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Room to Breathe: Testing the efficacy of mindful breathing and mindful design in enhancing museum experiences

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ABSTRACT

Mindfulness-based activities are increasingly offered in arts institutions, yet little is known about the effectiveness of different interventions. Across two experiments, we examined the impacts of mindful breathing and mindful design on mood and aesthetic experience at Manchester Art Gallery. In Experiment 1, 202 participants viewed two portraits in *Room to Breathe*, a gallery space designed for mindful art viewing, after watching either a mindful breathing video, an informational video, or no video. Mindful breathing had no significant effect on mood or aesthetic experience. Experiment 2 replicated Experiment 1 in a traditional, non-mindful gallery space, allowing for a direct comparison of mindful breathing and mindful design (N = 261). While mindful breathing again had no impact, mindful design led to increased valence, decreased arousal, higher perceptual engagement, and more time spent viewing. These findings suggest that mindful design, as in *Room to Breathe*, may enhance aesthetic engagement and well-being.

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Mindfulness; art viewing; museum; aesthetic experience; mood; wellbeing; mindful breathing; mindful design; context

Introduction

The positive humanities, flourishing, and museum engagement

Positive psychology aims to understand and enhance the factors that allow individuals and communities to thrive. Within this framework, the 'positive humanities' emerge as an interdisciplinary approach that integrates the arts and humanities into the study and promotion of human flourishing (Pawelski, 2022). Art museums, in particular, are increasingly associated with positive impacts on health and well-being (for a review, see Cotter & Pawelski, 2022), with museum visits leading to benefits such as enhanced subjective health (Grossi et al., 2019), decreased feelings of social disconnect (Koebner et al., 2019), and lower implicit stress levels (Mastandrea, Maricchiolo, et al., 2019).

The well-being benefits of museum visits can be understood through both hedonic (pleasure, happiness, or enjoyment) and eudaimonic (self-growth and actualization) frameworks (Ryan & Deci, 2001). Engaging with the arts is often enjoyable and thus may promote positive emotions associated with hedonic well-being. Indeed, museum-based art viewing has been shown to boost cheerfulness (Thomson et al., 2018) and increase valence and positive affect (Igdalova et al., 2025). At the same time, the arts often expose people to different perspectives and experiences, which may contribute to personal growth, self-acceptance, purpose in life, and other attributes associated with eudaimonic wellbeing (Tay et al., 2018). Though some multi-session art viewing interventions have been shown to enhance eudaimonic well-being (for a review, see Trupp et al., 2024), less is known about the impact of short-term interventions.

Museum visits that improve positive emotions may be of particular interest to museum educators because the affective components of art appreciation are less driven by expertise and largely consistent across observers (van Paasschen et al., 2015). With the development of new interactive, visitor-centred programming (Robinson, 2020), art museums have increasingly recognized the importance of promoting general visitor hedonic well-being, positioning themselves as spaces that foster human flourishing (Cotter, Crone, et al., 2023).

The mindful museum

Mindfulness-based viewing is one such initiative aimed at promoting visitor well-being, with over 600 UK institutions promoting mindfulness in both in-person (Friedrich, 2019) and virtual art viewing environments (Fox, 2020). Mindfulness can be defined or approached in several ways. Though Kabat-Zinn's (1994, p. 4) definition of mindfulness as 'paying attention in a particular

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way: on purpose, in the present moment, and nonjudgmentally' has been widely accepted, Dreyfus (2011) argues that mindfulness historically involves not just present but *sustained* attention and can also be evaluative. In this study, we define a mindful state as intentional, sustained engagement with an object in the present moment, allowing for evaluation but without external interpretation (i.e. no labels paired with the artworks).

Mindfulness-based strategies range from bodycentred approaches like yoga and breathwork to immersive, sensory-focused experiences (Kabat-Zinn, 2003). Over the past decade, art museums have integrated mindfulness into their programming through mindful breathing, mindful group viewing, and purposefully designed viewing spaces (Coates, 2022). While these initiatives assume mindfulness enhances the well-being benefits of arts engagement, empirical research testing this claim is only just emerging.

Mindfulness, aesthetic experience, and well-being

In art viewing, mindfulness may help focus the viewer's attention, promoting deeper engagement with artworks (Leder et al., 2004). The positive emotions from this deep engagement may then enhance mood and indirectly promote well-being (Mastandrea, Fagioli et al., 2019). Simultaneously, mindfulness-based art viewing may itself foster well-being by helping viewers become more immersed in their experience, centring their attention on their body or immediate environment without necessarily increasing aesthetic engagement.

Aesthetic experience

Aesthetic experience, defined by Cupchik and Winston (1996) as a psychological process in which attention focuses on the artistic object, is a key factor in artsbased health interventions (Fancourt & Finn, 2019). One mechanism by which mindfulness may enhance aesthetic experiences is by modulating attention. Higher trait mindfulness is related to enhanced executive attention (Lin et al., 2019), with mindfulness training leading to improved attentional control (Chambers et al., 2008). Additionally, observation - a core facet of trait mindfulness (Lilja et al., 2013) - is related to increased perceptual awareness (Anicha et al., 2012) and greater frequency of aesthetic experiences (Harrison & Clark, 2016). This heightened perceptual engagement may help individuals focus on sensory details and reduce cognitive biases that can disrupt the viewing experience (Adair & Fredrickson, 2015). Therefore, cultivating a mindful state before or during art viewing could promote deeper engagement with an artwork's aesthetic and perceptual elements.

Trait mindfulness appears to positively predict both the frequency (Harrison & Clark, 2016) and intensity (Weigand & Jacobsen, 2023) of aesthetic experiences. Other studies examine changes to state mindfulness and aesthetic experience. For example, a brief mindfulness induction was found to enhance aesthetic appreciation and self-reported attention in trained musicians (Diaz, 2013) and led to more beautiful experiences during music-listening in naïve listeners (Liu et al., 2021). Zabelina et al. (2020) also examined the impact of a mindfulness induction on viewing and making art in a sample of children and adults. Children in the mindfulness condition expressed more excitement about previously seen artworks, while adults had better recall of viewed artworks.

Hedonic well-being

Mindfulness can also impact well-being independently of aesthetic experience by promoting relaxation or increasing positive emotions. Physiologically, mindfulness can influence heart rate (HR) and heart rate variability (HRV), indicators of autonomic arousal often associated with attentiveness and aesthetic responses (Tschacher et al., 2012). Art experiences can vary considerably in how arousing they are, but most museum mindfulness programmes are designed to foster calmer, less aroused physiological responses, such as a decrease in HR (Kyeong et al., 2017) or increase in HRV, an important marker of health (Christodoulou et al., 2020). Furthermore, as mindfulness training has enhanced positive emotions in clinical (Geschwind et al., 2011) and healthy populations (Davidson et al., 2003), such interventions could also increase visit satisfaction, framing museums as 'restorative' environments that promote relaxed and positive states (Packer & Bond, 2010).

Indeed, mindfulness has been shown to increase the enjoyment of sensory experiences, such as food sampling (Hong et al., 2014), and more complex experiences, such as visits to historic and park sites (Moscardo & Pearce, 1986). Within the context of the art museum, a recent study by Karagöz et al. (2024) found that trait mindfulness predicted both hedonic and eudaimonic gallery experiences, and *flow* (a state of engaged absorption in an activity) functioned as a moderator, in that greater flow corresponded to greater awareness and attention and thus a more pleasurable and meaningful visit.

In summary, mindfulness can influence both aesthetic experience and well-being. Mindfulness may heighten attention to stimuli (e.g. Diaz, 2013) leading to deeper engagement with artworks (e.g. Weigand & Jacobsen, 2023), decrease arousal by impacting HRV (e.g.

Christodoulou et al., 2020), and increase hedonic museum experiences (e.g. Karagöz et al., 2024). As mindfulness programming becomes more common in art environments, it is crucial for researchers to test the efficacy of different mindfulness interventions.

Mindful breathing and mindful design

Art museums integrate mindfulness in a variety of ways. Some rely on familiar practice-based interventions like mindful breathwork in the gallery (Coates, 2022). Others have taken a more unique, context-based perspective, exploring the link between physical space and wellbeing, previously documented in clinical settings (for a review, see lyendo et al., 2016). For example, Manchester Art Gallery has designed a dedicated exhibition space for just this purpose. Room to Breathe, developed with community mental health groups, transforms a traditional viewing area into a mindfulness-based space by presenting only two artworks with no textual information in a low-lit, calmy-coloured room with comfortable seating. While both mindful breathing interventions and Room to Breathe receive anecdotal support (e.g. visitor feedback), the efficacy of each in a gallery setting remains empirically unexplored, yet there is evidence from non-gallery settings to suggest that each may be impactful.

Mindful breathing

Pre-viewing mindful breathing exercises offer a simple yet effective way to introduce mindfulness into the museum. Brief videos (e.g. 10 minutes) guiding visitors through focused breathing have been shown to increase state mindfulness (Watier & Dubois, 2016) and improve emotional regulation, helping viewers manage responses to challenging stimuli. For example, Arch and Craske (2006) found that a short breathing intervention reduced emotional reactivity and enhanced engagement with aversive images compared to unfocused attention or worry induction. Weigand and Jacobsen (2023) further demonstrated that mindful breathing before art viewing in the laboratory can improve aesthetic experiences, with participants reporting deeper engagement and more favourable ratings of artworks.

Mindful design

Due to its novelty, mindful design has received little attention, although recent investigations into the impacts of different museum environments have emerged. Dragija et al. (2024) found that hedonic museum spaces (e.g. The Museum of Chocolate) fostered sensory pleasure and positive affect, whereas eudaimonic spaces (e.g. The Museum of Broken Relationships) encouraged deep reflection and contemplation. Exhibition design elements also play a crucial role (Bitgood, 1992). Pelowski et al. (2017) highlight elements such as spotlighting, minimal distractions, accessible displays, and absence of labels as influential in art museum viewing. *Room to Breathe* incorporates these principles, using a quiet, spacious setting with limited, unlabelled works to direct and sustain attention, thereby promoting a mindful viewing experience that may enhance visitor engagement.

The present study

Mindfulness-based activities may serve a beneficial role in the art museum, whether by deepening aesthetic experience or by enhancing hedonic well-being, but existing research has not yet examined mindfulness, aesthetic experience, and well-being in one ecologically valid design. This study aimed to shed further light on the efficacy of mindful art viewing by examining how two interventions designed to engender a mindful state - mindful breathing and mindful design - impact aesthetic experience and hedonic well-being. Experiment 1 examined the impacts of a practicebased intervention [mindful breathing] performed before art-viewing compared to two control conditions, while Experiment 2 examined the impacts of both mindful breathing and a context-based intervention [mindful design] by comparing art viewing experiences in a mindful gallery space versus a traditional, nonmindful one. The art experience was assessed in both studies on a visit-based rather than artwork-based level, not comparing responses to individual paintings but to overall experience in the gallery. Both experiments were conducted in co-production with the curatorial and educational team at Manchester Art Gallery using the same artworks for both experiments.

Experiment 1 – mindful breathing

Design and hypotheses

This study used a between-subjects, experimental design in which three randomized participant groups (MBE, Information, Control) engaged in different previewing activities before entering *Room to Breathe*. Participants in the mindful breathing exercise (MBE) group watched and followed along with an MBE video before viewing artworks. The Information group also watched a video (about mindful design in *Room to Breathe*) but did not engage in active mindful practice. Control group participants did not watch any video



Figure 1. Layout of Room to Breathe.

before viewing. The dependent variables were change in mood, measured by pre- and post- self-reports of valence and arousal (as a proxy for hedonic well-being), and aesthetic experience. Art interest, trait mindfulness, and openness to experience were accounted for as covariates.

The hypotheses were as follows:

- All groups will experience a change in mood, reporting a positive increase in valence and decrease in arousal, as previously found in other short-term art viewing interventions (e.g. Igdalova & Chamberlain, 2023).
- (2) Participants who engage in mindful breathing before art viewing will report a greater change in mood, as measured by valence and arousal, compared to the Information and Control groups.
- (3) Participants who engage in mindful breathing before art viewing will also report heightened aesthetic experience, particularly with regards to perceptual engagement given its known link with mindfulness (Anicha et al., 2012).

Methods

Participant sample

Based on past studies (e.g. Harrison & Clark, 2016) reporting large effect sizes, we assumed a medium effect size and calculated a minimum sample size of 158 for 0.80 power using G*Power3 (Faul et al., 2007). We recruited 202 participants via Eventbrite advertising and opportunistic gallery sampling. Data collection occurred over several three-day sessions between April and May 2022. Participants had to be over 18 and not have seen *Room to Breathe* before. They received a café voucher as compensation.

The participants ranged in age from 18 to 78 years (M = 38.06, SD = 17.73). The gender distribution was 52.5% female, 43.0% male, and 4.5% other. The participants

reported a moderate level of art interest (M = 54.38 out of 77, SD = 12.89), as determined by the Vienna Art Interest and Art Knowledge Questionnaire (VAIAK: Specker et al., 2020), with no significant difference between the three experimental groups, F(2,199) = 0.271, p = .763.

Experimental setting

The study took place in a dedicated exhibition space called *Room to Breathe* in Manchester Art Gallery, a free public gallery with over 500,000 annual visitors. Designed for mindful art viewing, *Room to Breathe* features ample seating, dark walls, restricted access, and two spotlit, label-free artworks, hung at a lower height for seated viewers. The space is split into three chambers (see Figure 1). Participants completed pre-art-viewing activities in the first chamber, viewed artworks in the second, and completed the exit survey in the third. The exhibition was closed to other visitors during data collection.

Materials

Pre-viewing stimuli

The MBE group watched a 3-minute video of a box breathing visualization with a guided voiceover. The video was designed to induce a mindful state as defined earlier – participants were asked to first direct their awareness to any physical sensations they felt in the present moment before engaging in focused breathwork for several minutes (intentional, sustained attention). The Information group watched a 2-minute video featuring a gallery educator explaining *Room to Breathe's* mindful purpose. Video stimuli and transcripts are available here: https://osf.io/6ejnr/?view_only= fb89c98463de47518ba2a5398851a10c.

Artwork stimuli

Participants viewed two paintings from the gallery's collection: *Girl with Beret* by Lucien Freud and *Head of*

E.O.W. III by Frank H. Auerbach (see Figure 2). The two works were selected by the museum for their historical connection and their representation of both realistic and abstract portraiture. Participants evaluated their responses to both works as part of a 'visit-level' experience rather than to each work individually.

Mood

Mood was measured before and after art viewing by the Affect Grid (Russell et al., 1989), which assesses valence (pleasantness) and arousal (activity level) in a 9×9 grid.

Aesthetic experience

Aesthetic experience was measured by the Aesthetic Experience Questionnaire (AEQ: Wanzer et al., 2020), which includes six subscales: four structural (*emotional, cultural, understanding, perceptual*), and two 'flow'(*proximal flow, flow experience*), as conceptualized by Csikszentmihalyi and Robinson (1990). The understanding dimension was excluded from this study as it was not a target variable. The 22 items were rated on a 5-point Likert scale from 1 (*disagree*) to 5 (*agree*). We calculated the average subscale scores as well as a total average AEQ score, with higher scores indicating heightened experiences.

Art interest

Artistic interest was measured by the first scale of the Vienna Art Interest and Art Knowledge Questionnaire (VAIAK: Specker et al., 2020). The 11 items were rated on a 7-point Likert scale from 1 (*not at all/less than once*

a year) to 7 (*completely/once a week or more*). A total art interest score was calculated by summing the 11 items, with a higher score indicating more art interest (out of 77).

Trait mindfulness

Trait mindfulness was measured by the 15-item version of the Five-Facet Mindfulness Questionnaire, or FFMQ (15-item form: Baer et al., 2008), which is divided into five subscales—observing, describing, acting with awareness, non-judging, non-reactivity. The 15 items were rated on a 5-point Likert scale from 1 (never or very rarely true) to 5 (very often or always true), resulting in five subscale scores and a total trait mindfulness score.

Openness to experience

Openness to experience was measured by the 15-item version of the Big Five Inventory, or BFI (BFI-S: Lang et al., 2011). Only openness to experience, which closely relates to aesthetic experience (Silvia et al., 2015), was examined in this study.

Other questions

Participants reported their perceived viewing time ('How long did you spend in the exhibition?' with answers <5 min, 5–10 min, 10–30 min, 30–60 min, and >60 min) and artwork preference ('Which work did you spend the most time with?' with answers '*Girl with Beret*' and '*Head of E.O.W. III*'). For the full survey, see: https://osf.io/6ejnr/?view_only=fb89c98463de47518ba2a5398 851a10c.



Figure 2. a) *Girl with Beret* (1952) by Lucian Freud. Oil on canvas. Manchester Art Gallery, Manchester, UK. © The Lucian Freud Archive / Bridgeman Images. Image used under license, 2025. b) *Head of E.O.W. III* (1963–64) by Frank Auerbach. Oil on board. Manchester Art Gallery, Manchester, UK. © Frank Auerbach. Image courtesy of Frankie Rossi Art Projects. Permission granted by the artist via the gallery.

Procedure

Participants completed the Affect Grid for pre-viewing mood ratings in the first chamber of the exhibition space. They were then randomly assigned to one of three groups: MBE (n = 65), Information (n = 69), or Control (n = 68). Those in the MBE or Information groups watched a video with headphones before proceeding to the main viewing chamber, while control group participants proceeded immediately. They had up to 10 minutes to view both artworks in any order or manner they preferred. After viewing, participants completed post-viewing mood ratings, assessments of art interest, personality, and trait mindfulness, and assessments of their visit-level experience (collapsing across both artworks): the AEQ, perceived viewing time, and artwork preference. Individual sessions lasted about 30 minutes.

Ethics

Experiment 1 and 2's study procedure and ethical protocol was approved by Goldsmiths, University of London's Research Ethics and Integrity Sub-Committee.

Results

De-identified data for both experiments are available on the Open Science Framework at https://osf.io/6ejnr/? view_only=fb89c98463de47518ba2a5398851a10c.

Data preparation

Eight participants were excluded due to incomplete data and outliers, resulting in a N = 194 (MBE = 62; Information = 66;Control = 66). The Perceptual Engagement and Openness variables were reflected and log transformed to meet normality. When significant interactions were observed, post-hoc tests were Bonferroni corrected for multiple comparisons.

Hypothesis 1 and 2: Mood change across and between groups

The data were analysed using mixed-effects models (with by-participant random intercepts) to examine how Valence and Arousal were impacted by the between-subjects factor of Group (MBE vs. Information vs. Control) and the within-subjects factor of Time (Pre vs. Post). Trait Mindfulness, Art Interest and Openness were included as covariates in all models.

For Valence, there was a significant main effect of Time (F(1,191) = 52.70, p < .001) (see Figure 3) and a significant Group*Time interaction (F(2,191) = 6.67, p = .002). Both the MBE ($M_{adi} = 0.95$, SE = 0.19, p < .001) and Control $(M_{adi} = 1.15, SE = 0.19, p < .001)$ showed groups a significant positive change in Valence from Pre to Post, while there was no change in Valence in the Information group ($M_{adi} = 0.24$, SE = 0.19, p = .99) (see Figure 4).

For Arousal, there was a main effect of Time (F(1,191) =69.38, p < .001), such that participants reported significantly lower Arousal after art-viewing ($M_{adj} = 3.95$, SE = 0.13) compared to before ($M_{adj} = 5.25$, SE = 0.13) (see Figure 3), but the Group*Time interaction was not significant (F(2,191)) = .19, p = .83).

Hypothesis 3: Aesthetic experience between groups As there were no repeated measurements of AEQ vari-

ables, the data were analyzed using ANCOVAs. The

groups did not significantly differ in any AEQ dimensions

(see Table 1). Change in Valence Change in Arousal *** 10 8 8 Arousal 000 0 00 6 4 4 2 2 Pre Post Pre Post Time Time

Figure 3. Significant mood change across groups (N = 194).







Exploratory analyses

Two chi-square tests of independence were conducted to determine if Group was associated with Perceived Viewing Time or Preference for the Freud or Auerbach work, but no association was found between Group and Perceived Viewing Time, $X^2(2) = 6.306$, p = .177, $\omega = .180$, or between Group and Preference, $X^2(2) = 4.992$, p = .082, $\omega = .160$.

Discussion

This experiment investigated the impacts of an MBE on mood and aesthetic experience in an ecologically valid gallery setting. As hypothesized, participants felt more pleasant and relaxed after viewing art in *Room to Breathe*. However, there were no differences in aesthetic

Table 1. Main effects for Experiment 1. *p < .05, **p < .01, *** p < .001.

Measures	F	p	η_p^2
Valence			
Group	1.41	.246	
Time	52.70	<.001***	
Art Interest	1.32	.253	
Trait Mindfulness	0.46	.498	
Openness	0.34	.561	
Arousal			
Group	0.89	.414	
Time	69.39	<.001***	
Art Interest	2.72	.101	
Trait Mindfulness	1.67	.199	
Openness	0.96	.328	
Emotional Engagement (AEQ)			
Group	0.14	.869	.001
Art Interest	0.06	.811	.000
Trait Mindfulness	0.28	.595	.002
Openness	6.23	.013*	.032
Cultural Engagement (AEQ)			
Group	1.88	.156	.020
Art Interest	13.58	<.001***	.067
Trait Mindfulness	4.74	.031*	.025
Openness	0.59	.443	.003
Perceptual Engagement (AEQ)			
Group	1.78	.172	.019
Art Interest	5.69	.018*	.029
Trait Mindfulness	3.76	.054	.020
Openness	4.17	.043*	.022
Proximal Flow (AEQ)			
Group	0.02	.981	.000
Art Interest	5.00	.027*	.026
Trait Mindfulness	0.41	.523	.002
Openness	3.58	.060	.019
Flow Experience (AEQ)			
Group	0.20	.817	.002
Art Interest	0.21	.651	.001
Trait Mindfulness	7.29	.008**	.037
Openness	3.18	.076	.017
Total (AEQ)			
Group	1.25	.290	.013
Art Interest	7.96	.005**	.041
Trait Mindfulness	3.97	.048*	.021
Openness	8.30	.004**	.042

experience or arousal between the groups, though change in valence was found to be impacted by previewing activity. The MBE and Control groups reported significantly greater valence after art-viewing compared to before, while the Information group showed no difference in valence from pre to post. This finding suggests that providing visitors with extra information before art-viewing may lead to less positive impacts on mood compared to mindful breathing or no pre-viewing activity.

However, as Room to Breathe was designed by Manchester Art Gallery's well-being staff to encourage mindful artwork contemplation, the restorative environment itself may have impacted our results, highlighting the influential role that context plays on the art viewing experience (e.g. Mastandrea et al., 2021; Szubielska et al., 2021). Specifically, the immediate environment in *Room to Breathe* may be a stronger means of inducing a mindful state, as per our definition. By providing seating and presenting viewers with a select few works that are spotlit against dark walls, the space is designed to minimize distractions and promote sustained attention. The artworks in Room to Breathe are also unlabelled to allow viewers to engage without any prejudgement that may otherwise be induced by external interpretations. In this way, the space may also have impacted the effect of the MBE – if participants, simply by being in this space, had already entered into a mindful state, then the MBE may not have been able to have the desired impact. Mindful breathing may be a stronger intervention in a more sensory-noisy gallery space. For this reason, we replicated Experiment 1 in a nonmindful gallery space to investigate whether the impact of the MBE depends on space and whether mindful design itself affects the experience. As the Information condition was less impactful than the Control condition in Experiment 1, we repeated only the MBE and Control condition in the non-mindful gallery space.

Experiment 2 – mindful breathing and mindful design

Design and hypotheses

This study used a two-way factorial design to simultaneously examine the impacts of mindful breathing and mindful design. MBE and Control group data collected within the *Room to Breathe* setting from Experiment 1 were compared with a new sample that followed the same procedure and viewed the same stimuli but in a traditional, non-mindful gallery space at Manchester Art Gallery (*Gallery 3*). The two primary independent variables were pre-viewing activity [mindful breathing vs. control] and viewing space [mindful design, i.e. *Room to Breathe* vs. *Gallery 3*]. The dependent and covariate variables remained the same.

The hypotheses were as follows:

- (1) All participants will experience a change in mood, reporting a positive increase in valence and decrease in arousal.
- (2) Participants who engage in mindful breathing before art viewing will report a greater change in mood and heightened aesthetic experience, particularly with regards to perceptual engagement.
- (3) Participants who view the artworks in *Room to Breathe* will report a greater change in mood and heightened aesthetic experience, particularly with regards to perceptual engagement, compared to participants who view in *Gallery 3*.
- (4) There will be an interaction effect of pre-viewing activity and viewing space in that the MBE will be more effective in *Gallery 3* compared to in *Room to Breathe*.

Methods

Participant sample

Assuming a medium effect size, we conducted an a priori power analysis and determined that a sample size of 210 participants was needed for a power of 0.80. Therefore, 134 additional participants were recruited through Eventbrite and opportunistic sampling, totalling 267 participants. Data collection occurred primarily over one week in December 2023. Participants had to be over 18 years old, and compensation included a gallery café voucher.

The 133 participants from Experiment 1 ranged in age from 18 to 78 years (M = 37.35, SD = 17.96), with 51.9% self-reporting as female, 43.6% as male, and 4.5% as other. They reported a moderate level of art interest (M = 54.45 out of 77, SD = 13.03), with no significant difference between the MBE and Control groups, F(1,131) = 0.522, p = .471. The 134 new participants ranged in age from 18 to 77 years (M = 35.67, SD = 16.11), with 46.3% reporting as female, 47.7% as male, and 6.0% as other. They had a moderate level of art interest (M = 52.72 out of 77, SD = 12.78), with no significant difference between the MBE and Control groups, F(1,132) = 0.148, p = .702.



Figure 5. a) Artwork display in *Room to Breathe* (Experiment 1). Images courtesy of Manchester Art Gallery. b) Artwork display in *Gallery 3* (Experiment 2). Images courtesy of Manchester Art Gallery.

Experimental setting

Half of the sample completed the study in *Room to Breathe* (Experiment 1), while the other half completed the study in *Gallery 3*, viewing the same two works and performing the same tasks as the half in *Room to Breathe*. Unlike *Room to Breathe*, *Gallery 3* is a traditional museum hall with many labelled artworks, bright overhead lighting, and a single central bench. The Freud and Auerbach paintings were removed from *Room to Breathe* and rehung with their labels covered facing one another in *Gallery 3* to replicate the visit experience participants had in *Room to Breathe* (see Figure 5). Participants were told to view only these two works in the gallery. Access to *Gallery 3* was not restricted for other visitors.

Materials

The pre-viewing stimuli (the MBE video) and artwork stimuli (the Freud and Auerbach portraits, now rehung in *Gallery 3*) remained the same for the additional study.

The measures in the survey also remained the same as in Experiment 1 (see *Materials* section above).

Procedure

Participants were randomly assigned to MBE (n = 67) or Control (n = 67) groups, completed pre- and postsurveys outside *Gallery 3*, and were instructed to look only at the Freud and Auerbach portraits as part of their visit experience, ignoring other artworks in the space. All other procedures remained the same as in Experiment 1.

Results

Data preparation

Six participants were excluded due to incomplete data and outliers, resulting in a N = 261 (MBE = 129, Control = 132; *Room to Breathe* = 128, *Gallery* 3 = 133). The Perceptual Engagement and Openness variables were reflected and log transformed to meet normality assumptions. As before, when significant interactions were observed, post-hoc tests were Bonferroni corrected for multiple comparisons.

Sample comparison

Because the additional data collection for Experiment 2 took place at a different time of year, we checked for any baseline differences between the two samples to ensure that they were comparable. Neither baseline Valence (t (259) = 1.37, p = .173) nor Arousal (t(259) = -1.68, p = .094) differed between the samples. Age (t(219) =-0.69, p = .492), Trait Mindfulness (t(259) = -0.20, p= .844), and Art Interest (t(259) = -1.10, p = .272) also did not significantly differ between the two samples. However, participants in Room to Breathe reported higher Openness (M = 4.29) than those in the traditional gallery space (M = 4.07), t(259) = -2.57, p = .011. It can be problematic to include a covariate that differs significantly between groups, so we report here the analyses without Openness as a covariate. However, we ran the analyses with and without Openness and found that the results did not change.

Mood

The data were analysed using mixed-effects models (with by-participant random intercepts) to examine how Valence and Arousal were impacted by the between-subjects factors of Group (MBE vs. Control) and Space (*Room to Breathe* vs. *Gallery 3*) and the within-subjects factor of Time (Pre vs. Post).

For Valence, there was a main effect of Time (F(1,257) = 36.02, p < .001) (see Figure 6) and a significant Space*Time interaction (F(1,257) = 20.85, p < .001), indicating that mindful design increased the Valence of participants' mood. Participants in *Room to Breathe*

 $(M_{adj} = 1.052, SE = 0.14, p < .001)$ showed a significant positive change in Valence from Pre- to Post-art-viewing, while there was no change in Valence for *Gallery 3* participants ($M_{adj} = 0.143, SE = 0.14, p = .31$) (see Figure 7).

For Arousal, there was a main effect of Time (F(1,257) = 27.85, p < .001) (see Figure 6) and a significant Space*Time interaction (F(1,257) = 28.04, p < .001), indicating that mindful design impacted Arousal level. Participants in *Room to Breathe* ($M_{adj} = -1.37$, SE = 0.19, p < .001) reported significantly lower Arousal after artviewing, while there was no change in Arousal for *Gallery 3* participants ($M_{adj} = 0.002$, SE = 0.18, p = .99) (see Figure 7).

There were no significant interactions between Group*Time or Group*Time*Space for either measure, indicating that mindful breathing did not impact Valence or Arousal in either setting (all p > .05).

Aesthetic experience

The AEQ variables were analyzed using 2 (Group) * 2 (Space) ANCOVAs with Trait Mindfulness and Art Interest as covariates. For Perceptual Engagement, there was a significant effect of Space, F(1,255) = 7.92, p = .005, $\eta_p^2 = .03$. Room to Breathe participants (M = 4.516, SE = 0.05) reported greater Perceptual Engagement compared to Gallery 3 participants (M = 4.313, SE = 0.05), p = .012. See Figure 8 for boxplot. No other AEQ variables were significantly affected by Group or Space (see Table 2).

Exploratory analyses

A series of chi-square tests of independence were conducted to determine if Perceived Viewing Time or Preference for either work differed depending on



Figure 6. Significant mood change across groups and spaces (N = 261).



Change in Valence by Space



Pre

Post



Figure 8. Significant space difference in perceptual engagement (N = 261).

Group or Space. No association was found between Group and Perceived Viewing Time, $X^2(2) = 1.770$, p = .413, $\omega = .083$, or between Group and Preference, X^2 (1) = 0.953, p = .329, $\omega = .061$. However, the relationship between Space and Perceived Viewing Time was significant, $X^2(2) = 15.146$, p = .001, $\omega = .244$, with more *Room to Breathe* participants (58.7%) spending 5–10 minutes viewing relative to participants in *Gallery 3*, of which 68.7% spent <5 minutes viewing. Space and Preference were not significantly associated, $X^2(1) = 0.953$, p = .329, $\omega = .061$.

Discussion

Pre

Time

Post

This experiment investigated the impacts of mindful breathing and mindful design on mood and aesthetic experience in an ecologically valid gallery setting. As in Experiment 1, participants across all groups felt more pleasant and more relaxed after viewing,

Table 2. Main effects for Lype	1111111112. p < .03,	p < .01, p < .00	л.
Measures	F	р	η_p^2
Valence			
Time	36.02	<.001***	
Group x Space	0.00	.996	
Space x Time	20.85	<.001***	
Group x Time	0.22	.639	
Group x Space x Time	0.29	.593	
Art Interest	0.15	.702	
Trait Mindfulness	7.85	.005**	
Arousal			
Time	27.85	< 001***	
Group x Space	0.15	600	
Snace v Time	28.04	<pre>.000</pre>	
Group x Time	1 53	217	
Group x Space x Time	1.55	.217	
Art Interest	0.38	536	
Trait Mindfulness	0.38	304	
	0.75		
Emotional Engagement (AEQ)			
Group	0.55	.459	.002
Space	0.39	.535	.002
Group x Space	0.70	.405	.003
Art Interest	24.35	<.001***	.087
Trait Mindfulness	1.32	.251	.005
Cultural Engagement (AEQ)			
Group	2.91	.089	.011
Space	0.00	.974	.000
Group x Space	0.06	.808	.000
Art Interest	24.08	<.001***	.086
Trait Mindfulness	2.09	.149	.008
Percentual Engagement (AFO)			
Group	0.01	974	000
Snace	7 92	.005**	030
Group x Space	0.98	377	004
Art Interest	35.80	< 001***	123
Trait Mindfulness	1 35	377	004
	1.55	.322	.004
Proximal Flow (AEQ)			
Group	0.73	.394	.003
Space	0.01	.934	.000
Group x Space	1.57	.211	.006
Art Interest	30.40	<.001***	.107
Trait Mindfulness	0.83	.363	.003
Flow Experience (AEQ)			
Group	0.43	.512	.002
Space	0.92	.338	.004
Group x Space	0.21	.645	.001
Art Interest	23.53	<.001***	.084
Trait Mindfulness	4.08	.044*	.016
Total (AFO)			
Group	0.00	999	000
Share	1 1 1	293	.000
Group y Space	0.83	364	.004
Art Interest	65 27	~ 001***	.003
Trait Mindfulness	164	202	.204
	1.04	.202	.000

Table 2. Main effects for Expe	eriment 2. * <i>p</i> < .05	5, **p < .01, *** p < .0	001.
Measures	F	p	r
14.1			

regardless of intervention. Next, we found that mindful breathing did not impact mood or aesthetic experience, regardless of viewing space; nor did it relate to perceived viewing time or preferred artwork. However, we found a significant effect of mindful design on mood change and aesthetic experience, with participants in the mindful Room to Breathe space reporting a greater increase in valence (feeling more pleasant) and a greater decrease in arousal (feeling more relaxed) compared to participants in Gallery 3. Participants in Room to Breathe also reported higher perceptual engagement and longer perceived viewing time. Neither space related to artwork preference.

General discussion

This study examined the efficacy of two gallerybased interventions for inducing mindful art viewing - mindful breathing and mindful design - on enhancing aesthetic experience and hedonic wellbeing across two experiments in Manchester Art Gallery. In both experiments, we found that viewing artworks helped participants feel more pleasant and more relaxed. Next, while mindful breathing did not significantly affect the experience in either space, mindful design showed a significant impact, with participants in *Room to Breathe* reporting feeling more pleasant, more relaxed, more perceptually engaged, and spending more time viewing compared to participants in *Gallery 3*.

Feeling better after viewing

Art museum engagement has been shown to enhance hedonic well-being, leading to both positive affective experiences, including increased cheerfulness (Thomson et al., 2018) and uplifted engagement (Herron & Jamieson, 2020), as well as decreased arousal states, like lowered stress (Clow & Fredhoi, 2006). That participants across most groups reported a significant increase in valence and decrease in arousal supports the growing evidence that viewing artworks can lead to short-term mood improvement, whether by increasing valence (e.g. Ho et al., 2015; Igdalova et al., 2025) or by lowering arousal levels (e.g. Ter-Kazarian & Luke, 2019). However, we note that in Experiment 2, participants in Gallery 3 did not report these mood impacts, suggesting that the positive impacts of museum-based art viewing may be dependent on certain settings.

What could make an MBE successful?

Across both experiments and gallery spaces, we found that mindful breathing before art viewing did not enhance aesthetic experience or well-being compared to a control condition. While the MBE was designed for easy implementation across different environments, its video format and short length may have contributed to its lack of effect. Though breathing is a central practice in mindfulness, watching a video may not induce the same mindful state as in-person meditation sessions such as those offered by the gallery (Manchester Art Gallery, 2021). The timing of the intervention may also play a role. Participants in our study completed the breathing exercise before viewing, whereas other institutions integrate mindful engagement with the act of looking.

Next, the MBE video length, which matched the length of other gallery videos, may have been too short to induce significant changes in state mindfulness. For example, Weigand and Jacobsen's (2023) study used a 10-minute breathing meditation in their investigation of the relationship between trait mindfulness and aesthetic experience, although it was performed in a lab environment. This duration may be more effective, as a 10-minute meditation, practiced over eight-weeks, has been shown to enhance attentional focus (Moore et al., 2012). Furthermore, repeated mindfulness practice has been shown to improve trait mindfulness over time (Kiken et al., 2015), and as trait mindfulness is linked to frequency of aesthetic states (Harrison & Clark, 2016) and well-being (Karagöz et al., 2024), mindful engagement with art may simply require more time and practice than that which can be achieved through a short, one-time video. However, future investigations into practicebased interventions should account for gallery space and visitor time constraints if installing longer, labbased stimuli.

Impactful design in Room to Breathe

Conducting research in ecologically valid settings is crucial for empirical aesthetics (Pelowski et al., 2017), but as we show here, different spaces within that same setting can lead to different experiences, highlighting the importance of context in shaping viewing experience (Mastandrea et al., 2021). Kirchberg and Tröndle (2015), for example, found close causal relationships between the physical context of an exhibition (e.g. artwork choice, installation, labelling) and visitors' contemplative experiences, such as their sense of connection, reflection, and appreciation. Our findings show that *Room to Breathe*, with its dark green walls, comfortable seating, and spotlit display of limited works without text, offers a different museum experience from the brighter, more crowded *Gallery 3*.

Specifically, participants felt more pleasant and relaxed in the mindful space, reporting increased perceptual engagement with the composition, colours, and subtle details of the artworks compared to Gallery 3 participants. As the procedural tasks and stimuli were identical across both spaces, these effects may be driven by the mindful design elements of Room to Breathe. For example, the display of only two artworks – strategically hung to enhance their perceived importance (Bitgood, 1992) – likely makes them feel more 'special', fostering deeper aesthetic processing (Nadal et al., 2008), increased expectations, and a more pleasurable experience (Leder et al., 2004). The dim room and focused spotlighting likely contribute to this effect, as both exhibition lighting and accented artwork illumination have been shown to impact visual engagement and appreciation (Leccese et al., 2020). Additionally, the availability of seating - often cited in feedback on slow- or mindfullooking events (Slow Art Day, 2024) - may help maintain

focus, while the quieter, less crowded environment could further sustain it, as noise has been linked to lower satisfaction, engagement, and restorative experiences in art exhibits (Jakubowski, 2011). Finally, as Griswold et al. (2013) suggest, spatial dimensions can shape visitors' moods and evaluations. The intimate size and low ceilings of *Room to Breathe* may cultivate a more personal and immersive experience, further reinforced by the absence of labels, which might otherwise disrupt sustained engagement (Bitgood, 1992).

Lastly, considering how these environmental elements might sustain engagement with an aesthetic object, we also examined their impact on viewing time. Indeed, our findings indicate that *Room to Breathe* participants reported spending 5–10 minutes with the artworks, compared to the 5 minutes or less spent by *Gallery 3* participants. As longer viewing times have been linked to increased art appreciation (Lachapelle et al., 2009) and increased internal processing (Palumbo et al., 2025), the extended time in *Room to Breathe* likely facilitated more interaction and contemplation of the artworks.

An embodied, immersive experience?

The design elements in Room to Breathe likely worked together to deepen contemplation and enhance mood. Increased engagement through aesthetic processing can be rewarding (Mastandrea, Fagioli et al., 2019), which might then also explain the greater boost in valence observed in the mindful space. However, this boost could also stem from the effects of simply being in the mindful space, as mindfulness can enhance positive emotions from sensory experiences (Richter & Hunecke, 2021). As we did not track the order of these experiences, further research is needed to clarify how mindful spaces may influence the relationship between aesthetic experience and mood. Still, as heightened bodily presence may expand appreciation (Best, 2002), with recent studies finding that visitors who enjoyed the embodied experience in art installations also liked the art more (Kühnapfel et al., 2023), the unique sensory environment of Room to Breathe-offering space to move and sit without bright lights or noise - may have helped link mood and engagement. Indeed, valence was positively correlated with engagement in an installation exhibit (Szubielska & Imbir, 2022), although causal order was not determined there either. Future studies might consider bodily experience in mindful spaces to further explore its role in engagement and well-being.

While mindful breathing also promotes body awareness (Pérez-Peña et al., 2022), the mindful space may have led to a more embodied experience and thus a more mindful state. Immersion could play a key role here. Defined as a state of heightened engagement and sensory experience, immersion is one mechanism linking arts engagement to flourishing outcomes (Tay et al., 2018) and may be particularly relevant in the context of mindfulness-based art viewing. Recent studies found that immersion was associated with increased wellbeing and positive emotions in both short virtual gallery visits (Cotter, Harrouche, et al., 2023) and repeated visits (Cotter et al., 2024). Mindful design may enhance immersion, leading to greater sensory pleasure and positive emotions during art viewing. However, as we did not assess immersion directly, future studies should consider it as a potential mechanism linking mindfulness to wellbeing.

Limitations

Conducting experimental studies in naturalistic gallery settings presents challenges (Pelowski et al., 2017), and our study may have missed aspects of aesthetic experience and well-being due to time and space constraints. For example, spending more time with the artworks might have enhanced emotional engagement or induced flow, as seen in a slow-looking study with 10minute viewing times (Igdalova et al., 2025). Next, while we assessed valence and arousal, these measures may not fully capture hedonic well-being; eudaimonic wellbeing, linked to trait mindfulness (Karagöz et al., 2024), could also have been influenced by mindfulness-based viewing. Finally, while a key feature of *Room to Breathe* is its limited number of artworks, as these differed in style, the variation in style may have led to differing responses to representational versus abstract works (Belke et al., 2006). Future studies could also explore the role of different artwork genres beyond portraits, as certain characteristics may shape the mindful or aesthetic experience differently (Krauss et al., 2021).

While the mindful environment in this study was part of an ongoing engagement strategy at Manchester Art Gallery, the space itself combined various factors that we cannot disentangle. For example, comfortable seating likely promoted relaxation and longer viewing, while the quieter, less crowded environment may have contributed to a more pleasant mood. Future research should isolate the individual impact of these factors on viewing experience. It is also worth noting that access to *Gallery 3* was not restricted as it was in *Room to Breathe*, which could have affected the experience. However, the two spaces naturally tend to have different visitor numbers, and operational feasibility prevents closing large galleries. Although the goal of *Room to Breathe* is to reduce visitor numbers in the space, the challenge of disentangling the effects of mindful design versus visitor numbers remains an important consideration for future studies.

Conclusion

This study is the first to quantitatively examine the impacts of two mindfulness interventions on aesthetic experience and hedonic well-being in a museum setting. Our findings indicate that the context-based mindful design intervention is more effective than the practice-based mindful breathing intervention in enhancing both aesthetic experience and well-being. *Room to Breathe's* immersive qualities – such as spotlighting, comfortable seating, and minimal distractions – seem to foster deeper engagement and a more positive affective state. These results highlight the potential for mindful design to enhance art museum experiences.

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