



The impact of preference for interior space design on incidental recognition memory

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Abstract

The extent to which preference shapes memory formation remains debated. Across three experiments, we tested whether preference for images of interior design predicts incidental recognition memory performance, while accounting for individual differences. Stimuli systematically varied in ceiling height, spatial openness, and curvature, design features known to influence preference. In Experiments 1 and 2 (online and laboratory), participants completed preference ratings followed by immediate recognition memory tasks, with individual differences measured via Desire for Aesthetics, Openness to Experience, and Extraversion. While participants reliably preferred rectilinear spaces, these preferences did not enhance immediate recognition memory, likely reflecting a near-ceiling effect in their performance. Experiment 3 addressed this limitation by increasing the number of stimuli, introducing a filler task, and implementing an 8-day delay interval. Here, higher preference and greater distinctiveness significantly predicted recognition memory accuracy, with a marginal moderation such that preference effects were weaker for low ceilings and closed spaces. Together, these findings suggest that preference enhances long-term, but not short-term, recognition memory, and that this effect is modulated by design features and stimulus distinctiveness.

Keywords Environmental psychology · Incidental recognition memory · Curvature · Interior design preference · Individual differences

Introduction

The majority of people in post-industrial societies spend most of their lives indoors (Klepeis et al., 2001; Spence, 2020), yet how the design of the preferred interior spaces shapes cognition remains poorly understood (Evans & McCoy, 1998; Evans et al., 2003). As urbanisation and indoor living increasingly dominate daily life, identifying how interior design influences cognitive processes is critical for creating environments that support human cognitive functioning. While certain architectural features have been shown to influence preference, their role in shaping cognitive outcomes remains unclear (Coburn et al., 2017; Palumbo et al., 2022; Vartanian et al., 2013, 2019). Moreover, although recent studies report substantial individual differences in preference (Cotter et al., 2017; Palumbo et al.,

2021, 2022; Tawil et al., 2021; Vartanian et al., 2019), the extent to which such variability moderates the impact of architectural features is not well established. The present study aimed to explore these relationships. Specifically, it examined: (1) how ceiling height, spatial openness, and curvature in domestic interior spaces influenced preference; (2) whether such preferences predicted cognitive outcomes as measured by incidental recognition memory performance for those spaces; and (3) the extent to which individual differences in personality and desire for aesthetics moderated these effects.

Features of interior spaces such as ceiling height, spatial openness, and curvature shape the experience of interior spaces (Coburn et al., 2020; Palumbo et al., 2022; Vartanian et al., 2013, 2015, 2021). For example, Meyers-Levy and Zhu (2007) demonstrated that high ceilings are often associated with feelings of freedom, creativity, and grandeur, as they create a spacious area that encourages abstract thinking and cognitive flexibility. In contrast, low ceilings evoke a sense of intimacy and enclosure, which can promote focus and a feeling of safety. Research

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has also shown that preferences for high ceilings are associated with a sense of awe, contributing to a more uplifting and inspiring environment (Vartanian et al., 2015). This is further supported by Rollings and Evans (2019), who found that high ceilings reduce the physiological stress experienced by children in crowded homes.

Similar to ceiling height, spatial openness positively correlates with ratings of beauty, pleasure, and interest (Franz et al., 2005). Expansive environments with open views may support mental restoration by reducing cognitive fatigue (Kaplan & Kaplan, 1989). Consistent with this, Stamps (2005) found that perceived openness in architectural spaces strongly influences preference responses, with individuals favouring environments that convey spaciousness and unobstructed views. Open spaces may also evoke feelings of safety, awe, and inspiration, thereby enhancing psychological well-being (Irvin & Robinson, 2023; Fich et al., 2014; Meagher & Marsh, 2017).

With respect to curvature, smooth contours are often preferred over angular forms in abstract and meaningless shapes (Bertamini et al., 2016; Cotter et al., 2017; Palumbo & Bertamini, 2016; Palumbo et al., 2021, 2022), architectural facades (Ruta et al., 2019), and drawings of real objects (Chuquichambi et al., 2021). Curvature has also been implicitly linked to positive affect and a sense of safety (Palumbo et al., 2015). However, this “curvature effect” is not universal and varies depending on object type and function (Chuquichambi et al., 2022, 2025; Maezawa et al., 2020). In interior design, higher beauty ratings for curvilinear than rectilinear designs are reported (Tawil et al., 2022, 2024; Vartanian et al., 2019, 2021; Wang et al., 2024), with the effect modulated by participants’ expertise in architecture (Vartanian et al., 2019).

In contrast, Palumbo et al. (2022), using the same stimuli and tasks as Vartanian et al. (2019), found preference for rectilinear interior spaces among quasi-experts in industrial design and individuals with high cognitive functioning autism. Similarly, Tawil et al. (2021) tested curvilinear versus rectilinear interiors in virtual reality (VR). They found minimal differences between the two contour types regarding various measures including beauty and pleasantness, with rectilinear rooms rated higher only on novelty and order.

In interior spaces, ceiling height, spatial openness, and curvature jointly shape preference, supporting the idea that preference responses emerge from the interplay of multiple architectural features rather than any single feature (S.-Y. Lee & Yoon, 2022; Oberfeld et al., 2010; Palumbo et al., 2022; Vartanian et al., 2013). This complexity raises a critical question: beyond shaping aesthetic judgements, do these preferences also influence how such environments are remembered?

Converging evidence suggests that aesthetic preference can indeed shape memory through several interacting psychological and neural mechanisms. Preferred stimuli tend to capture greater attention during encoding, resulting in stronger and more durable memory traces (Choe et al., 2017; Stalinski & Schellenberg, 2013). In addition, aesthetic preference is closely linked to reward processing. Specifically, aesthetically pleasing stimuli engage neural circuits associated with meaning integration and affective valuation, including the orbitofrontal cortex and anterior cingulate cortex (Coburn et al., 2017; Vartanian et al., 2013). Aesthetic experiences also involve self-referential processing, engaging networks such as the default mode network (Vessel et al., 2012), which may facilitate the integration of new information with existing knowledge. Together, these processes promote deeper semantic elaboration and more distinctive memory representations, suggesting that stimuli eliciting stronger aesthetic preferences are more likely to be remembered.

Importantly, these mechanisms are likely to influence recognition memory primarily at the encoding stage. Enhanced attention to preferred stimuli supports more efficient allocation of cognitive resources during initial processing, enabling more detailed perceptual and semantic analyses (Celli et al., 2025; Chun & Turk-Browne, 2007). This enhanced processing depth promotes elaborative encoding, in which incoming information is linked to existing knowledge structures, resulting in more distinctive and accessible memory representations (Mather & Sutherland, 2011). In this way, aesthetic preference may not only increase engagement with a stimulus but also shape the quality of encoding, thereby improving the likelihood of subsequent recognition.

Recent evidence shows that interior spaces can impact cognitive processes such as attention, learning, creativity, and decision making (Aljunaidy & Adi, 2021; Andréa De Paiva, 2018; Azzazy et al., 2021; Brunsgaard & Fich, 2016; Evans et al., 2003; Evans & McCoy, 1998; Irvin & Robinson, 2023), but no studies have tested whether incidental memory outcomes are predicted by individuals’ preferences for specific architectural features. Therefore, the present study investigated whether preference for domestic interior space designs predicted incidental recognition memory. Recognition memory refers to the ability to correctly identify previously encountered stimuli as familiar, typically by distinguishing them from novel stimuli. It involves detecting the prior occurrence of an item without necessarily retrieving specific details about its context or source (Yonelinas, 2002). The incidental nature of the task provides a robust measure of learning that occurs with minimal effort (Bjorklund, 1989; Choe et al., 2017). This approach provides insight into theoretically relevant, but largely unexplored, questions on the mechanisms linking preference and memory formation

(Babo-Rebelo et al., 2022; Choe et al., 2017). Incidental recognition memory is less effortful (Bjorklund, 1989) and has been proved to be more accurate than intentional memorisation following aesthetic judgement tasks, such as liking judgements (Choe et al., 2017).

Research on emotional memory has largely focused on highly arousing stimuli, such as snakes, guns, and angry faces (Bradley et al., 1992; Buratto et al., 2014) or contrasts between negative and neutral stimuli (Kensinger & Corkin, 2003). Enhanced memory for highly arousing stimuli is not observed for moderate- or low-arousal stimuli (Buratto et al., 2014). A key question, therefore, is whether similar memory effects emerge in low-arousal contexts, where emotional salience is reduced and preference may play a more central role. Memory can be predicted by positive evaluations in relatively non-arousing contexts (Stalinski & Schellenberg, 2013). Because the present images of domestic spaces are unlikely to evoke strong arousal, evaluative processes such as aesthetic liking may play a greater role in shaping recognition memory. Accordingly, the present study examined whether preference for domestic interior space designs enhanced incidental recognition memory.

This question is not only theoretically relevant but also has important implications for the design of built environments. Professional architects emphasize the importance of creating memorable interior spaces, which can improve navigation and the overall experience of built environments (Alihodzic & Kurtovic-Folic, 2010; Dohr & Portillo, 2011). Furthermore, research in marketing and art suggests that likability enhances memory by generating positive arousal in observers (Babo-Rebelo et al., 2022; Kroeber-Riel, 1979; Youn et al., 2001), indicating that preference can play a critical role in how interior spaces are encoded.

However, not all individuals value or respond to design features in the same way. The final aim of the present study was therefore to explore which architectural features enhanced memorability when accounting for individual differences (Hunt & Worthen, 2006). Specifically, we examined how traits such as Openness to Experience (OTE), Extraversion (EXT), and Desire for Aesthetics (DFAS) modulated the relationship between preference for interior design features and performance in the incidental recognition memory task.

Studies have consistently found that OTE is the most reliable personality predictor of artistic preferences (Chamorro-Premuzic et al., 2009; Palumbo et al., 2025) and positively correlates with preference evaluations (Furnham & Chamorro-Premuzic, 2004). Extroverts tend to prefer high ceilings and open spaces, presumably due to their need for stimulation and sociability, which align with perceptions of expansiveness, creativity, and social facilitation (Augustin

et al., 2009; Dehghani Tafti et al., 2022; DeYoung et al., 2007; H. Lee & Park, 2013). Moreover, the DFAS strongly predicts the motivational component of aesthetics (Lundy et al., 2010).

In sum, the present study aimed to examine how key features of domestic interior spaces (i.e., ceiling height, spatial openness, and curvature) shaped individuals' preferences, whether these preferences subsequently influenced incidental recognition memory for those spaces, and how individual differences in personality and desire for aesthetics might have moderated these effects. Drawing on prior research (Tawil et al., 2022, 2024; Vartanian et al., 2019, 2021; Wang et al., 2024), we hypothesised that curvilinear interiors would be preferred over rectilinear ones, and that curvature would interact with ceiling height and spatial openness to influence preference. We further anticipated that spaces rated as more preferable would be remembered more accurately, and that the strength of this preference–memory relationship would vary as a function of participants' personality traits and their desire for aesthetics.

To test our hypothesis, we conducted two classification assessments of interior space images, followed by three experiments using these images as stimuli. Experiment 1a, conducted online, examined participants' preferences, incidental recognition memory, personality traits, and their desire for aesthetics. Experiment 1b replicated this procedure in a controlled laboratory setting to assess consistency across testing environments. Experiment 2, conducted online with a new set of images, addressed an additional question that emerged from the first experiments: whether the distinctiveness of the interior space designs affects preference and incidental recognition memory. Finally, Experiment 3, also online, introduced a more demanding task to mitigate near-ceiling effects in the recognition memory performances observed in Experiments 1a, 1b and 2.

Experiment 1a

Experiment 1a aimed to test to what extent appreciation for interior space designs was predicted by the space's design features and personality traits. Importantly, it assessed to what extent appreciation for interior space design predicted recognition memory performance as a function of the architectural design features, personality traits, and desire for aesthetics. Experimental methodology and hypotheses were preregistered prior to data collection (see: <http://osf.io/hn7xt>).

Method and materials

Participants

Forty individuals (23 females and 17 males; $M_{\text{age}} = 30.25$, $SD_{\text{age}} = 5.01$ years) voluntarily participated in the online task. All participants reported normal or corrected-to-normal vision. In addition, these participants did not participate in the preliminary classification assessment.

Stimuli and questionnaires

A preliminary classification assessment was conducted to select and validate the images for Experiment 1. Twenty-six participants (13 females and 13 males; $M_{\text{age}} = 20.80$ years, $SD_{\text{age}} = 6.77$ years) with reported normal or corrected-to-normal vision voluntarily completed the online classification task. This task involved rating 114 colour images of domestic interiors sourced via Google Image Search. All images were resized to a fixed longest side while maintaining aspect ratio and were presented in PsychoPy (Peirce et al., 2019), which automatically scaled them to fit participants' screens/image size ratio.

Images were chosen to vary in ceiling height (low vs. high), spatial openness (open vs. closed), and curvature (curvilinear vs. rectilinear). Ceiling height was defined by the elevation of the ceiling on the vertical axis and the relative size of the furniture. Spatial openness refers to functional areas without structural divisions and/or large enough to appear open. Curvature was determined from structural (e.g., walls), functional (e.g., furniture), and decorative (e.g., mirrors, frames) elements. In addition, participants rated image

distinctiveness, defined as a quality that makes a space stand out and be easily noticed, as it has been shown that distinctiveness may influence memory performance (Farley et al., 1979; Guérard et al., 2010; Hunt & Worthen, 2006).

On each trial, participants rated ceiling height, spatial openness, curvature, and distinctiveness (0 = low to 100 = high). Each trial began with a fixation cross (0.5 s), followed by the image and rating slider (visible until response), and ended with a 0.5-s blank screen. Images were presented in a randomised order across participants.

Images were selected if their ceiling height, spatial openness, or curvature ratings differed from the grand mean by ≥ 1 SD, resulting in sets of high versus low ceilings, open versus closed spaces, and curvilinear versus rectilinear images. For distinctiveness, images exceeding ± 2 SD from the mean were excluded to control for distinctiveness effects on recognition memory performance. These strict criteria resulted in insufficient ($M = 8.62$; $SD = 3.50$; min. = 2, and max. = 12) images for five of the eight design conditions. To address this issue, four additional independent coders (three females and one male; $M_{\text{age}} = 29.75$, $SD_{\text{age}} = 1.30$ years), all non-experts in design, classified additional images into the same categories and rated their distinctiveness. This additional procedure yielded a final set of ten images per condition for use in the main experiment (see Fig. 1).

OTE was measured through the Openness/Intellect subscale from the Big Five Aspect Scales (BFAS; DeYoung et al., 2007). This subscale captures two separate, but related, traits: Openness to Experience and Intellect. Only the Openness subscale (ten items) was administered, as this trait best reflects aesthetic receptivity and aesthetic emotions. Participants provided responses on a 5-point Likert



Fig. 1 Example images used in Experiments 1a and 1b

scale (1 = Never, or Very Rarely True, 5 = Very Often, or Always True). Sample items include: “*I see beauty in things that others might not notice*”; “*I love to reflect on things*”. In the original validation study (BFAS; DeYoung et al., 2007), this subscale displayed an acceptable level of internal consistency (Cronbach’s $\alpha = .72$).

EXT was measured with the Extraversion/Enthusiasm trait from the BFAS questionnaire (DeYoung et al., 2007). Sample items include: “*Make friends easily*”; “*Warm up quickly to others*”. Participants responded to ten items using a 5-point Likert scale (1 = Never, or Very Rarely True, 5 = Very Often, or Always True). In the original validation study (BFAS; DeYoung et al., 2007), this subscale displayed a good level of internal consistency (Cronbach’s $\alpha = .88$).

The DFAS comprises 36 items and measures motivation for aesthetics with responses on a Likert-type scale ranging from 0 = strongly disagree to 6 = strongly agree. Sample items include: “*I have a strong appreciation for great architecture*”; “*I could stare a long time at a beautiful painting*” (Lundy et al., 2010). In the original validation study (Lundy et al., 2010), this subscale displayed a good level of internal consistency (Cronbach’s $\alpha = .82$).

Design

A $2 \times 2 \times 2$ within-participants design was employed with fixed factors: ceiling height (2: high-ceiling vs. low-ceiling), spatial openness (2: open vs. closed) and curvature (2: curvilinear vs. rectilinear). The dependent variables were preference ratings and recognition memory performance. In addition, measures of personality (OTE and EXT) and desire for aesthetics were included as predictors of the relationship between preference and recognition memory.

We estimated the statistical power for Experiment 1 using the effect size computed from the Palumbo et al. (2022) study, which explored preference for curvature in abstract shapes and interior spaces, using the PANGEA application (v0.2; Westfall et al., 2014). The power of our current design was 0.936 for an effect size of $d = 0.25$. This value was greater than the recommended level of 0.80, indicating that our study was well powered to detect effects of the expected magnitude.

Procedure

The task was designed in PsychoPy v2023.1.3 and was deployed online via Pavlovia (Peirce et al., 2019). The experiment comprised three main blocks. In Block 1, participants viewed 40 images presented in a randomised order and rated their preference using a slider anchored from 0 to 100. Block 2 immediately followed and assessed incidental recognition memory for images presented in Block 1. In Block 2, participants indicated via a yes/no button if they had seen each image before. Block 2 included 80 images, 40 of which were

novel. Image presentation was counterbalanced, such that half of the participants saw a set of 40 images in Block 1, while the other half of the participants saw the remaining 40 images in Block 1. In Block 3, participants completed three questionnaires: OTE, EXT, and DFAS.

Results

The data were structured to examine how preference responses and recognition memory performance are modulated by architectural features and individual differences. Specifically, we tested the effects of personality traits (OTE, EXT) and desire for aesthetics (DFAS), architectural features (ceiling height, spatial openness, and curvature), and their interactions on preference ratings and accuracy of recognition memory performance.

Data were processed in R version 4.4.1 (Posit team, 2025; R Core Team, 2025). Data were fitted in Linear Mixed-Effects Models (LMMs) using the lme4-package (Bates et al., 2015) and the MASS-package (Venables & Ripley, 2002). The random effects were structured for items and participants, including slopes for meaningful fixed effects and correlation (Barr et al., 2013). The full random structure was trimmed down for those models that did not converge or had a high or equal to zero correlation. The t -values equal to or higher than 1.96 were interpreted as significant because the t -statistic in LMM approximates the z -statistic for high degrees of freedom (Baayen et al., 2008). All continuous predictors were z -scored transformed prior to analysis.

For preference, the final LMMs included a random structure of $(1 + \text{Curvature} + \text{Distinctiveness} | \text{Participant}) + (1 | \text{Image})$. Fixed effects tested the main effects and interactions between personality traits (OTE, EXT, and DFAS) and architectural features (ceiling height, spatial openness, and curvature), while controlling for image distinctiveness and block order. Full results are shown in Table 1.

For incidental recognition memory, the accuracy of participants’ responses was treated as a binomial variable (correct vs. error) and analysed using a logistic General Linear Mixed-Effects Model (GLMM). The random structure for the model was $(1 + \text{Distinctiveness} | \text{Participant}) + (1 | \text{Image})$. Fixed factors tested the main effects and interactions between preference and the architectural features (ceiling height, spatial openness, and curvature), while controlling for image distinctiveness, reaction time in the preference task, and the block order. Full results are reported in Table 2.

Preference response. Participants preferred high ($M = 65.9$, 95% CI [61.0, 70.8]) over low ($M = 55.6$, 95% CI [49.4, 61.7]) ceiling, open ($M = 64.6$, 95% CI [59.5, 69.8]) over closed ($M = 56.8$, 95% CI [51.3, 62.4]) spaces, and rectilinear ($M = 64.5$, 95% CI [59.2, 69.9]) over curvilinear ($M = 56.9$, 95% CI [51.5, 62.3]) layouts of domestic interior spaces. The effect of DFAS on preference ratings

Table 1 Estimates for the fixed effects and interactions between design features and individual differences, block, and distinctiveness for preference ratings in Experiment 1a

Measure	<i>b</i>	<i>SE</i>	<i>t</i>
Intercept	46.40	4.24	10.94
Ceiling (High vs. Low)	10.34	2.94	3.52
Space (Open vs. Closed)	7.82	2.56	3.05
Curvature (Rectilinear vs. Curvilinear)	7.64	2.65	2.88
DFAS	2.67	3.22	0.83
EXT	-0.96	3.22	-0.30
OTE	2.29	2.93	0.78
Distinctiveness	-2.30	1.50	-1.53
Block (2 vs. 1)	2.86	4.55	0.63
Ceiling (High vs. Low) × DFAS	4.56	2.08	2.19
Ceiling (High vs. Low) × EXT	-1.55	2.09	-0.74
Ceiling (High vs. Low) × OTE	0.36	1.89	0.19
Space (Open vs. Closed) × DFAS	2.26	1.65	1.37
Space (Open vs. Closed) × EXT	-2.61	1.66	-1.57
Space (Open vs. Closed) × OTE	-0.84	1.50	-0.57
Curvature (Rectilinear vs. Curvilinear) × DFAS	-2.26	1.39	-1.63
Curvature (Rectilinear vs. Curvilinear) × EXT	1.89	1.40	1.35
Curvature (Rectilinear vs. Curvilinear) × OTE	-0.56	1.26	-0.44

Significant effects are indicated in bold

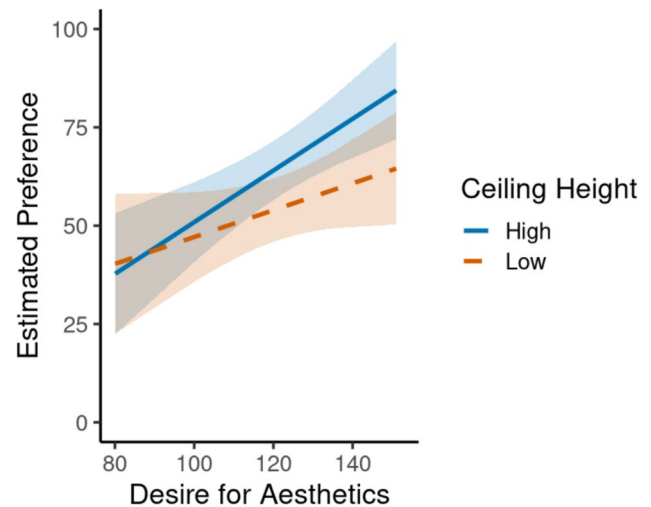
Table 2 Estimates for the fixed effects and interactions between preference, design features, block, preference reaction time, and distinctiveness for recognition memory accuracy in Experiment 1a

Measure	<i>b</i>	<i>SE</i>	<i>z</i>
(Intercept)	2.29	0.25	9.26
Preference	-0.15	0.18	-0.85
Ceiling (Low vs. High)	-0.13	0.18	-0.71
Space (Closed vs. Open)	-0.07	0.18	-0.38
Curvature (Rectilinear vs. Curvilinear)	-0.22	0.19	-1.17
Distinctiveness	0.20	0.12	1.71
Preference RT	1.16	0.36	3.20
Block (2 vs. 1)	-0.31	0.24	-1.28
Preference × Ceiling (Low vs. High)	-0.02	0.16	-0.15
Preference × Space (Closed vs. Open)	0.02	0.16	0.10
Preference × Curvature (Rectilinear vs. Curvilinear)	0.04	0.16	0.28

Significant effects are indicated in bold

was moderated by ceiling height, such that individuals with higher DFAS scores showed stronger preferences under high ceilings compared to low ceilings (see Fig. 2). None of the other fixed effects or interactions reached significance.

Recognition memory performance. The analysis revealed a positive effect of reaction time ($\bar{p}=0.87$, 95% CI [0.84, 0.90]) in the preference task on incidental recognition memory

**Fig. 2** Interaction effects of ceiling height (high vs. low) and desire for aesthetics on preference responses. Ribbons represent 95% confidence intervals

accuracy, suggesting that longer response times led to more accurate responses. All other fixed effects and interactions were non-significant.

Discussion

Experiment 1a showed that ceiling height and spatial openness predicted preference. Specifically, high ceilings and open spaces were rated higher, consistent with prior work (Baird et al., 1978; Coburn et al., 2020; S.-Y. Lee & Yoon, 2022; Palumbo et al., 2022; Rollings & Evans, 2019; Vartanian et al., 2015). Desire for aesthetics influenced these effects, particularly increasing preference for high-ceiling spaces, whereas personality traits (EXT, OTE) had no impact. The Desire for Aesthetics Scale captures individual differences in sensitivity to beauty and the visual qualities. Individuals scoring high on this trait may allocate greater attention to aesthetic features, which in turn may amplify evaluative responses and lead to higher preference ratings. Contrary to our hypothesis, curvilinear designs were not preferred over rectilinear ones. The results showed the opposite pattern: participants preferred rectilinear over curvilinear layouts of domestic interior spaces. Finally, preference did not enhance incidental recognition memory performance, highlighting a dissociation between liking and short-term incidental encoding.

Experiment 1b

Building on the findings from Experiment 1a, Experiment 1b aimed to replicate the effects in a more controlled laboratory setting, employing a forced-choice preference task with a new group of participants.

Method and materials

Participants

Forty voluntary participants (34 females and six males; $M_{\text{age}} = 21.57$, $SD_{\text{age}} = 4.69$ years) took part in Experiment 1b. All participants reported normal or corrected-to-normal vision. In addition, these participants did not participate in the previous experiment.

Stimuli and questionnaires

The stimuli and the questionnaires used in the experiment were identical to Experiment 1a.

Design

The design was identical to that of Experiment 1a.

Procedure

The procedure only differed from Experiment 1a in two respects. First, it was conducted in the psychology behavioural laboratory at Liverpool Hope University. Second, the preference slider was replaced with a forced-choice format (0 = dislike/1 = like) to capture immediate, implicit responses while minimising the influence of higher-order cognitive processes (Palumbo & Bertamini, 2016).

Results

Data analyses followed the same procedures described in Experiment 1a. In this analysis both preference and incidental recognition memory accuracy were treated as binomial variables. The final preference model included a random structure of $(1|Participant) + (1|Image)$. For incidental recognition memory accuracy, the random structure for the model was $(1 + Preference | Participant) + (1 | Image)$. Full results for the preference responses model and for recognition memory accuracy are shown in Tables 3 and 4, respectively.

Preference response. Participants preferred high ($\bar{p} = 0.64$, 95% CI [0.56, 0.72]) over low ($\bar{p} = 0.48$, 95% CI [0.40, 0.56]) ceiling, and rectilinear ($\bar{p} = 0.67$, 95% CI [0.59, 0.74]) over curvilinear ($\bar{p} = 0.45$, 95% CI [0.37, 0.54]) layouts. Participants with lower openness to experience showed lower preferences for low ceilings and closed spaces compared to high ceilings and open spaces. These differences became smaller among individuals with higher openness to experience (see Fig. 3). None of the other fixed effects or interactions reached significance.

Table 3 Estimates for the fixed effects and interactions between design features and individual differences, block, and distinctiveness for preference ratings in Experiment 1b

Measure	<i>b</i>	<i>SE</i>	<i>z</i>
(Intercept)	-0.47	0.26	-1.85
Ceiling (High vs. Low)	0.66	0.19	3.47
Space (Open vs. Closed)	-0.11	0.19	-0.61
Curvature (Rectilinear vs. Curvilinear)	0.87	0.21	4.24
DFAS	0.12	0.15	0.79
EXT	0.02	0.16	0.13
OTE	0.22	0.17	1.36
Distinctiveness	0.13	0.10	1.28
Block (2 vs. 1)	0.04	0.29	0.13
Ceiling (High vs. Low) × DFAS	0.12	0.11	1.04
Ceiling (High vs. Low) × EXT	-0.08	0.12	-0.64
Ceiling (High vs. Low) × OTE	-0.25	0.12	-2.05
Space (Open vs. Closed) × DFAS	-0.13	0.11	-1.17
Space (Open vs. Closed) × EXT	0.16	0.12	1.37
Space (Open vs. Closed) × OTE	-0.29	0.12	-2.44
Curvature (Rectilinear vs. Curvilinear) × DFAS	-0.05	0.11	-0.41
Curvature (Rectilinear vs. Curvilinear) × EXT	-0.14	0.12	-1.17
Curvature (Rectilinear vs. Curvilinear) × OTE	0.02	0.12	0.18

Significant effects are indicated in bold

Recognition memory performance. As in Experiment 1a, the analysis revealed a positive effect of reaction time ($\bar{p} = 0.89$, 95% CI [0.86, 0.92]) in the preference task on incidental recognition memory accuracy. All other fixed effects and interactions were non-significant.

Discussion

Experiment 1b showed that low ceilings and curvilinear spaces predicted lower preference for interior spaces, replicating the results of Experiment 1a. In contrast to Experiment 1a, there was no significant effect of spatial openness on preference response, which could be due to the dichotomous response in the task, leaving less detailed variability in responses. Although predicted preferences for ceiling height and spatial openness were generally centred around the midpoint, the significant interaction patterns suggest meaningful individual differences in responses to low ceilings and closed spaces. A possible interpretation is that individuals higher in openness to experience, who are characterized by receptivity to a wide range of perceptual and aesthetic experiences (McCrae, 1994) and cognitive flexibility (Schretlen et al., 2010), may have adopted a malleable interpretation of environmental features (Koivisto & Pallaris, 2024), hence resulting in more tolerant response toward low ceilings and

Table 4 Estimates for the fixed effects and interactions between preference, design features, block, preference reaction time, and distinctiveness for recognition memory accuracy in Experiment 1b

Measure	<i>b</i>	<i>SE</i>	<i>z</i>
(Intercept)	2.41	0.33	7.26
Preference (Like vs. Dislike)	0.32	0.35	0.92
Ceiling (Low vs. High)	0.11	0.27	0.40
Space (Closed vs. Open)	0.07	0.26	0.26
Curvature (Curvilinear vs. Rectilinear)	0.33	0.28	1.18
Distinctiveness	0.14	0.01	1.20
Preference RT	1.02	0.17	6.04
Block (2 vs. 1)	-0.16	0.30	-0.54
Preference (Like vs. Dislike) × Ceiling (Low vs. High)	0.02	0.31	0.06
Preference (Like vs. Dislike) × Space (Closed vs. Open)	0.02	0.31	0.05
Preference (Like vs. Dislike) × Curvature (Curvilinear vs. Rectilinear)	-0.59	0.31	-1.92

Significant effects are indicated in bold

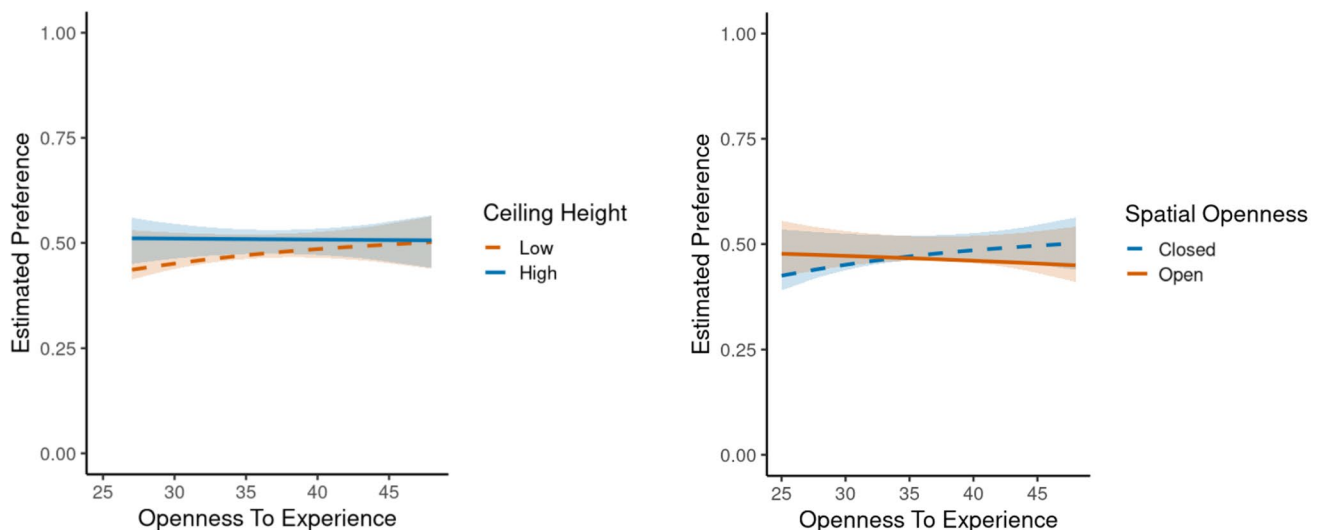


Fig. 3 Interaction between openness to experience and ceiling height (**left panel**) and spatial openness (**right panel**) on preference responses. Ribbons represent 95% confidence intervals

closed layouts. Moreover, we did not observe a significant effect of preference on accuracy in incidental recognition memory performance.

Experiment 2

Based on the findings of Experiments 1a and 1b, Experiment 2 was designed to test whether the same effects would occur using another set of images, which previously reported a preference for curvature (Vartanian et al., 2013, Vartanian et al., 2021). This different set of images was used to determine whether the effects

observed in Experiments 1a and 1b were specific to the selected images or could be generalised to a different set of stimuli.

Method and materials

Participants

Forty individuals (24 females, one non-binary, 15 males; $M_{\text{age}} = 20.98$, $SD_{\text{age}} = 3.46$ years) voluntarily participated in the online task. All participants reported normal or corrected-to-normal vision and had not taken part in the previous experiments.

Stimuli and questionnaires

The stimulus set consisted of 80 colour photographs taken from Vartanian et al. (2021), originally selected from the 200 photographs used in Vartanian et al. (2013). Categorized by two architects, 40 depicted rectilinear interiors and 40 depicted curvilinear interiors, with each group balanced for ceiling height (low vs. high) and spatial openness (open vs. closed). This stimulus set included both domestic and non-domestic interior spaces, such as libraries, hotels, theaters, etc.

We asked 26 participants (20 females and six males; $M_{\text{age}} = 20.65$, $SD_{\text{age}} = 3.14$ years) with reported normal or corrected-to-normal vision to rate each image with respect to ceiling height, spatial openness, and curvature. As for the classification assessment in Experiment 1a, participants' ratings were compared to the researchers' original image allocations by Vartanian et al. (2021), to assess whether the participants perceived the categorizations in a similar way to the architects. Participants agreed with the allocations for only 45 of the 80 images. Because the aim was to replicate Experiment 1 using this previously published stimulus set, we did not replace any images outside the data set and retained all 80 images. However, we used median ratings by the participants to categorise images into high versus low ceilings, open versus closed spaces, and rectilinear versus curvilinear designs. Unlike in the first classification assessment, different levels of distinctiveness were maintained across the images.

The same questionnaires (OTE, EXT, and DFAS) were administered in Experiment 2.

Design

The design of the experiment was identical to that of Experiment 1a.

Procedure

The procedure was identical to that of Experiment 1a.

Results

Data analyses followed the same procedures described in Experiment 1a. For the preference ratings, the final LMM included a random structure of $(1 \mid \text{Participant}) + (1 \mid \text{Image})$, and the full results are presented in Table 5. For recognition memory accuracy, responses were modelled as binomial (correct vs. error) in a logistic GLMM with a random structure of $(1 + \text{SpatialOpenness} + \text{PreferenceRT}$

Table 5 Estimates for the fixed effects and interactions between design features and individual differences, block, and distinctiveness for preference ratings in Experiment 2

Measure	<i>b</i>	<i>SE</i>	<i>t</i>
(Intercept)	48.17	4.10	11.76
Ceiling (Low vs. High)	-2.41	3.16	-0.76
Space (Open vs. Closed)	1.02	3.31	0.31
Curvature (Rectilinear vs. Curvilinear)	8.14	3.17	2.56
DFAS	1.14	2.21	0.52
EXT	1.34	2.18	0.61
OTE	1.23	2.29	0.54
Distinctiveness	5.63	1.87	3.01
Block (2 vs. 1)	-1.14	4.39	-0.26
Ceiling (Low vs. High) × DFAS	-0.70	1.44	-0.49
Ceiling (Low vs. High) × EXT	0.28	1.42	0.19
Ceiling (Low vs. High) × OTE	-0.04	1.49	-0.02
Space (Open vs. Closed) × DFAS	-0.96	1.44	-0.67
Space (Open vs. Closed) × EXT	3.32	1.41	2.35
Space (Open vs. Closed) × OTE	-0.53	1.48	-0.36
Curvature (Rectilinear vs. Curvilinear) × DFAS	-0.94	1.38	-0.68
Curvature (Rectilinear vs. Curvilinear) × EXT	-3.19	1.35	-2.36
Curvature (Rectilinear vs. Curvilinear) × OTE	2.59	1.42	1.83

Significant effects are indicated in bold

$\mid \text{Participant}) + (1 \mid \text{Image})$. Full results are reported in Table 6. Descriptive statistics of the questionnaires across all the experiments are summarized in Table 7.

Preference response. Participants preferred rectilinear ($M = 55.0$, 95% CI [49.8, 60.3]) over curvilinear ($M = 46.9$, 95% CI [41.7, 52.1]) spaces. Unsurprisingly, greater variability in image distinctiveness led to a positive effect of more distinctive spaces on preference. There was an interaction between participants' level of extraversion and space openness and curvature (see Fig. 4). Participants with relatively high levels of extraversion preferred open spaces and those with low levels of extraversion preferred rectilinear forms more, whereas preferences for closed spaces and curvilinear forms were not substantially influenced by extraversion. None of the other fixed effects or interactions reached significance.

Recognition memory performance. Similar to Experiments 1a, 1b, and 2, the analysis revealed a positive effect of reaction times of the preference task ($\bar{p} = 0.92$, 95% CI [0.88, 0.95]) on incidental recognition memory accuracy. In addition, participants were less accurate in recognising images of spaces with low ($\bar{p} = 0.90$, 95% CI [0.84, 0.94]) ceilings than those with high ($\bar{p} = 0.94$, 95% CI [0.90, 0.96]) ceilings. All other fixed effects and interactions were non-significant.

Table 6 Estimates for the fixed effects and interactions between preference, design features, block, preference reaction time, and distinctiveness for recognition memory accuracy in Experiment 2

Measure	<i>b</i>	<i>SE</i>	<i>z</i>
(Intercept)	2.22	0.28	7.99
Preference	0.00	0.14	0.02
Ceiling (High vs. Low)	0.53	0.20	2.64
Space (Open vs. Closed)	-0.30	0.22	-1.32
Curvature (Rectilinear vs. Curvilinear)	0.19	0.20	0.94
Distinctiveness	0.07	0.12	0.60
Preference RT	2.65	0.66	4.01
Preference × Ceiling (High vs. Low)	-0.15	0.16	-0.94
Preference × Space (Open vs. Closed)	-0.04	0.16	-0.22
Preference × Curvature (Rectilinear vs. Curvilinear)	0.23	0.15	1.57

Significant effects are indicated in bold

Discussion

Experiment 2 showed that rectilinear spaces were associated with higher preference responses, an effect now consistently observed across three experiments. Furthermore, greater variability in image distinctiveness was associated with higher preference for more distinctive spaces. Extraversion also interacted with spatial characteristics, positively influencing preference for open spaces and negatively influencing preference for rectilinear spaces. This pattern is broadly consistent with previous findings showing that extraversion is associated with preference for more open spaces and socially facilitative environments (Dehghani Tafti et al., 2022; Matthews et al., 2010). For example, open and semi-circular spaces may be more appealing to extroverts because they facilitate social interaction through eye contact (Augustin et al., 2009). Additionally, we replicated the finding that higher reaction times in the preference task were associated with better incidental recognition memory performance. Contrary to previous findings, higher ceilings predicted higher recognition memory accuracy.

Experiment 3

Recognition accuracy was high across Experiments 1a, 1b, and 2, indicating a near-ceiling effect that may have reduced sensitivity to variability in recognition memory performance. To address this limitation, Experiment 3 made the task more demanding to explore whether preference responses predicted long-term recognition memory (see Online Supplementary Materials for signal detection metrics). This effect may require further processing, hence not detectable immediately after the initial task.

Experiment 3 incorporated an 8-day delay between the preference and recognition memory tasks, making the recognition memory task more demanding. We selected a delay period of 8 days between the liking task and the implicit recognition memory task, as memory performance remains above chance but declines significantly after approximately 1 week, providing a suitable window to assess longer-term recognition memory while still capturing effects of initial encoding (Ishai et al., 2007; Lindbergh et al., 2021; Saloner et al., 2018). Moreover, the number of stimuli was increased, the presentation time was fixed, and to prevent rehearsal, the participants completed a filler task after the preference task.

In recognition tasks, faster responses are often interpreted as reflecting stronger or more confident memory decisions, whereas slower responses may indicate greater uncertainty or more effortful retrieval (Pleskac & Busemeyer, 2010). Therefore, in Experiment 3 we also analysed recognition response times to explore whether the experimental manipulations influenced the speed and confidence of memory judgements, although no significant effects were observed.

We hypothesised that this experimental design would finally reveal: (1) higher preference scores for interiors with rectilinear designs as compared to those with curvilinear designs; (2) a positive association between preference scores and performance in incidental recognition memory task, with greater preference corresponding to faster response times and higher accuracy; and (3) that the strength of the relationship between preference and recognition memory performance would vary as a function of individual differences in OTE, EXT, and DFAS.

Table 7 Descriptive statistics of the questionnaires used across the Experiments 1–3

	Desire for aesthetics			Extraversion			Openness to experience		
	Mean	<i>SD</i>	Range	Mean	<i>SD</i>	Range	Mean	<i>SD</i>	Range
Experiment 1a	121	14.60	80–153	32	6.78	19–44	37.90	4.32	28–48
Experiment 1b	129	17.10	97–166	36	5.69	23–48	36.10	5.25	25–48
Experiment 2	123	23.80	71–163	34.50	6.31	19–45	34.20	5.30	24–47
Experiment 3	119	17.90	78–161	31.80	6.13	19–46	36.80	6.02	21–48

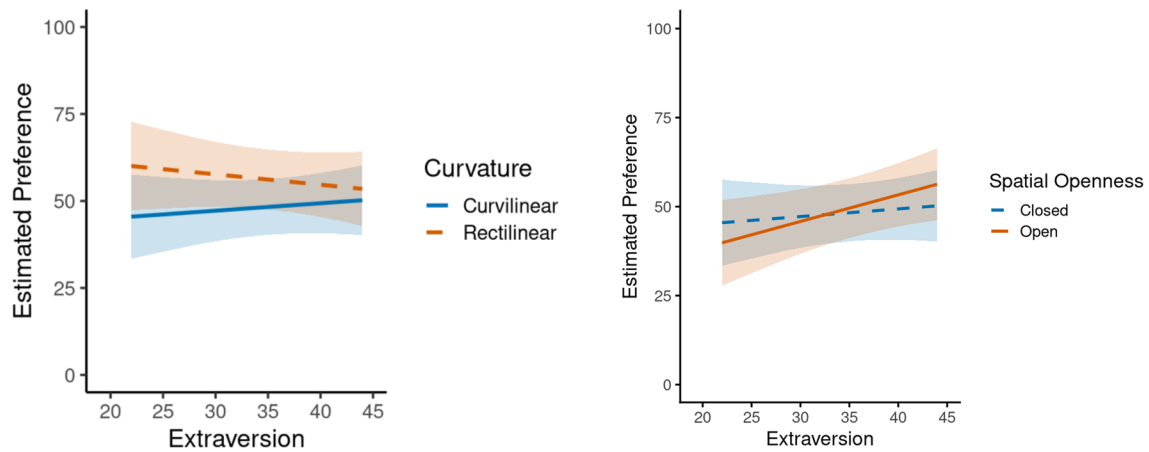


Fig. 4 Interaction between extraversion and Curvature (**left panel**) and spatial openness (**right panel**) on preference responses. Ribbons represent 95% confidence intervals

Method and materials

Participants

Fifty individuals voluntarily participated in the online task, administered on the Prolific platform. However, two participants did not enter the final sample ($N=48$; 25 females and 23 males; $M_{\text{age}}=37.54$, $SD_{\text{age}}=11.58$ years) as they did not complete the second block of the experiment. All reported normal or corrected-to-normal vision and none of the participants took part in the previous experiments.

Stimuli and questionnaires

The number of stimuli in the preference task was increased from 40 to 60 images, and in the incidental recognition memory task, from 80 to 120 images, compared with the previous experiments. These images were sourced from the classification assessment in Experiment 1a and the domestic interior spaces from classification assessment in Experiment 2. The same questionnaires were also administered in Experiment 3.

Design

We used randomly selected data from ten participants in Experiment 1a as a data-generating model, fitting a logistic mixed-effects model with crossed random intercepts for participants and items and random slopes for curvature and preference. Using *simr* (Green & MacLeod, 2016), we ran 100 simulations with a likelihood ratio test at $\alpha=0.05$ to project power for design with 50 participants and 60 items per participant (the same items for all participants). Estimated power to detect the curvature effect was 0.96 (95% CI [0.90, 0.99]), and for the preference effect was close to

1.00 ([0.96, 1.00]). As both exceeded the conventional 0.80 threshold, we set our target sample size to $n=50$.

Procedure

The study consisted of two blocks: a preference block and an incidental recognition memory block, separated by an 8-day delay. In the preference block, participants rated 60 images of interior spaces on Liking and Distinctiveness using a 0–100 slider. Each trial began with a fixation cross in the centre of the screen for 500 ms, followed by a centred image displayed for 2 s, based on the median reaction times observed in Experiment 1b (laboratory setting). After the image disappeared, the slider for Liking and Distinctiveness appeared.

Following the ratings, participants completed a filler task: a 3-back task assessing visuospatial working memory capacity (Shackman et al., 2006; Trawiński et al., 2024). The task included two blocks: one in which participants needed to remember the identity of letters, and another in which they monitored the spatial locations of letters. Each block contained 104 trials, and the order of blocks was counterbalanced across participants. In each trial, a box of letters appeared on a background of random letters for 500 ms, after which participants had 2.5 s to indicate if the stimulus matched the letter or location seen three trials earlier.

In the recognition memory block, participants completed an incidental recognition task. They were presented with the same images they had rated during the preference block, along with 60 new images not previously shown. On each trial, participants indicated whether they had seen the image before using a dichotomous yes/no response. The recognition task consisted of 120 trials (60 familiar and 60 unfamiliar interiors), presented in randomised order and counterbalanced across participants.

After the recognition memory block, participants completed three self-report questionnaires: OTE, EXT, and DFAS. Finally, they were fully debriefed and compensated £7 for their participation. Experimental methodology and hypotheses were preregistered prior to data collection (see: <http://osf.io/d7w6p>).

Results

Data analyses followed the same procedures described in Experiment 1a. For preference, the final LMMs included a random structure of $(1 + \text{Curvature} | \text{Participant}) + (1 | \text{Image})$. For incidental recognition memory accuracy, the random structure for the model was $(1 | \text{Participant}) + (1 | \text{Image})$.

With respect to the reaction time, data were analysed using LMMs with random effects of $(1 + \text{Curvature} | \text{Participant}) + (1 | \text{Image})$. Fixed factors included the preference, architectural features (ceiling height, spatial openness, and curvature), image distinctiveness, and image blocks.

Full results for the preference responses model and for recognition memory accuracy are shown in Tables 8, 9, 10.

Preference response. Participants preferred rectilinear spaces ($M = 57.2$, 95% CI [53.1, 61.4]) over curvilinear layouts ($M = 51.8$, 95% CI [47.3, 56.2]). Higher ratings

Table 9 Estimates for the fixed effects and interactions between preference, design features, individual differences, 3-back, block, and distinctiveness for recognition memory accuracy in Experiment 3

Measure	<i>b</i>	<i>SE</i>	<i>z</i>
Intercept	0.30	0.22	1.37
Preference	0.30	0.09	3.20
Ceiling (Low vs. High)	-0.09	0.13	-0.65
Space (Closed vs. Open)	-0.06	0.13	-0.47
Curvature (Curvilinear vs. Rectilinear)	-0.04	0.13	-0.27
DFAS	0.02	0.13	0.16
EXT	0.06	0.13	0.44
OTE	0.02	0.13	0.14
3-back	0.04	0.13	0.27
Distinctiveness	0.15	0.07	2.02
Block (2 vs. 1)	-0.09	0.27	-0.35
Preference × Ceiling (Low vs. High)	-0.16	0.09	-1.79
Preference × Space (Closed vs. Open)	-0.17	0.09	-1.89
Preference × Curvature (Curvilinear vs. Rectilinear)	0.08	0.09	0.90
Preference × DFAS	0.01	0.05	0.31
Preference × EXT	0.01	0.04	0.30
Preference × OTE	-0.08	0.05	-1.73

Significant effects are indicated in bold

Table 8 Estimates for the fixed effects and interactions between design features and individual differences, block, and distinctiveness for preference ratings in Experiment 3

Measure	<i>b</i>	<i>SE</i>	<i>t</i>
Intercept	52.84	2.42	21.81
Ceiling (Low vs. High)	-2.66	1.46	-1.82
Space (Open vs. Closed)	0.49	1.52	0.32
Curvature (Rectilinear vs. Curvilinear)	5.48	1.61	3.40
DFAS	-2.98	2.16	-1.38
EXT	-1.54	2.16	-0.71
OTE	2.77	2.21	1.26
Distinctiveness	8.46	0.83	10.17
Block (2 vs. 1)	1.99	4.20	0.47
Ceiling (Low vs. High) × DFAS	-0.73	0.85	-0.85
Ceiling (Low vs. High) × EXT	0.55	0.84	0.66
Ceiling (Low vs. High) × OTE	0.50	0.86	0.58
Space (Open vs. Closed) × DFAS	2.06	0.85	2.41
Space (Open vs. Closed) × EXT	-1.46	0.84	-1.74
Space (Open vs. Closed) × OTE	-0.70	0.86	-0.81
Curvature (Rectilinear vs. Curvilinear) × DFAS	3.02	1.03	2.94
Curvature (Rectilinear vs. Curvilinear) × EXT	0.57	1.01	0.56
Curvature (Rectilinear vs. Curvilinear) × OTE	-2.32	1.04	-2.23

Significant effects are indicated in bold

Table 10 Estimates for the fixed effects and interactions between preference, design features, block, and distinctiveness for recognition memory reaction time in Experiment 3

Measure	<i>b</i>	<i>SE</i>	<i>t</i>
Intercept	0.51	0.07	7.45
Preference	-0.02	0.02	-1.18
Ceiling (Low vs. High)	0.01	0.02	0.28
Space (Closed vs. Open)	-0.02	0.02	-0.90
Curvature (Curvilinear vs. Rectilinear)	0.02	0.02	0.92
DFAS	-0.04	0.05	-0.95
EXT	0.06	0.05	1.27
OTE	-0.02	0.05	-0.49
Distinctiveness	-0.01	0.01	-1.12
3-back	0.07	0.05	1.38
Block (2 vs. 1)	0.15	0.09	1.59
Preference × Ceiling (Low vs. High)	-0.01	0.02	-0.28
Preference × Space (Closed vs. Open)	0.03	0.02	1.72
Preference × Curvature (Curvilinear vs. Rectilinear)	0.02	0.02	0.88
Preference × DFAS	0.01	0.01	1.14
Preference × EXT	0.01	0.01	1.05
Preference × OTE	0.01	0.01	0.63

Significant effects are indicated in bold

of distinctiveness were associated with higher preference. DFAS predicted relatively stronger preferences for open over closed spaces, and for rectilinear over curvilinear designs. Moreover, higher OTE predicted stronger preferences for curvilinear designs compared to when the OTE is low (see Fig. 5). None of the other fixed effects or interactions reached significance.

Recognition memory performance. The analysis revealed a positive effect of preference ($\bar{p} = 0.54$, 95% CI [0.48, 0.60]) and distinctiveness ($\bar{p} = 0.54$, 95% CI [0.48, 0.60]) on incidental recognition memory accuracy. All other fixed effects and interactions were non-significant.

To test whether preference predicted incidental recognition memory independently of distinctiveness, two GLMMs were fitted: one including preference and one including distinctiveness. For the first model, the preference significantly predicted recognition accuracy ($\bar{p} = 0.55$, 95% CI [0.48, 0.60]). For the second model, distinctiveness significantly predicted recognition accuracy ($\bar{p} = 0.52$, 95% CI [0.46, 0.58]). Model comparison using ANOVA showed a better fit for the first model

that involved preference as a fixed factor ($AIC = 3773.0$ vs. 3780.5 ; $BIC = 3844.8$ vs. 3852.3) indicating that the preference explained recognition accuracy performance beyond distinctiveness.

Recognition memory reaction time. No predictors reached significance.

Discussion

Experiment 3 showed that rectilinear and distinctive designs were preferred, with individual differences further shaping these preferences: desire for aesthetics was linked to stronger preference for rectilinear designs and open spaces, consistent with the idea that individuals high in aesthetic motivation are particularly sensitive to spatial features (Lundy et al., 2010). In addition, openness to experience predicted a preference for curvilinear designs, in line with previous findings (Chamorro-Premuzic et al., 2009; Cotter et al., 2017). Although high ceilings and open spaces also received higher ratings, these effects were not significant once distinctiveness was controlled.

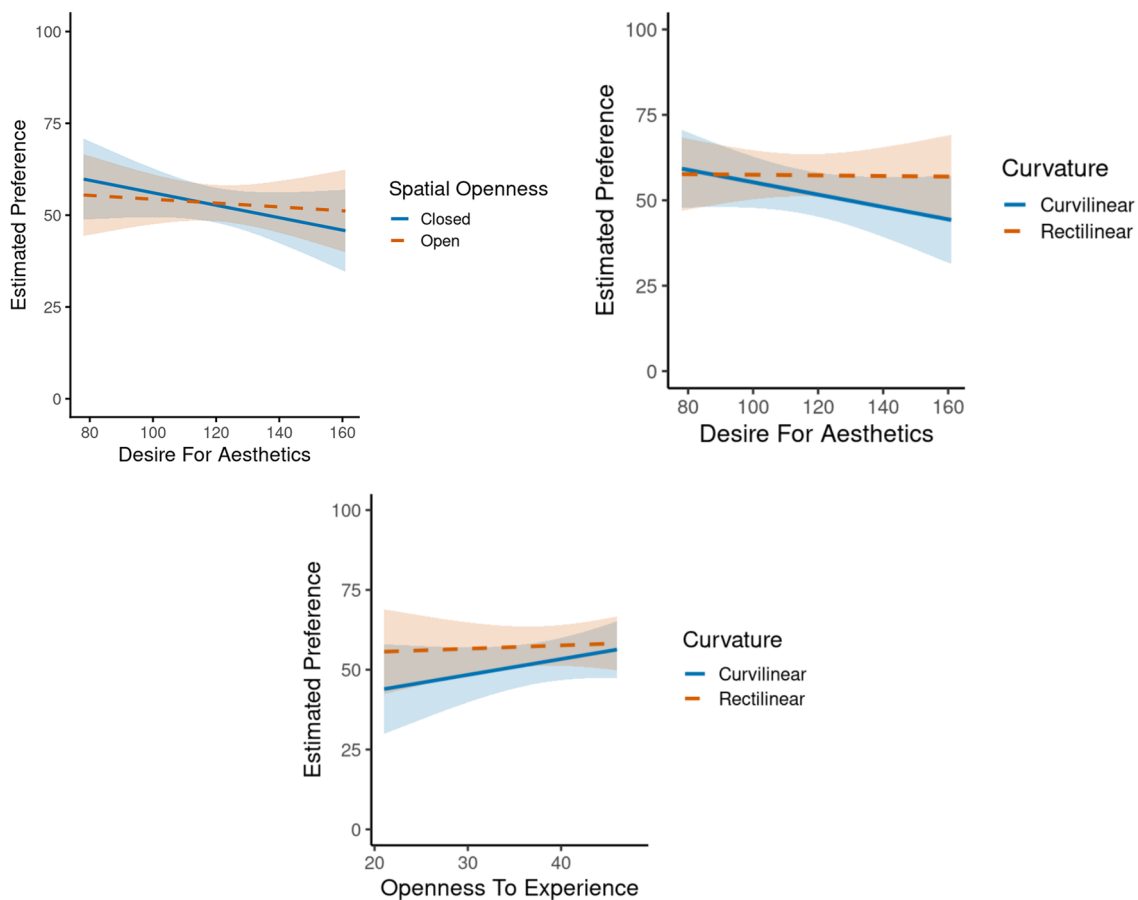


Fig. 5 Interaction between desire for aesthetics and spatial openness (**top left panel**) and curvature (**top right panel**), and openness to experience and curvature (**bottom panel**) on preference responses. Ribbons represent 95% confidence intervals

The manipulation to increase task difficulty was successful, as reflected in the signal detection metrics reported in the Online Supplementary Materials. Both preference and distinctiveness predicted recognition memory accuracy, but architectural features and personality traits did not. Importantly, model comparisons showed that the preference explained unique variance in recognition memory beyond distinctiveness, suggesting that preference reflects deeper cognitive or perceptual processes influencing memory. This supported our hypothesis that aesthetic experience not only shapes preference judgement but can also enhance long-term recognition memory performance.

General discussion

Across three experiments we examined how ceiling height, spatial openness, and curvature in domestic interior spaces influenced preference, whether these preferences predicted incidental recognition memory, and the extent to which individual differences in personality and desire for aesthetics moderated these effects.

Contrary to expectations and some previous findings, participants consistently preferred rectilinear over curvilinear designs. This preference persisted even though rectilinear interiors were judged less distinctive, suggesting that functionality, familiarity, and perceptual fluency may override distinctiveness in shaping preferences for domestic environments (Reber et al., 1998; Steadman, 2006). These results highlight that preferences reported in the past literature may be context dependent, varying across images showing domestic and public interiors, and influenced by the degree to which participants interact with or immerse themselves in the environment (Chuquichambi et al., 2022; Djebbara & Kalantari, 2023; Tawil et al., 2021).

Preferences for ceiling height and spatial openness were less robust. When distinctiveness was statistically controlled, the expected effects largely disappeared, implying that distinctiveness may partly account for these architectural preferences. Nevertheless, rectilinear designs retained an advantage, raising questions about the role of exposure and familiarity in shaping preference judgements of everyday environments.

Experiment 3, which employed a longer retention interval and more demanding task, provided clear evidence that both preference and distinctiveness predicted recognition memory accuracy. Model comparisons further showed that preference explained unique variance beyond distinctiveness alone, suggesting that aesthetic evaluation is not simply reducible to judgements of visual distinctiveness but taps into deeper perceptual and cognitive processes.

Individual differences moderated some of these effects, underscoring that personality traits help to explain

heterogeneity of preference judgement. Specifically, no single trait or spatial feature consistently predicted the preference across all studies. This variability is consistent with previous research showing that aesthetic preferences are shaped by multiple interacting factors and often show limited stability across contexts (Cleridou & Furnham, 2014; Palumbo et al., 2022; Vartanian et al., 2019). Such variability may reflect differences in task design (i.e., response format) and sample characteristics.

Given this variability, it was important to ensure that the observed effects were not driven by differences in model specification across experiments. To this end, we fitted simplified models with a common random-intercepts-only structure (i.e., (1| participant) + (1| item)) for all experiments. These models showed the same overall pattern of results as the main reported analyses.

Moreover, in the current experiments, variability across samples may have significantly contributed to these effects. Specifically, tests of group differences indicated that extraversion scores were significantly higher in Experiment 1b compared to Experiments 1a and 3 ($p < .05$), and openness to experience differed between Experiments 1a and 2 ($p < .05$). These findings suggest that aesthetic preference for interior space is particularly sensitive to context-dependent interactions between observer characteristics and environmental properties.

From a theoretical perspective, the present findings contribute to ongoing debates about the role of object preference and its cognitive consequences. First, they suggest that preference is not merely a by-product of visual distinctiveness but reflects broader processes linked to familiarity, functionality, and perceptual fluency. This supports fluency-based accounts of preference judgement (Reber et al., 1998) while extending them to the architectural domain, where design constraints and lived experience play an important role. Second, the link between preference and memory demonstrates that aesthetic evaluations can serve as an organising principle of cognition, shaping which aspects of the environment are encoded and retained. This process may, in turn, influence memory prioritisation, with the brain tending to stabilise information that carries personal value. Finally, by showing that personality traits moderate these relationships, our findings speak to individual-differences approaches in aesthetics (e.g., Furnham & Chamorro-Premuzic, 2004), highlighting that preference is not uniform but filtered through enduring psychological dispositions.

The present research is not without limitations. Participants evaluated two-dimensional images, whereas interior spaces are typically experienced in three dimensions, often dynamically. Future work employing computer-generated or virtual reality environments may provide more

ecologically valid tests of how design features shape aesthetic experience and memory.

Conclusion

Overall, our findings advance understanding of how architectural features and individual differences jointly shape the experience and memorability of interior spaces. These results suggest that aesthetic preference is not merely a subjective evaluation but also a predictor of cognitive outcomes, implying that memory retention is modulated by subjective value. This integration of aesthetics and memory opens new avenues for research into the psychological functions of built environments and offers practical insights for designing spaces that support both well-being and cognitive performance.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.3758/s13421-026-01897-z>.

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Data availability The anonymised data supporting the findings of this study are openly available on the Open Science Framework at osf.io/hn7xt and osf.io/d7w6p.

Code availability The code supporting the findings of this study is openly available on the Open Science Framework at osf.io/hn7xt and osf.io/d7w6p.

Declarations

Ethics approval This study was performed in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Ethical approval for all experiments was granted by the Ethics Committee of the School of Psychology at Liverpool Hope University (Experiment 1a: SEL-20032023-005; Experiment 1b: SEL-24112023-018; Experiment 2: SEL-24112023-017; Experiment 3: SEL-16062025-001).

Consent to participate Written informed consent was obtained from all individual participants included in the study.

Consent for publication All participants provided informed consent for the publication of anonymized study data and results.

Statement of significance This research shows that aesthetic preference for architectural interiors is shaped not only by design features such as rectilinearity and spatial openness but also by individual differences in personality and desire for aesthetics. Crucially, these preferences predict how well interiors are remembered, suggesting that aesthetic experience plays a role in guiding cognitive processes such as memory. The findings contribute to theories of aesthetic judgement by extending fluency-based accounts to architectural spaces, while also offering practical insight for designers and architects aiming to create environments that are both appealing and cognitively supportive.

Conflicts of interest The authors declare that they have no conflicts or competing interests.

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