	205.61*		803
Store layout								*63.76***	
→ Approach behaviour	6	0.20	0.07	0.33	3.05	0.00	46.05*		93
→ Behavioural intentions	4	0.43	0.31	0.54	6.30	0.00	15.94*		244
→ Emotional states	15	0.20	0.11	0.28	4.36	0.00	164.79**		639

Notes: *p\0.05; **p\0.01; ***p\0.001: *K* (no. of effects); *r* (transformed and standardised correlations coefficient); Q (homogeneity and variability within group); QB (between-study variance and heterogeneity).

Table 2 Meta-analytic results for the disaggregate/subgroup effects of design atmospherics on shopping outcomes (continued)

Variables	*K*	*r*	*–95% CI*	*+95% CI*	*z-value*	*p-v*	*Q-value*	*QB*	*Fail-safe N*
Lighting								*157.16***	
→ Approach behaviour	9	0.25	0.06	0.42	2.51	0.01	220.98**		311
→ Behavioural intentions	7	0.31	0.01	0.57	1.91	0.05	529.02**		402
→ Emotional states	14	0.12	0.03	0.21	2.68	0.01	174.15**		203
Colour								*23.55***	
→ Approach behaviour	4	0.19	0.05	0.33	2.60	0.01	34.61**		62
→ Behavioural intentions	12	0.28	0.21	0.35	6.99	0.00	53.85**		783
→ Emotional states	9	0.22	0.18	0.26	10.57	0.00	7.87***		233

Notes: *p\0.05; **p\0.01; ***p\0.001: *K* (no. of effects); *r* (transformed and standardised correlations coefficient); Q (homogeneity and variability within group); QB (between-study variance and heterogeneity).

To verify the hypotheses of the specific relationships between the atmospheric design factors and the shopping outcomes, we conducted a sub-group analysis, shown in Table 2.

Table 3 Meta-analytic results of the effects of the contextual moderators on the design atmospheric stimuli – shopping outcomes relationships

Variables		*K*	*r*	*–95% CI*	*+95% CI*	*z-value*	*p-value*	*QB-statistic*
H5	*Shopping setting*							
	Online	28	0.24	0.15	0.33	4.94	0.00	10.24***
	Retail	68	*0.26*	0.19	0.33	6.98	0.00	
	Service	10	0.11	0.05	0.18	3.34	0.00	
H6	*Store formats*							
	Multi-purpose stores	52	*0.27*	0.19	0.33	7.03	0.00	25.23***
	Specific-purpose stores	54	0.22	0.15	0.29	5.96	0.00	
H7	*Experimental setting*							
	Actual	50	0.19	0.14	0.25	7.04	0.00	61.91***
	Fictitious	56	*0.23*	0.15	0.31	5.28	0.00	

Notes: *p\0.05; **p\0.01; ***p\0.001: *K* (no. of effects); *r* (transformed and standardised correlations coefficient); QB (between-study variance).

Our analysis indicates that product display has a positive, significant effect on approach behaviour (r = 0.21), behavioural intention (r = 0.17), and emotional states (r = 0.27), thereby confirming H1; colour is positively and significantly correlated to approach behaviour (r = 0.19), behavioural intention (r = 0.28), and emotional states (r = 0.22), thereby confirming H2; lighting has a positive, significant impact on approach behaviour (r = 0.25) and emotional states (r = 0.12), and behavioural intention (r = 0.31), which confirms H3; and store layout is positively and significantly associated with

approach behaviour (r = 0.20), behavioural intention (r = 0.43), and emotional states (r = 0.20), confirming H4. It deserves to remark that the fail-safe N of the relationships are above the normative value. Another interesting observation from Table 1 is the comparative effects of the atmospheric design factors on each shopping outcome level. For instance, findings reveal that at the approach behaviour level, the impact of lighting (r = 0.25) is higher than product display (r = 0.21), store layout (r = 0.20), and colour (r=.19). However, at the level of the behavioural intention, we observe that the impact of store layout is the strongest (r = 0.43) in relation to lighting (r = 0.31), colour (r = 0.28), and product display (r = 0.17). Finally, at the emotional states or reactions level, we can notice that the impact of product display is the highest (r = 0.27) compared to colour (r = 0.22), layout (r = 0.20), and lighting (r = 0.12). Overall, our analysis's strongest association relates to the impact of store layout on behavioural intentions (r = 0.43), whereas the lowest association strength relates to the effect of lighting on emotional states (r = 0.12).

Table 4 Meta-analytic results of the effects of the methodological moderators on the design atmospherics – shopping outcomes relationships

Variables		*K*	*r*	*–95% CI*	*+95% CI*	*z-value*	*p-value*	*QB-statistic*
H8	*Cues*							
	Multi-cue	68	0.24	0.17	0.31	6.34	0.00	1.590
	Single cue	38	0.23	0.18	0.31	6.96	0.00	
H9	*Study design*							
	Experiment	41	0.22	0.17	0.26	8.39	0.00	8.26**
	Survey	65	0.25	0.17	0.33	5.96	0.00	
H10	*Atmospheric design measurement*							
	Multi-item	98	0.25	0.19	0.29	8.70	0.00	4.68***
	Single item	8	0.20	0.07	0.42	2.74	0.01	
H11	*Sampling unit*							
	Real consumers	92	0.24	0.19	0.29	8.57	0.00	0.80
	Students	14	0.23	0.12	0.33	4.06	0.00	
H12	*Theory usage*							
	Atheoretical	35	0.30	0.20	0.38	5.96	0.00	1.75
	Theoretical	71	0.22	0.16	0.28	6.91	0.00	
H13	*Sampling technique*							
	Non-probabilistic	75	0.24	0.17	0.31	6.58	0.00	0.94
	Probabilistic	36	0.25	0.17	0.32	6.20	0.00	
H14	*Factorial design*							
	Between subjects	25	0.23	0.17	0.29	7.58	0.00	2.12*
	Within subjects	5	0.16	0.07	0.26	3.26	0.00	

Notes: *p\0.05; **p\0.01; ***p\0.001: K (no. of effects); r (transformed and standardised correlations coefficient); QB (between-study variance).

The second objective of the study was to ascertain and validate the possible existence of moderators related to the contextual and methodological characteristics of the studies that may account for heterogeneity (i.e., between-study variance). Our analysis's Q-statistics demonstrate that heterogeneity is present in our model, hence the appropriateness to run a moderator analysis to test the significance of the moderator variables. We tested the significance of the moderator variables via the QB statistic (similar to ANOVA). Table 3 presents the contextual moderators while Table 4 displays the methodological moderators and Table 5 the MARA results.

As Table 3 shows, we can confirm our prediction that shopping setting moderates the design atmospherics – shopping outcomes relationship, such that it is stronger in the retail setting (r = 0.26) than online (r = 0.24), and service (r = 0.11), thereby partially confirming our hypothesis, since we expected that online setting will yield larger effect size than retail. Moreover, we predicted that the nature of store formats will moderate the design atmospherics – shopping outcomes relationship. Supportively, our findings show that multi-purpose stores (r = 0.27) generate larger effect sizes than specific-purpose stores (r = 0.22). Finally, our hypothesis that experimental setting (actual versus fictitious) will account for between study variance is supported, such that the studies conducted in the fictitious settings (r = 0.23) produce larger effect sizes than those in the actual settings (r = 0.19). The meta-regression (MARA) shown in Table 5 confirms these findings of the subgroup analysis.

Table 4 displays the impact of the methodological moderators on the focal relationship. Overall, findings show that the between-study variance was significant for study design (QB = 8.26), in such wise that the effect sizes in the survey studies (r = 0.25) are larger than experimental design studies (r = 0.23). Likewise, we find support for our prediction that atmospheric design measurement will account for between-study variance (QB = 4.68), such that it is stronger in multi-item studies (r = 0.25) than single-item studies (r = 0.20). Finally, the moderating effect of factorial design (between-subject versus within-subject) is confirmed (QB = 2.12), such that the empirical studies using between-study subjects (r = 0.23) produce larger effect sizes than those using within-study subjects (r = 0.16). The meta-regression (MARA) shown in Table 5 confirms these findings of the subgroup analysis.

However, findings show that the between-study variances were not significant for cues, sampling unit, sampling technique, and theory usage. The meta-regression (MARA) shown in Table 5 confirms these findings of the subgroup analysis. As a verification of the binary subgroup analysis, a MARA shows whether a moderating variable increases or decreases the effects of the focal relationship. Here, the relationship between design atmospheric and shopping outcomes is the dependent variable while the measurement moderators are the independent variables. As the results reveal, the regression coefficient for H8-cues (B = 0.02, $p > 0.05$), H13-sampling unit (B = 0.03, $p > 0.05$), H112-theory usage (B = 0.05, $p > 0.05$), and H13-sampling technique (B = 0.04, $p > 0.05$) are confirmed as not significant. Therefore, since the MARA shows the interdependencies among the variables, we can confirm that these variables do not significantly influence effect sizes. This implies that these methodological disparities across studies do not significantly influence effect sizes of the focal relationships.

Table 5 Results of the meta-analytical regression analyses (MARA)

Contextual moderators		*K*	*B*	*SE*	*Z*	R^2	*p*
H5	Shopping setting (0 = retail, 1 = service)	68/28	*0.17*	0.09	2.8	0.12	0.04
H6	Store format (0 = specific-purpose, 1 = multi-purpose stores)	54/52	*0.08*	0.01	6.7	0.19	0.03
H7	Experimental setting (0 = actual, 1 = fictitious)	50/56	*0.09*	0.01	7.8	0.18	0.02
Methodological moderators		*K*	*B*	*SE*	*Z*	R^2	*p*
H8	Cues (0 = single cues, 1 = multi-cues)	38/68	0.02	0.05	0.39	0.01	0.69
H9	Study design (0 = experiment, 1 = survey)	41/65	*0.12*	0.09	2.43	0.34	0.00
H10	Atmospheric design measurement (0 = single item, 1 = multi-item)	8/98	*0.13*	0.02	2.70	0.01	0.01
H11	Sampling unit (0 = students, 1 = real consumers)	14/98	0.03	0.07	0.35	0.01	0.73
H11	Theory usage (0 = atheoretical, 1 = theoretical)	35/71	0.05	0.01	1.04	0.02	0.18
H13	Sampling technique (0 = probability sampling, 1 = non-probability)	36/75	–0.06	0.05	–1.2	0.01	0.23
H14	Factorial design (0 = within group, 1 = between group)	5/25	*0.15*	0.03	02.8	0.17	0.03

Notes: *$p < 0.05$; **$p < 0.01$.

The MARA demonstrates that H9-study design ($B = 0.12$, $p < 0.01$), H10-atmospheric design measurement ($B = 0.13$, $p = 0.01$), H5-shopping setting ($B = 0.17$, $p < 0.05$), H6-store format ($B = 0.08$, $p < 0.05$), H7-experimental setting ($B = 0.09$, $p < 0.02$), and H14-factorial design ($B = 0.15$, $p < 0.05$) are all significant. Thus, we can confirm our H9, H10, H5, H6, H7, and H14, that study design, study measure, shopping setting, store format, and factorial design measurements factors influence the heterogeneity of the effect of the studies in the focal relationship. The theoretical and managerial implications of these results are briefly discussed in the next section, beginning with the discussions of the findings vis-à-vis the extant literature.

5 Discussion

5.1 Design atmospherics and shopping outcomes relationship

Overall, our results demonstrate that the associations' strength was small-to-medium, which is evident in the subtle feature of the atmospheric design factors. This range of strength is consistent with the results of previous reviews (e.g., Roschk et al., 2017; De Nisco, 2010), which clearly demonstrates that the impact of store atmospherics, in general, is significantly moderate. In addition, the significant, positive link between the design atmospheric factors and shopping outcomes demonstrate that the design atmospheric factors create diverse cognitive and affective customer responses (Choi et al., 2018; Baker et al., 2002) and that store performance on these variables significantly influence consumers' perception and retail patronage (Tantanatewin and Inkarojrit, 2016; Baeka et al., 2018).

Furthermore, our findings show that the impact of the product display factor is stronger on the aggregate stimuli level followed by colour, lighting, and store layout. In fact, research demonstrates that product display significantly influences consumers' movement and their product perceptions and purchase intention (Riaz and Ali, 2015). Fiore et al. (2000) found that product display generates strong positive impact on approach responses and pleasurable experiences. Colour emerged as the second strongest design atmospheric stimuli but its greatest impact is on behavioural intentions, followed by emotional reactions, and approach behaviour. This result confirms the literature that colour enhances purchase intention (Bagchi and Cheema, 2013), influences online shoppers' perceptions (Wang et al., 2011), and induces variety seeking behaviour (Bellizzi et al., 1983). By contrast, this finding disconfirms the results of Riaz and Ali (2015) that colour does not influence customers' perception and purchase intention.

Moreover, the findings show that the aggregate impact of the atmospheric design stimuli is stronger for behavioural intention than for approach behaviour and emotional states (reactions). This result is consistent with the current discussions of the literature that atmospheric design factors will more likely influence consumers' "likelihood to engage in a behaviour" [Ali and Amin, (2014), p.28] than consumers' emotional reactions like pleasure and arousal (Choi et al., 2018). Research notes that ambiance factors like music and scent instead significantly influence emotional states like pleasure, arousal, and satisfaction (e.g., Roschk et al., 2017).

At the sub-group level of the analysis, our results show that all the atmospheric design stimuli have a significant, positive disaggregate effect on the shopping outcomes, namely, behavioural intention, approach behaviour, and emotional states, which confirms earlier meta-analysis of De Nisco (2010), while disconfirming that of Roschk et al. (2017), that colour has a negative effect on satisfaction and behavioural intentions. Furthermore, the comparative effects of the store design factors on each level of the shopping outcomes reveal that, at the approach behaviour level, the aggregate effect of lighting is the highest, but at the level of the behavioural intention, the impact of layout is the strongest, while at the emotional states level, product display is the highest. This indicates that the aggregate strengths of the atmospheric design factors vary from shopping outcomes to shopping outcomes, with some stronger at certain levels and weaker at others.

For instance, results show that the atmospheric design factor to stimulate the emotional states (satisfaction, pleasure and arousal) of consumers is product display. Research demonstrates that product display can evoke positive consumer emotions (Tulipa et al., 2014) and stimulate their degree of activation and satisfaction (Jang and Namkung, 2009). Again, it deserves remarking that the strongest association of our analysis relates to the aggregate effect of store layout on behavioural intentions, whereas the weakest association strength relates to the effect of lighting on emotional states (r = 0.12). Extant literature unveils that store layout attractiveness can cause a consumer to visit a store (Seock, 2009), purchase more items, take more time to shop (Viera, 2010), and spend more money if the store layout aesthetics are well-designed and neatly laid out (Riaz and Ali, 2015).

It is quite surprising to observe the lower aggregate effect of lighting on emotional states, although literature shows that lighting stimulates pleasure (Custers et al., 2010; Fleisher et al., 2001; Liao, 2011), induces customers' arousal and attention (Lin and Yoon, 2015), and affects customers' emotions and satisfaction (Baker et al., 2002).

De Nisco (2010) also found in his meta-analysis that lighting has a weaker effect on the consumption process. The positive association of the impact of lighting on shopping outcomes disagrees with Quartier et al. (2014) that lighting does not have a significant effect on behaviour.

5.2 Study moderators

This study's second objective was to investigate the heterogeneity (i.e., between-study variance) in the effect sizes of the generalisable estimates. Our subgroup and MARA analyses reveal significant heterogeneity for most of the associations, demonstrating that the prescriptive efficacy of design atmospherics is likely to hinge on the particular setting in which they are utilised. More specifically, shopping setting, store formats, factorial design, experimental design, and study design unfold the following insights. For shopping setting, we found that the relationship was stronger in physical stores than in online and physical service stores, which confirms earlier reviews (Roschk et al., 2017). The lower rating in the service setting is quite surprising, but this could be partly due to the fewer samples or effects in this study. With respect to the study design, the strength of the association tends to be stronger in survey studies compared to experimental studies, which may be partly due to difficulty in gaining significant control of the sceneries for a different group in experimental studies (Wang and Tang, 2008) compared to survey where there is significant flexibility (Vieira et al., 2017).

Concerning the experimental design (actual versus fictitious), the effect sizes manifest stronger effects in studies in artificial or fictitious settings than those in the actual setting, which confirms the current thinking of the literature (Shadish et al., 2002). This implies that the studies that occur in the artificial settings may inflate effect sizes, and therefore, future researchers should preferably conduct their studies in an actual setting to provide an accurate estimate of effect sizes. Thus, our finding disagrees with Roschk et al. (2017) that experimental design does not account for between-study variance. The store format, which appears for the first time as a moderator in a meta-analysis in this field of inquiry, shows that the strength of the association is more robust in multi-purpose stores than single-purpose stores. This implies that the type of store (e.g., chain store, departmental store, supermarket, etc.) in which a study is conducted may account for between-study variance (Marques et al., 2016), and therefore future studies should be cognizant of this potential influence, and manipulate or control it accordingly.

Furthermore, findings divulge that the factorial design of experimental studies does account for between-study variance, thereby confirming the literature (e.g., Peterson, 2001) that different treatment groups used in an experimental study can influence effect sizes, while disconfirming the finding of De Nisco (2010) that between-subjects and within-subjects treatment groups do not affect effect sizes of hypothesised relationships. Disagreeing with De Nisco (2010) and agreeing with Roschk et al. (2017), our results did not explain the between-study variance of effect sizes for sampling unit (student versus real consumers). It must be noted that the differences in our results with the previous meta-analyses may stem from the difference in sample size, the focus of the studies, and the year of publications. Our study includes samples that did not fall within the focus year of the previous meta-analyses.

Similarly, we did not find any heterogeneity for cues (single cue versus multi-cue), although De Nisco found significance for this moderating factor. Again, we observed no

between-study variance significance for the theory usage and sampling techniques. Thus, while theory usage may reflect journal outlet quality (Lu et al., 2016), it does not affect effect sizes of the examined relationships. Similarly, the use of either probabilistic or non-probabilistic-based samples does not significantly influence effect sizes, although Wang and Yang (2008) and Fern and Moroe (1996) confirmed this in their studies. These results, pending further study verification, indicate that the generalisable estimates do not systematically vary with respect to these methodological moderators or specifications.

5.3 Implications

5.3.1 Theoretical implications

There has been much research in the last few decades investigating the diverse ways in which store atmospherics influence consumer shopping behaviours. The primary purpose of this meta-analysis was to examine the effect of design atmospherics on shopping outcomes. This was motivated by the observed research deficit in the literature vis-à-vis the inconclusive findings of the true nature and magnitude of the impact of atmospheric design factors on the consumption process as well as the methodological moderators that may account for the between-study variance of the investigated studies. Some earlier efforts had followed a methodological approach similar to ours in this research stream, but this is the first meta-analysis to lend special, concentrated attention to the design atmospherics – shopping outcomes relationship. Thus, the findings of this study add useful insight and knowledge to the ensuing scholarly discussion on the role of store atmospherics in creating a superior shopping experience for customers. Therefore, our study advances the S-O-R framework on how environmental stimuli influences consumer behaviour. Empirical findings confirming theory-based expectations boost the robustness of established common knowledge. Yet, novel ground is sometimes broken by findings that challenge conservative thinking. Therefore, our most intriguing result may be that, contrary to expectations, more recent studies found that design atmospherics do not influence shopping outcomes, particularly emotional states. More specifically, our results challenge the conventional thinking of the literature that product display merely influences behavioural intention and approach behaviour, but not substantially emotional states of consumers like pleasure, arousal, and satisfaction.

5.3.2 Managerial implications

Our results have several managerial implications for practitioners. Firms are encouraged to strategically and carefully incorporate design atmospherics (product display, store layout, colour and lighting) into their marketing strategies because they are positively and significantly related to shopping outcomes. Indeed, our meta-analytic findings reveal that retailing innovations and investment in design atmospheric stimuli are worthwhile for retail executives. In particular, our result brings to focus that the overall average effect to be expected from design atmospherics campaign is $r = 0.23$ or within the range (0.12–0.43). Our study, therefore, offers managers and practitioners a valid and reliable insight about the average effect of retailing 'beauty' on shopping outcomes. Yet, because of the small-to-medium nature and magnitude of the effect sizes of the atmospheric design stimuli, retailers and marketing executives must not view them as short- and medium-term strategies but rather as long-term strategies. Further, our results on the

relative effects of the design atmospherics on shopping outcomes show that retailers and marketing executives should not depend much on the atmospheric design stimuli if they aim to stimulate the emotional reactions of customers, though. Instead, the atmospheric design factors should be adopted to stimulate consumers' behavioural intentions like purchase, repurchase, word of mouth, and revisit as well as their approach behaviours like time spent, extra shopping, number of items touched, etc. Further, the varying comparative effects of design atmospherics on each level of the shopping outcomes – means design atmospherics should be tailored to the specific shopping outcomes to be stimulated in a given period. In other words, retailers and marketing practitioners should deploy atmospheric design factors based on the specific shopping outcomes that they aim to arouse or stimulate; that is, based on specific marketing objectives. For example, the atmospheric design factors to stimulate the emotional states (e.g., satisfaction, pleasure and arousal) of consumers are product display and colour. Moreover, retailers and practitioners should take into consideration the contextual factors that were found to significantly moderate the design atmospherics – shopping outcomes relationship. For instance, results show that the stimulating effects of the design atmospherics on consumer behaviour differs from shopping settings and formats to another, being stronger in retail shops than in online stores and in multi-purpose stores than specific-purpose stores. Accordingly, managers must need to take these nuances into account while interpreting the outcomes our study. Thus, our result can guide retailers in their budget allocation and strategic orientations.

6 Limitations and future research

The present study, akin to any scientific inquiry, has some research limitations that provide inspiration and potential avenues for further research. First, our study employed a bivariate correlation metric (i.e., correlation coefficients) because of the study's primary objective, which was to calibrate effect sizes across existing studies to comprehend their magnitude and direction as well as the moderating factors that account for heterogeneity. Although we complemented our bivariate analysis with meta-regression, our study still did not account for the causal effects. Therefore, we encourage further research to evaluate causal effects because "downstream sequential effects relate to many additional types of exogenous influences besides those of atmospheric stimuli" [Roschk et al., (2017), p.6].

Second, our study was limited to only four most frequently examined design atmospherics for which there were enough data of quantitative empirical evidence, namely colour, lighting, store layout, and product display. Therefore, we encourage future studies to integrate into their meta-analytic framework, in light of this limitation, other atmospheric design factors like texture, fixtures, furniture, employee appearance, etc. as the field steadily evolves, and more studies permit aggregation through a meta-analysis. Third, our moderator analysis yielded some agreements and disagreements with previous reviews regarding certain methodological moderators, specifically, experimental design, sampling unit, cues, and factorial design, which may stem from differences in sample size and year of analysis. Consequently, it would be intriguing for future scholarships to incorporate these methodological moderators in their meta-analytic model to validate their potential to account for between-study variance, and as well, verify new moderators tested in our study, namely assortment types.

In addition to the above gaps, we are also curious about the effect of the cultural background of consumers on their shopping behaviour in the retailing environment. Does culture (e.g., individualism or collectivism) influence how consumers view design atmospherics like colour, product display or store layout? For instance, the colour red may be interpreted as evil or lucky based on the cultural context (geographic location) of the consumer (Baeka et al., 2018). Therefore, investigating such cultural differences could offer a lucid understanding regarding when and where to apply a particular colour to elicit consumers' positive response. Furthermore, given the growing importance of 'green design' and 'green marketing' in today's era of sustainability, could there be any significant relationship between the green design of a store and consumer shopping outcomes? Said somewhat differently, what is the relationship between green store design and the behavioural intentions, approach behaviour, and emotional states or reactions of shoppers?

Again, elucidating how the design atmospherics examined – product display, store layout, lighting, and colour interact concurrently with one another to impact the perception of consumers and consequently, their impulse buying attitude is warranted. As well, investigating the extent to which social factors like employee appearance and crowding influence consumer emotional responses and impulse buying behaviour would spice up research interest in this field. Moreover, there is a limited attention to the determinants or antecedents of the design atmospherics stimuli. To this end, we suggest that future researchers examine drivers or antecedents like store commitment and other determinants that may facilitate the manifestation of certain behaviour and attitude (Savelli et al., 2017). Along the same line of thoughts, we highlight the importance of paying particular attention to how study design, study measure, shopping setting, store format, and factorial design influence effect sizes of the studies. Therefore, researchers must manipulate and control these variables carefully in primary studies, since they can either increase or decrease the effect sizes.

Furthermore, one research avenue arising from the findings of this study concerns the need to examine the comparative effects of store atmospherics on each level of the shopping outcomes in different shopping settings or assortments (e.g., chain stores versus departmental stores). This will shed useful insights on how different industries and store types influence consumer behaviour in different retailing environment. Again, it would be intriguing for future researchers to examine the impact of lighting on consumer emotional states or reaction as this area has received limited studies particularly in the service setting. Moreover, it was observed that design atmospherics studies in the physical service stores are very scant, needing further attention. To this end, we call for more studies on the atmospheric design factors to be conducted in the service setting to balance the literature, and consequently, verify the outcome of this study. Also, we believe that a future meta-analysis of the effect of atmospheric designs on sales or profit (firm perspective) will balance the literature, since previous meta-analyses including ours have considered the subject merely from consumers' perspective. But how do design atmospherics influence company performance in terms of brand performance, innovation performance, sales, and profitability?

From methodological perspective, we use meta-analysis (i.e., subgroup analysis and meta-regression) to explain the focal relationship. However, as stated above, this approach of meta-analysis does not account for causal effects. To this end, we suggest the adoption of more advanced meta-analysis techniques like meta-analysis structural

equation modelling (MASEM) to deepen our understanding of the main causal effects in the design atmospherics – shopping outcomes relationship. Relatedly, since our review was a quantitative systematic review, which excluded qualitative articles, we suggest that future studies adopt qualitative meta-analysis (QMA), which is now gaining recognition, to address the effects of qualitative studies that were not accounted for in this study (Combs et al., 2019). Moreover, given the complexity of the phenomenon, we encourage future researchers to adopt mixed methodologies (quantitative and qualitative sequentially or simultaneously) to offset the methodological weaknesses of these approaches of study design.

Another interesting gap in this field concerns the lack of replication of the primary studies in different contexts. As observed, most of the studies are not replicated in different settings to allow for cross-cultural and cross-regional validation of the findings of the extant literature on the store atmospheric – shopping outcomes. In particular, since studies on this subject are very limited in emerging economies like Africa and South America, it is important that the phenomenon is extended to this less-researched cultural settings.

Despite the limitations of the study, we believe our meta-analysis offers some useful clarifications to the anecdotal and mixed results in the field, advance significant insights to the ongoing scholarly debate on how store atmospherics influence consumer behaviour, and highlight several managerial implications for practitioners.

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