

Typicality, Novelty, and Liking in Product Shape and Sound: A Study of Two Domestic Appliances on Cognitive Aesthetics

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Abstract

The Most Advanced Yet Acceptable (MAYA) principle holds that consumers prefer designs balancing typicality (familiarity) with novelty, but evidence for this claim rests almost entirely on visual product form. This study tests whether typicality and novelty independently predict liking for product sound and shape, using ratings from Phase 2 of a three-phase investigation, as a linear test underlying MAYA's broader balance claims. Respondents (n = 106-107 per product) independently rated ten shapes and ten sounds of a hairdryer and a vacuum cleaner for typicality, novelty, and liking using 7-point scales. GEE models, clustered by participant, regressed item-level liking on typicality and novelty across four item sets: hairdryer shape, hairdryer sound, vacuum cleaner shape, and vacuum cleaner sound. Typicality and novelty were both significant, positive predictors of liking in all four sets. Typicality was the stronger predictor for hairdryer shape, hairdryer sound, and vacuum cleaner shape, while novelty was stronger for vacuum cleaner sound. These findings show that the joint contribution of typicality and novelty to aesthetic preference also holds for product sound, detectable at the single-stimulus level, prior to the combination effects examined in a companion Phase 3 paper. Implications for extending MAYA to auditory product design are discussed.

Keywords: *Aesthetic preference, MAYA principle, novelty, product sound, typicality*

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Ketipikalan, Kebaharuan, dan Kepuasan terhadap Bentuk dan Bunyi Produk: Kajian Dua Peralatan Elektrik Utama Rumah terhadap Kognitif Kepuasan Estetik

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Abstrak

Prinsip Most Advanced Yet Acceptable (MAYA) menyatakan bahawa pengguna lebih menggemari reka bentuk yang mengimbangi ketipikalan (kebiasaan) dengan kebaharuan, tetapi bukti tuntutan ini hampir keseluruhannya tertumpu pada aspek visual produk. Kajian ini menguji sama ada ketipikalan dan kebaharuan meramal kesukaan secara bebas bagi bunyi produk selain bentuk, menggunakan penilaian daripada Fasa 2 kajian tiga fasa ini, sebagai ujian linear yang mendasari tuntutan keseimbangan MAYA yang lebih luas. Responden (n = 106-107 bagi setiap produk) menilai sepuluh bentuk dan sepuluh bunyi pengering rambut serta pembersih vakum bagi ketipikalan, kebaharuan, dan kesukaan, menggunakan skala 7 mata. Model GEE, berkelompok mengikut responden, meregresikan kesukaan peringkat item terhadap ketipikalan dan kebaharuan bagi empat set item: bentuk dan bunyi pengering rambut, serta bentuk dan bunyi pembersih vakum. Ketipikalan dan kebaharuan merupakan peramal positif yang signifikan bagi kesukaan dalam keempat-empat set. Ketipikalan lebih kuat meramal bentuk pengering rambut, bunyi pengering rambut, dan bentuk pembersih vakum, manakala kebaharuan lebih kuat meramal bunyi pembersih vakum. Dapatan ini menunjukkan bahawa sumbangan bersama ketipikalan dan kebaharuan terhadap keutamaan estetik turut wujud bagi bunyi produk, yang dapat dikesan pada peringkat item tunggal, sebelum kesan gabungan yang dikaji dalam kertas sampingan fasa ketiga kajian ini. Implikasi memperluas prinsip MAYA kepada reka bentuk produk auditori turut dibincangkan.

Kata Kunci: Bunyi produk; kebaharuan; ketipikalan; keutamaan estetik; prinsip MAYA

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1.0 Introduction

Typicality (a stimulus's familiarity) and novelty (its distinctiveness) have long been treated as central, jointly acting predictors of aesthetic liking (Berlyne, 1971; Hekkert, Snelders, & Van Wieringen, 2003). The Most Advanced Yet Acceptable (MAYA) principle (Loewy, 1951; Hekkert et al., 2003) formalizes this relationship: the products people find most pleasing are those that balance typical, familiar design elements with a measure of novelty, satisfying existing expectations while still introducing something new. This balance is well documented for product shape, color, and form (Mugge & Dahl, 2013; Veryzer & Hutchinson, 1998), but the literature establishing it has been developed almost entirely from visual stimuli. Product interaction, however, rarely engages a single sense at a time: it unfolds through an interplay of seeing, touching, and hearing (Schifferstein & Cleiren, 2005), and this richer sensory engagement is what allows a user to draw more information from a product during use (Demattè, Sanabria, Sugarman, & Spence, 2006). Product sound in particular is just as manipulable as product form in shaping a consumer's emotional response and perception of functionality (Björk, 1985; Jekosch, 2005; Langeveld, van Egmond, Jansen, & Özcan, 2013), which raises the question of whether the typicality-novelty relationship established for visual form extends to this largely untested sensory channel.

This gap matters because a product's affective quality is increasingly understood as a composite of properties assessed separately across sensory channels, rather than a single, unified judgment (Özcan, Cupchik, & Schifferstein, 2017), and domestic appliances specifically are judged through both their auditory and visual dimensions (Seifert & Chattaraman, 2020). If the typicality-novelty relationship that governs visual preference does not extend to sound, then treating product aesthetics as a purely visual phenomenon and generalizing MAYA-based design guidance to a product's sound as well as its shape would be unwarranted.

This paper reports the second phase of a larger three-phase study investigating typicality, novelty, and aesthetic preference across the visual and auditory design of two domestic appliances: the hairdryer and the vacuum cleaner. In the first phase, these two products were selected from a wider set of sixteen candidate appliances based on their ownership frequency among a survey sample, a proxy for genuine consumer familiarity that avoided both very low ownership (unfamiliar products) and near-universal ownership (products too familiar to differentiate the sample) (Özcan, Cupchik, & Schifferstein, 2017). In this second phase, ten shapes and ten sounds were constructed for each product and rated independently, prior to any combination of shape and sound, for typicality, novelty, and liking. This item-level design allows a direct test of a foundational question: do typicality and novelty, as isolated properties of a single shape or a single sound, already function as joint predictors of liking, in the way they are known to for visual product form taken as a whole?

A companion paper, using the third phase of the same study, extends this question to the combination effects that arise when a specific shape and a specific sound are paired together, and reports a more fully controlled test of four combination-level hypotheses concerning cross-modal typicality and novelty. The findings reported here provide the empirical groundwork for that



combination-level analysis: if typicality and novelty did not predict liking at the level of individual shapes and sounds, there would be little basis for expecting them to predict liking for combinations built from those same shapes and sounds. Accordingly, this paper tests one specific hypothesis: H1: Typicality and novelty are positive predictors of liking across visual (shape) and auditory (sound) product stimuli, examined here at the level of individual shapes and sounds prior to any combination of the two modalities. Correspondingly, this paper addresses the underlying research question: do typicality and novelty independently and positively predict liking for individual visual (shape) and auditory (sound) stimuli of domestic appliances?

2.0 Literature Review

2.1 Typicality, Novelty, and the MAYA Principle

Berlyne's (1960, 1971) Collative-Motivation Model proposed that stimulus properties he termed collative variables, novelty, complexity, and incongruity foremost among them, raise a perceiver's arousal, and that the relationship between arousal potential and hedonic value follows an inverted U-shape: moderate arousal is pleasurable, while arousal that is too low produces boredom and arousal that is too high produces discomfort. Because collative variables arise from comparing a stimulus against a perceiver's expectations and prior experience, a modality-general comparison process, they apply in principle as much to sound as to sight, even though Berlyne's own experiments relied almost entirely on visual stimuli.

Whitfield and Slatter (1979) challenged Berlyne's emphasis on novelty with a preference-for-prototypes account, in which people prefer stimuli that closely match their mental prototype of a category; this account gives typicality, rather than novelty, the dominant role in aesthetic evaluation. Whitfield (2000) later reconciled the two accounts in a Categorical-Motivation Model, proposing that aesthetic preference is jointly determined by a stimulus's arousal potential and its prototypicality, with the relative contribution of each depending on the categorical meaningfulness of the stimulus being judged.

Hekkert, Snelders, and Van Wieringen (2003) formalised this joint treatment in the MAYA principle: rather than typicality and novelty trading off against one another, the products people find most pleasing are those that combine high typicality with as much novelty as the design can sustain without becoming unfamiliar. Blijlevens, Carbon, Mugge, and Schoormans (2012) refined this picture further, reporting a curvilinear relationship in which some novelty is valued but excessive novelty produces cognitive overload that reduces, rather than increases, appreciation. This pattern is also consistent with the Processing Fluency account (Reber, Schwarz, & Winkielman, 2004), which explains the preference for typical, familiar stimuli as a preference for stimuli that are easier to process.



2.2 Typicality and Novelty in Product Design

A product's shape, colour, and form typically do the most work in forming a consumer's initial impression (Mugge & Dahl, 2013; Veryzer & Hutchinson, 1998), and novelty in this visual sense has been consistently linked to consumer perceptions of innovation and quality (Mugge & Schoormans, 2012a; Rindova & Petkova, 2007), provided the novelty is not so extreme that consumers can no longer relate the product to its intended function (Mugge & Dahl, 2013; Mugge & Schoormans, 2012b). Whitfield's (2000) distinction between rich product categories, which tolerate a wide range of typical-to-novel designs (chairs, lamps), and poor categories, which have few subtypes and less tolerance for novelty (industrial equipment), has been repeatedly confirmed in recent work (Suhaimi, Kuys, Barron, Whitfield, & Rahman, 2022; Suhaimi, Kuys, Barron, Li, Rahman, & Whitfield, 2023; Chen, Whitfield, Barron, Zahari, Suhaimi, Huang, & Wang, 2025), and the MAYA principle itself continues to be tested across new product categories, including smartwatches (Ma, Yahaya, Tai, Whitfield, & Barron, 2025) and smart products more broadly (Akiike, Katsumata, Yoshioka-Kobayashi, & Baumann, 2025).

This body of work, however, has assessed aesthetic preference through visual appearance in every case, including for functionally rigid, poor-category products such as industrial boilers (Suhaimi et al., 2023) that are, in practice, also experienced through the sounds they produce. Whether the same typicality-novelty relationship holds when the stimulus is a product's sound rather than its visual form has not been directly tested, which is the gap this study addresses.

2.3 Multisensory Aesthetics and Product Sound

Much of empirical aesthetics has historically privileged vision, leaving the auditory modality considerably less explored (Silvia, 2005a; Brattico et al., 2011). Constructing controlled multisensory stimuli, however, is a task well suited to industrial designers, who are trained to design and construct exactly this kind of controlled stimulus for experimental use (Schifferstein & Desmet, 2008), and a growing body of evidence indicates that sound meaningfully shapes product perception even in interactions that seem primarily visual (Tajadura-Jiménez, Liu, Bianchi-Berthouze, & Bevilacqua, 2014).

Özcan (2014) distinguishes consequential sounds, which arise naturally from a product's mechanical operation (a motor, a switch), from intentional sounds, which are deliberately designed and embedded to serve a communicative function (a notification tone, an alert). Both categories offer a route by which typicality and novelty, well studied for visual product form, can be examined for product sound: a consequential sound that is highly typical of its product category signals reliability and correct functioning, whereas an intentional sound has more latitude to introduce novelty for the sake of distinctiveness, provided it remains within limits the user can relate to prior experience (Langeveld, van Egmond, Jansen, & Özcan, 2013). The hairdryer and vacuum cleaner sounds examined in this study are consequential sounds, arising from motor and airflow rather than being



added deliberately by a designer, which makes them a natural first test case for extending the typicality-novelty relationship into the auditory domain.

2.4 Theoretical Framework

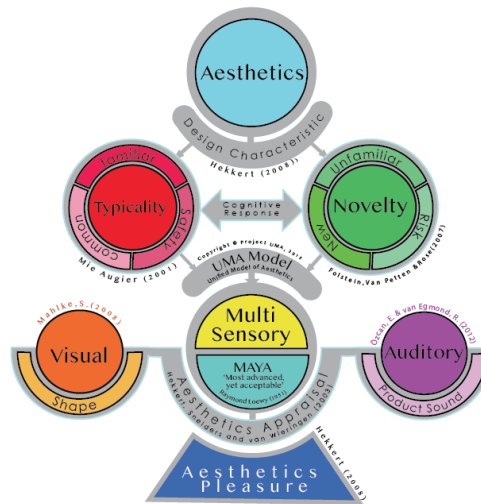


Figure 1. Theoretical framework linking design characteristics to typicality and novelty as independent predictors of aesthetic liking.

Figure 1 sets out the theoretical framework guiding the present study. Aesthetic appraisal is modelled as proceeding from a product's design characteristics, through the cognitive response of typicality (familiar, common, safe) and novelty (unfamiliar, new, risky), to an overall judgement of aesthetic pleasure. Consistent with the scope of this item-level analysis, typicality and novelty are modelled here as two separate, independent predictors of liking, $\text{Typicality} \rightarrow \text{Liking}$ and $\text{Novelty} \rightarrow \text{Liking}$, rather than as an interactive or curvilinear joint effect; the fuller test of MAYA's optimal-balance and interaction claims that this independent-predictors model does not address is left to the combination-level analysis reported in the companion Phase 3 paper. This study operationalises the framework across two sensory modalities, visual (shape) and auditory (product sound), and examines it at the level of individual shape and sound stimuli, providing an item-level test of the typicality-novelty-liking relationship that underpins that combination-level analysis.

3.0 Method

3.1 Design and Participants

This study forms the second of three phases in a larger research design. In Phase 1, an online survey of 232 respondents (230 usable responses) presented a checklist of sixteen candidate domestic appliances, adapted from Özcan, Cupchik, and Schifferstein



(2017), and asked respondents to indicate which they owned. Ownership rates ranged from 92.6% (washing machine) to 4.8% (epilator); the hairdryer (49.1% ownership) and the vacuum cleaner (70.9% ownership) were selected as the two test products for this reason, and because Özcan et al. (2017) had already identified the hairdryer's distinctive acoustic properties and its acoustic similarity to the vacuum cleaner.

In this second phase, 106 respondents completed the hairdryer survey and 107 completed the vacuum cleaner survey. Respondents were recruited using a convenience (intercept) sampling approach at an electrical appliance centre in the Hulu Langat district, Selangor, Malaysia, approached in person at the store counter during their regular shopping visit and supplemented by online recruitment using the same survey instrument; recruitment was monitored on an ongoing basis to maintain a broad spread of participant ages and an even gender split, giving the sample quota-like diversity without constituting probability-based random sampling. Eligible participants were working adults aged 20 to 60 who were able to purchase their own electrical appliances and reported no vision or hearing impairment; professional designers were excluded, as their design-focused training has been shown to affect aesthetic judgement in ways that are not representative of the general public (Whitfield, 2007). The resulting sample skewed toward working-age adults (43% aged 31-40, 37% aged 21-30) and was fairly evenly split by gender (53% female, 47% male). Gacula and Rutenbeck (2006) report that a sample of 40 to 100 respondents is generally the optimal size for analytical consumer sensory testing, a range this sample exceeds.

3.2 Stimuli

Ten shape variants and ten sound variants were constructed for each product. Shape images were compiled from publicly available online product photographs of real, commercially available hairdryers and vacuum cleaners and digitally standardised by the researcher, with brand identifiers, colours, backgrounds, and image scale modified to isolate shape as the sole varying visual attribute, presented against a plain background. Figure 2 shows the ten hairdryer shape stimuli used in this phase; an equivalent set of ten shapes was constructed for the vacuum cleaner. Sound stimuli were consequential product sounds (motor and airflow noise) sourced from a commercial sound library maintained by an audio engineer at a national radio broadcaster, originally compiled for producing radio commercial advertisements; from this library the researcher selected and edited a set of hairdryer and vacuum cleaner sounds varying systematically in typicality and novelty, presented to respondents as audio clips rather than visual spectrograms.





Figure 2. Hairdryer and Vacuum Cleaner shape stimuli used in the Phase 2 survey.

3.3 Procedure

Data collection took place at the electrical appliance centre described above and online. Respondents were approached at the store counter, where a recruitment display invited customers to participate during their regular shopping visit, and were also recruited online using the same survey instrument. Each respondent rated all ten shapes and all ten sounds of a single product (hairdryer or vacuum cleaner) independently, one stimulus at a time, on typicality, novelty, and liking, using 7-point scales anchored by the statements "This is a typical [product]" and "This is a novel [product]".

3.4 Measures

The questionnaire items measuring typicality, novelty, and liking were adapted from established aesthetic evaluation measures in the MAYA and product-aesthetics literature (Hekkert et al., 2003), reworded for the shape and sound stimuli examined in this study. In addition to typicality and novelty, a third question asked respondents to rate how pleasing (liking) each individual shape and sound was, using the same 7-point scale; these item-level liking ratings are the dependent variable analysed in this paper.



3.5 Data Analysis

To examine whether typicality and novelty predict liking at the level of individual shapes and sounds, a generalised estimating equations (GEE) model (Liang & Zeger, 1986) was fitted separately for each of the four Phase 2 item sets (hairdryer shape, hairdryer sound, vacuum cleaner shape, vacuum cleaner sound), regressing item-level liking on typicality and novelty with a Gaussian family, an exchangeable working correlation structure, and standard errors clustered by participant. GEE was chosen over ordinary regression because each participant rated all ten items in a set, violating the independence assumption of ordinary least squares; the exchangeable working correlation structure accounts for this repeated-measures clustering while the empirical (sandwich) standard errors remain robust to misspecification of that structure.

4.0 Results

This study tests whether typicality and novelty independently and positively contribute to liking as an item-level foundation for examining the MAYA principle; it is not a test of MAYA's optimal-balance, interaction, or curvilinear predictions, which are addressed at the combination level in the companion Phase 3 paper. For the hairdryer shapes, shape 10 was rated most typical ($M = 6.60$, $SD = 0.76$) and shape 6 least typical ($M = 1.49$, $SD = 0.98$); shape 9 was rated most novel ($M = 5.14$, $SD = 1.92$) and shape 10 least novel ($M = 3.04$, $SD = 2.14$). For the hairdryer sounds, sound 1 was rated most typical ($M = 5.99$, $SD = 1.27$) and sound 4 least typical ($M = 1.94$, $SD = 1.55$); sound 9 was rated most novel ($M = 4.37$, $SD = 2.00$) and sound 10 least novel ($M = 3.10$, $SD = 1.81$).

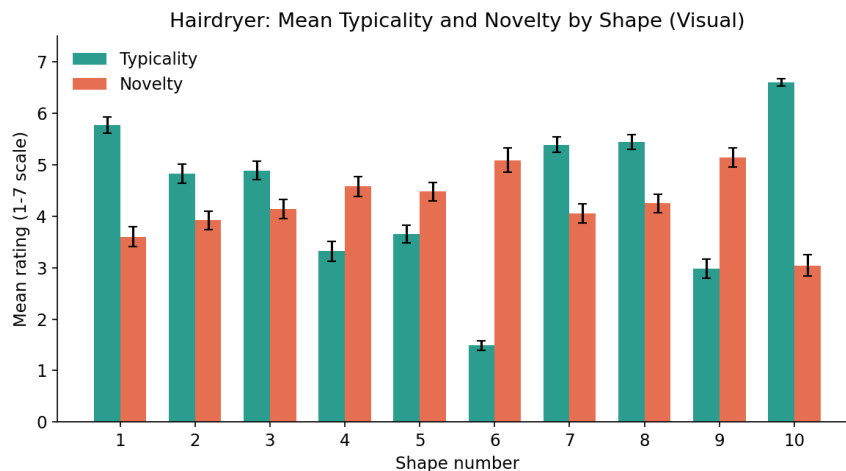


Figure 3. Hairdryer: mean typicality and novelty ratings by shape.



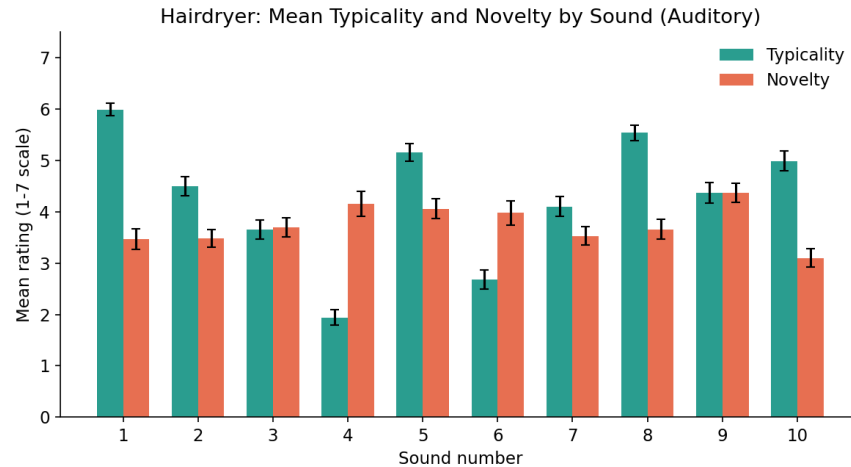


Figure 4. Hairdryer: mean typicality and novelty ratings by sound.

For the vacuum cleaner shapes, shape 2 was rated most typical ($M = 5.70$, $SD = 1.40$) and shape 9 least typical ($M = 2.45$, $SD = 1.99$); shape 9 was also rated most novel ($M = 5.65$, $SD = 1.89$), while shape 1 was rated least novel ($M = 3.56$, $SD = 1.85$). For the vacuum cleaner sounds, sound 2 was rated most typical ($M = 6.21$, $SD = 1.32$) and sound 6 least typical ($M = 2.52$, $SD = 1.66$); sound 10 was rated most novel ($M = 5.17$, $SD = 1.86$) and sound 2 least novel ($M = 2.74$, $SD = 2.02$).

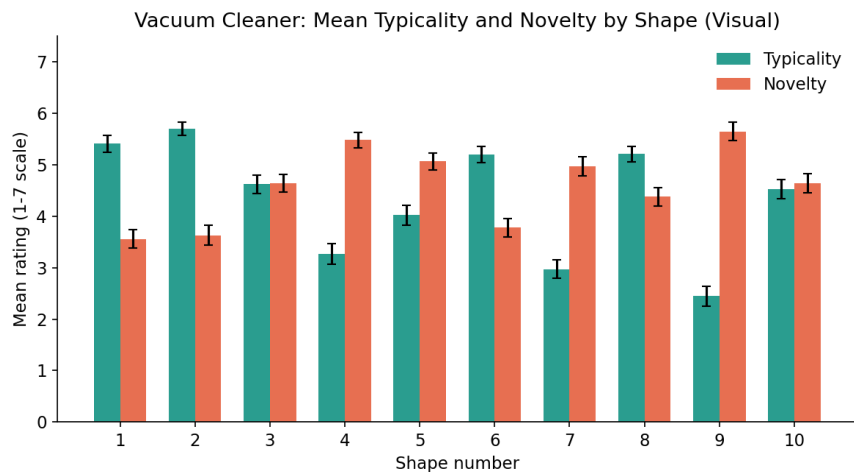


Figure 5. Vacuum cleaner: mean typicality and novelty ratings by shape.



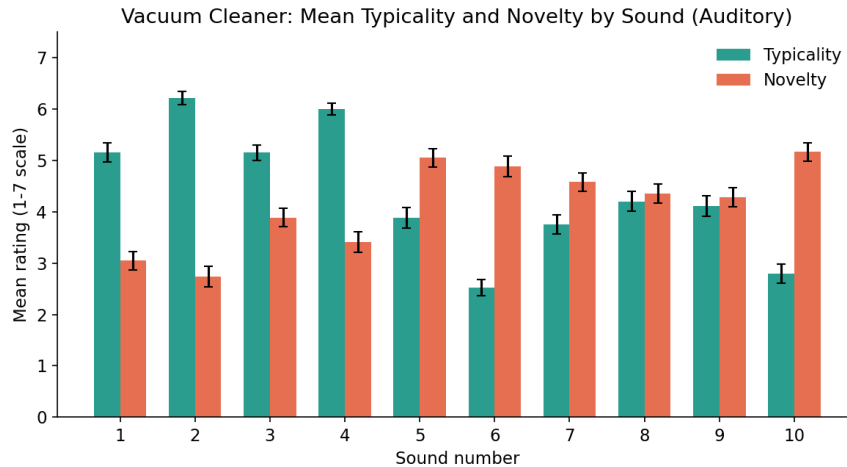


Figure 6. Vacuum cleaner: mean typicality and novelty ratings by sound.

Table 1. Generalised estimating equations (GEE) results for item-level liking, Phase 2, by product and modality.

Product / Modality	Predictor	B	Robust SE	z	p	Within-Participant Correlation (α)
Hairdryer Shape	Typicality	0.581	0.030	19.24	< .001	0.254
	Novelty	0.236	0.028	8.40	< .001	0.254
Hairdryer Sound	Typicality	0.488	0.038	12.95	< .001	0.133
	Novelty	0.348	0.036	9.60	< .001	0.133
Vacuum Cleaner Shape	Typicality	0.386	0.040	9.54	< .001	0.191
	Novelty	0.271	0.038	7.11	< .001	0.191
Vacuum Cleaner Sound	Typicality	0.349	0.037	9.53	< .001	0.133
	Novelty	0.503	0.035	14.56	< .001	0.133

Note. B = unstandardised GEE coefficient; Robust SE = empirical (sandwich) standard error; family = Gaussian; working correlation = exchangeable, clustered by participant. Dependent variable in all models is item-level liking (pleasingness), rated on the same 7-point scale as typicality and novelty.

In all four item sets, typicality and novelty were both significant, positive predictors of liking. Typicality was the stronger predictor for the hairdryer shape and sound and for the vacuum cleaner shape, while for the vacuum cleaner sound, novelty was the somewhat stronger predictor. This item-level pattern foreshadows a corresponding finding, reported in the companion Phase 3 paper, that novelty is on average a slightly stronger predictor of liking than typicality for the vacuum cleaner, while for the hairdryer the two dimensions are more evenly matched.



5.0 Discussion

The central finding of this study is that typicality and novelty function as joint, positive predictors of liking not only for product shape, where this relationship is well established (Hekkert et al., 2003; Mugge & Dahl, 2013), but also for product sound, where it has rarely been tested directly. This pattern held across all four item sets examined, hairdryer shape, hairdryer sound, vacuum cleaner shape, and vacuum cleaner sound, with typicality the stronger predictor in three of the four sets and novelty the stronger predictor for vacuum cleaner sound. This is consistent with the MAYA principle's characterisation of the most preferred stimuli as those combining familiarity with a manageable degree of newness (Hekkert et al., 2003), and, to our knowledge, provides an early empirical extension of that characterisation, in this item-level form, to a product's auditory as well as visual design.

That the relationship is already detectable at the level of single, isolated stimuli, before any combination of shape and sound is introduced, is itself a noteworthy finding. Much of the prior typicality-novelty literature has examined a product's overall visual form as a single composite judgement (Veryzer & Hutchinson, 1998; Zhao et al., 2009); the item-level design used here shows that the relationship does not depend on that composite judgement; it is present even when a single shape or a single sound is rated in isolation. This provides empirical grounding for the combination-level test reported in the companion Phase 3 paper, in which specific shapes and sounds identified here as typical, novel, or neutral exemplars are paired together and rated as combined stimuli.

The finding that novelty was the stronger predictor for vacuum cleaner sound specifically, while typicality dominated elsewhere, is also worth noting. One plausible account draws on Özcan, van Egmond, and Jacobs's (2014) distinction between consequential and intentional product sound: because the sounds examined here are consequential, arising from motor and airflow rather than being deliberately designed, the acoustic profile of a vacuum cleaner in particular may carry more latitude for novelty before that novelty reads as a functional defect, compared to a hairdryer, whose motor sound is more closely tied in consumers' expectations to a narrower band of acceptable pitch and texture. This interpretation is offered tentatively, as this study was not designed to test it directly, and it would benefit from a study manipulating consequential versus intentional sound status directly.

The findings should be read alongside several limitations. The stimuli were two-dimensional shape images and recorded sounds rather than physical, three-dimensional products experienced in context; consumer response to appearance and sound in an actual use setting may differ from response to isolated stimuli presented in a survey. Respondents rated each stimulus once, in a single sitting, so the findings cannot speak to how typicality, novelty, and liking might shift with repeated exposure (Berlyne, 1971). The sample was a convenience (intercept) sample of non-designer customers and staff of a single electrical appliance centre, recruited in person and online rather than through probability-based random sampling, and the study examined only two product categories, both consequential-sound domestic appliances; generalisation to other product categories, or to intentional product sounds, should be made cautiously.



6.0 Conclusion

This study found that typicality and novelty are both significant, positive predictors of liking for individual shapes and sounds of two domestic appliances, extending the MAYA principle's joint treatment of typicality and novelty from the visual modality, where it is well established, to the auditory modality, where it has rarely been tested. This item-level relationship provides the empirical foundation for a companion paper, which uses the third phase of this study to examine how typicality and novelty operate when a specific shape and a specific sound are combined into a single product stimulus, and to test four hypotheses concerning cross-modal typicality-novelty combinations. Together, the two papers offer a fuller account of how typicality and novelty shape aesthetic preference across both the visual and auditory design of consumer products.

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