

Article

Associations Between Soundscape Perception and Customer Self-Reported Mood in London Cat Cafés: An Exploratory Cross-Sectional Study

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Abstract

Cat cafés, where customers and resident cats share indoor spaces, create a distinctive yet understudied soundscape. This exploratory cross-sectional study examined cat cafés through three questions: acoustic conditions and customer perceptions using the ISO 12913 pleasant–eventful framework; associations between perceived sound sources, acoustic comfort, and mood; and links between perceptual ratings and typical activities. During weekday peak hours in July–August 2024, sound pressure levels were measured with Noise-Capture in three of four London cat cafés, while 50 customers completed questionnaires. SPLs generally ranged from 65–75 dB(A), exceeding the 45–50 dB(A) recommended for cafeterias; nevertheless, 88% of respondents described the soundscape as pleasant or very pleasant, mainly within the pleasant–uneventful region. Acoustic comfort was moderately positively associated with self-reported mood ($r_s = 0.35$, Holm-adjusted $p = 0.01$). Of six perceived source types, cat-generated sounds alone were positively associated with mood ($r_s = 0.41$, Holm-adjusted $p = 0.02$). Activity-related associations were non-significant after multiple-comparison correction, suggesting that larger samples may be needed. Attribute inter-correlations broadly reflected the established circumplex structure, preliminarily supporting the ISO framework in this setting. Overall, acoustic experience appears shaped not only by sound level but also by context, expectations, human–animal interaction, and possible biophilic associations.

Keywords: soundscape perception; cat café; indoor acoustic environment; acoustic comfort; self-reported mood; biophilia; animal-generated sounds



Academic Editor: Ángel Fermín
Ramos Ridao

Received: 29 May 2026

Revised: 22 July 2026

Accepted: 24 July 2026

Published: 27 July 2026

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1. Introduction

Soundscape, defined as the acoustic environment as perceived, experienced, or understood by individuals or groups within a specific context [1], has received growing attention in indoor environmental quality research. Unlike conventional acoustic assessment, which characterises sound environments through physical parameters such as sound pressure level (SPL) and frequency spectrum, soundscape research emphasises how people interpret and respond to sounds within their surroundings [1], recognising that identical physical conditions can produce different perceptual outcomes depending on the meaning, context, and individual sensitivity associated with those sounds [1]. This perceptual dimension is particularly important for indoor settings, where poor acoustic conditions have been identified as the second most important factor contributing to occupant dissatisfaction with indoor

environmental quality [2,3], with documented adverse effects including cardiovascular stress, sleep disturbance, and reduced cognitive performance [4,5]. Understanding how occupants perceive and respond to their acoustic environment, rather than relying solely on physical measurements, is therefore essential for creating comfortable indoor spaces.

A growing body of evidence indicates that soundscape perception cannot be fully predicted from physical acoustic parameters alone, as the meaning and context of sounds also play a critical role [6]. Cafés illustrate this disconnect particularly well: Wright et al. (2016) and Christie (2004) reported that although café environments commonly exceed recommended acoustic guidelines, customers frequently give high satisfaction ratings to these soundscapes [7,8].

Multiple factors contribute to the meaning and context that shape soundscape perception in a given space, including interrelationships between person, activity, and place in space and time, as well as factors influencing auditory sensation, interpretation of auditory sensation, and responses to the acoustic environment [1]. Biophilia, the hypothesis that humans have an innate tendency to attend and respond positively to natural stimuli as a result of evolutionary history [9], is one such factor that may shape how individuals interpret and respond to sounds in their environment. The presence of natural sounds has been shown to facilitate recovery from sympathetic activation following psychological stress, enhance cognitive performance, and promote emotional restoration, even when overall SPL remains unchanged [10–13], suggesting that the informational content of sounds can influence human wellbeing independently of their physical intensity.

Despite growing interest in the roles of biophilia and biophony in soundscape perception, existing research has focused predominantly on wild animal sounds in outdoor or laboratory settings, leaving the perceptual effects of domesticated animal sounds in real-world indoor environments largely unexplored [14,15].

Cat cafés present a distinctive setting for investigating how the presence and sounds of animals shape indoor soundscape perception. A cat café is a café where customers can enjoy food and drinks in the company of resident cats [16]. In this environment, cats are not merely background elements but the primary reason customers visit, meaning that customers are likely to perceive and interpret cat-related sounds differently from other ambient noise. At the same time, cats constitute a unique and largely uncontrollable sound source within the space. This combination of contextual meaning and physical sound contribution makes cat cafés a particularly suitable setting for examining how animal presence shapes indoor soundscape perception.

Several characteristics of cat cafés make their acoustic environments both challenging to manage and theoretically interesting to study. First, environments housing animals typically require higher ventilation rates to control odours and airborne pollutants [17], which can increase mechanical noise or, where natural ventilation is used, allow more external traffic noise to enter the space. Both types of noise are recognised sources of annoyance that can reduce acoustic comfort [18–21]. Second, sounds produced by cats, such as vocalisations, running, and jumping, may influence the soundscape either positively through biophilic associations or negatively as unwanted noise. In animal shelters, animal-generated sounds have been estimated to contribute up to 21% of overall noise levels [22], suggesting that their perceptual influence in cat cafés may also be notable. Third, traditional café environments have frequently been found to exceed recommended acoustic guidelines. Wright et al. (2016) [7] reported that none of the 30 cafés surveyed met standard noise level recommendations, suggesting that cat cafés may face similar challenges. In addition, whether the theoretical benefits associated with biophilia extend to real-world indoor environments featuring domesticated animals remains unclear. Unlike controlled laboratory settings or outdoor nature soundscapes, animal-themed indoor environments

such as cat cafés involve complex interactions between visitor expectations, unpredictable animal behaviour, ambient noise from multiple sources, and the social context of a hospitality setting, all of which may moderate soundscape perception in ways that existing theories do not fully account for.

Despite the rapid global expansion of cat cafés since their origin in Taiwan in 1998 [23,24] and their explicit orientation towards customer wellbeing, no study to date has systematically investigated soundscape perception in cat cafés or similar animal-themed indoor hospitality environments. This gap is notable for several reasons. First, existing research on cat cafés has focused predominantly on the benefits of human–animal interaction, such as stress reduction and mood improvement [25–27], without examining the acoustic dimension of the customer experience. Second, acoustic research in animal-housing facilities has concentrated on animal welfare rather than human perceptual experience [22,28], leaving it unknown how animal-generated sounds shape occupants’ perception of the acoustic environment. Third, the pleasant–eventful perceptual framework [6], adopted by ISO 12913-2 (2018) [29] as a standard tool for soundscape assessment, has been applied primarily in urban public spaces and conventional indoor settings; its applicability to animal-themed environments remains untested. Finally, although previous studies have demonstrated that objective acoustic measurements and subjective soundscape ratings often diverge in café settings [7,8], whether this pattern extends to cat cafés, where positively perceived animal sounds may offset the negative effects of elevated noise levels, has not been examined.

This study addresses these gaps through an exploratory cross-sectional investigation of soundscape perception and customer self-reported mood in London cat cafés. To provide a multifaceted characterisation of the acoustic experience, the study combined indicative acoustic measurements with a questionnaire-based soundscape assessment administered to 50 customers across three cat cafés. Three research questions guided the investigation: (1) What are the indicative acoustic conditions and customer soundscape perceptions in the sampled cat cafés, as assessed through the ISO 12913 pleasant–eventful perceptual framework [29]? (2) What associations exist between perceived sound source types (particularly sounds generated by cats) and customers’ acoustic comfort and self-reported mood? (3) To what extent are customers’ perceptual attribute ratings of the soundscape associated with their typical activities?

Three main findings emerged. First, although measured SPL substantially exceeded recommended guidelines in all sampled cafés, most customers rated the soundscape as pleasant, with responses clustered in the pleasant–uneventful region of the perceptual space. Second, acoustic comfort was positively associated with self-reported mood, and among six sound source types, only cat-generated sounds showed a significant positive association with mood. Third, associations between customer activities and soundscape perception did not reach statistical significance after correction for multiple comparisons, suggesting that larger samples may be needed to detect such effects.

2. Materials and Methods

This study adopted an exploratory cross-sectional design combining indicative acoustic measurements with a structured questionnaire-based soundscape assessment to examine how customers perceive the acoustic environment of cat cafés, a novel indoor setting in which humans and live animals coexist, and to explore associations between perceived sound sources (particularly cat-generated sounds), acoustic comfort, self-reported mood, and typical customer activities within the ISO 12913 pleasant–eventful perceptual framework. Data were collected from 50 customers (aged 18 and over) across three cat cafés in London during July–August 2024. Indicative sound pressure levels were recorded us-

ing a calibrated smartphone application, while soundscape perception, acoustic comfort, self-reported mood, and activity patterns were assessed via a paper-based questionnaire employing five-point ordinal scales.

2.1. Study Design and Setting

Nine establishments in London were initially identified as potential cat cafés through online searches (Google Maps v11.130.0104 and Google Search; keywords: “London cat café”). Site visits confirmed that only four were operating and met the definition of a cat café, namely a café in which “there are cats for customers to play with or watch” [16]. Of these four, three agreed to participate; the fourth declined due to concerns about disturbing customers.

Visits were conducted on weekdays during July–August 2024, when café owners were more available to accommodate the research and fewer ticketed slots were occupied compared with weekends, thereby minimising disruption to normal operations and the possibility of displacing regular customers. The 16:00–18:00 time slot was selected because it coincided with the evening rush hour, when traffic noise—a potentially significant contributor to café soundscapes—was expected to peak. Each two-hour visit also allowed sufficient time for on-site coordination and questionnaire collection.

Given the exploratory nature of the study and the limited capacity of each café (10–30 seated places), a convenience sample of 50 voluntary participants aged 18 and over was targeted. One café (Café 2) was visited twice to reach an adequate number of responses.

2.2. Indicative Acoustic Measurements Design

ISO 12913-2 (2018) recommends binaural measurements using an artificial head system for acoustic data collection [29]. However, café rules prohibit restraining the cats, and the uncontrolled movement of animals posed a risk of damage to such equipment. Indicative acoustic measurements were therefore conducted using NoiseCapture (v1.2.23), a free, open-source Android application that has been widely used for environmental noise assessment in peer-reviewed research [30–32].

The built-in traffic-based calibration procedure described by Aumond et al. (2020) [33] was employed to improve measurement accuracy. For each calibration session, a dry, well-maintained asphalt road within the London urban area, subject to a 30 mph (48 km/h) speed limit, was selected. Measurement positions were chosen to be distant from traffic lights, intersections, and other obstacles so that passing vehicles were likely travelling at or near the posted speed limit. At each position, a measuring tape was used to mark a point approximately 5 m perpendicular to the road centreline, where the researcher held the smartphone (Huawei Honor 20; Huawei Technologies Co., Ltd., Shenzhen, China) at 1.5 m above ground level. After 15 isolated vehicle pass-bys were detected, the calibration at that position was complete. This procedure was repeated at three separate locations, as recommended by the protocol. According to Aumond et al. (2020) [33], this method yields an average measurement error of -0.6 ± 1.2 dB(A) relative to a Class 1 sound level meter.

During data collection, the researcher walked through the café with the smartphone placed on the shoulder to approximate ear-level recording (~1.5 m above ground), with brief placements on the table when distributing questionnaires and explaining the consent procedure. Although NoiseCapture can support indicative measurements, it should be noted that smartphone microphones are less sensitive than professional-grade equipment and may introduce higher inherent noise [34].

2.3. Questionnaire Design

A paper-based questionnaire was developed to assess soundscape perception, self-reported mood, acoustic comfort, sound source perception, typical activity patterns, and suggestions for acoustic improvement. An information sheet addressing potential data-

security concerns accompanied each questionnaire. The instrument was adapted from Torresin et al. (2023) [34] and incorporated the eight perceptual attributes (PAs) proposed by Axelsson et al. (2010) [6], pleasant, annoying, eventful, uneventful, calm, chaotic, vibrant, and monotonous (Figure 1), rated on a five-point ordinal scale in accordance with ISO 12913-2 Method A [29]. To reflect the specific context of cat cafés, cat-related sound sources and questions on typical customer activities were added. To minimise respondent burden and encourage participation, the questionnaire was designed for completion in approximately five minutes. Brief definitions of potentially unfamiliar terms (e.g., “chaotic”, “vibrant”, “monotonous”) were provided on the basis of the Oxford English Dictionary [35]. The full questionnaire is included in Appendix A.

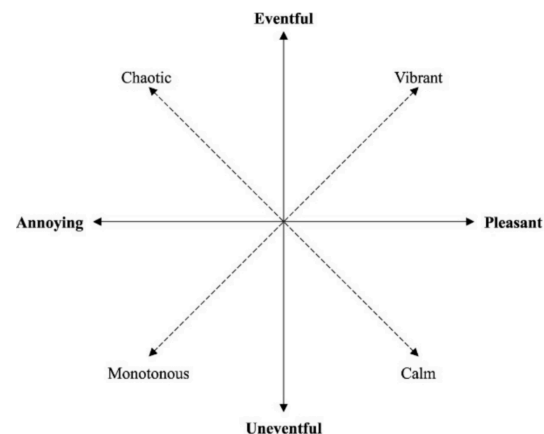


Figure 1. The eight perceptual attributes used in ISO/TS 12913-2 Method A for soundscape assessment, adapted from Axelsson et al. (2010) [6].

The key questions analysed in this study were as follows:

- Acoustic comfort (Q5): “How would you describe the overall acoustic environment of the café?”, rated from 1 (“very annoying”) to 5 (“very pleasant”).
- Self-reported mood (Q6): “How are you feeling right now?”, rated from 1 (“depressed”) to 5 (“elated”).
- Sound source perception (Q7): “To what extent do you presently hear the following types of sounds?”, assessed for six categories: traffic noise, human sounds, cat sounds, natural sounds, mechanical ventilation sounds, and background music. Each rated from 1 (“not at all”) to 5 (“dominates completely”).
- Soundscape perception (Q8): “To what extent do you agree or disagree that the present surrounding sound environment is ... [pleasant/annoying/eventful/uneventful/calm/chaotic/vibrant/monotonous]?”, rated from 1 (“strongly disagree”) to 5 (“strongly agree”).
- Activity frequency (Q10): “What do you usually do at the cat café?”, assessed for five activities: relax, chat, play with cats, eat and drink, work or study. Each rated from 1 (“never”) to 5 (“very often”). This item captured usual rather than current activity.
- Customer suggestions (Q12): Participants rated the perceived importance of five potential acoustic improvements: soundproofing, reducing background music, increasing background music, layout design, and ventilation management—from 1 (“unnecessary”) to 5 (“essential”).
- Demographic items (Q1–Q4): Age, gender, visit frequency, and duration of stay were collected as descriptive context.

Q9 (perceived influence of each sound source on experience) was excluded from analysis because the questionnaire did not include a “not applicable” option for sound sources that respondents had not heard, making responses for inaudible sources uninterpretable.

2.4. Data Collection Procedure

Upon arrival at each café, the researcher presented the information sheet to staff and obtained permission from the café owner to conduct the study. While awaiting approval, the researcher observed and recorded physical and environmental features potentially relevant to the acoustic environment, including glazing type, ventilation method, location of HVAC units and ducts, floor and wall materials, seating layout, and presence of background music.

Once permission was granted, continuous acoustic recording was initiated using NoiseCapture on the smartphone. Concurrently, the researcher approached customers individually, briefly explained the purpose of the study and the consent process, and emphasised that participation was voluntary, anonymous, and that responses could be withdrawn at any time before submitting the questionnaire. Willing participants were handed the paper questionnaire to complete on-site. This process was repeated whenever new customers entered the café during the recording session.

2.5. Data Analysis

The data collected comprised three categories: (1) physical and environmental characteristics of each café (location type, glazing type, ventilation type, floor and wall materials, partial carpeting, background music, and notable sound sources), observed and recorded by the researcher through visual inspection during each visit; (2) indicative acoustic measurements, used to characterise the acoustic environment; and (3) questionnaire responses, used to examine soundscape perceptions and their associations with acoustic comfort, self-reported mood, perceived sound sources, and typical customer activities. The visit codes follow a [café]_[visit] convention (e.g., “Café 1_1,” meaning Café 1, first visit).

2.5.1. Analysis of Indicative Acoustic Measurements

To characterise the indicative acoustic environment of each sampled café, standard SPL descriptors—LA50, LA90, LA10, and overall minimum, maximum, and mean levels—were extracted from the NoiseCapture recordings to describe typical, peak, and background noise levels. Overall SPL descriptors were read directly from the application’s built-in summary; mean 1/3 octave band levels (100 Hz–16 kHz) were computed from per-second spectral data exported in GeoJSON format using Microsoft Excel.

2.5.2. Descriptive Statistics of Questionnaire Responses

All Likert-type responses were treated as ordinal data. Medians, interquartile ranges (IQRs), and percentage distributions were calculated for all items rated on the five-point scale. Frequency distributions were reported for demographic variables (age, gender, visit frequency, and duration of stay). For items where an “I don’t know” option was provided (Q11 and Q12), such responses were treated as missing data and excluded from analysis.

2.5.3. ISO Pleasant and ISO Eventful Coordinates

To locate each respondent’s soundscape perception within the pleasant–eventful perceptual space, ISO Pleasant and ISO Eventful coordinates were calculated following Mitchell et al. (2022) [36]:

$$\text{ISO pleasant} = [(\text{pleasant-annoying}) + \cos 45^\circ \times (\text{calm-chaotic}) + \cos 45^\circ \times (\text{vibrant-monotonous})] \times 1/(4 + \sqrt{32}) \quad (1)$$

$$\text{ISO eventful} = [(\text{eventful-uneventful}) + \cos 45^\circ \times (\text{chaotic-calm}) + \cos 45^\circ \times (\text{vibrant-monotonous})] \times 1/(4 + \sqrt{32}) \quad (2)$$

The resulting coordinates range from -1 to $+1$, with higher ISO Pleasant values indicating a more pleasant perceived soundscape and higher ISO Eventful values indicating a more eventful one. Individual responses were plotted as scatter and density plots using Soundscapy [36].

2.5.4. Correlation Analyses

Associations between key variables were examined using two-tailed Spearman rank correlations ($\alpha = 0.05$), with 95% confidence intervals estimated via the Fisher z-transformation [37]. Correlations were computed using SciPy's `spearmanr` function (v1.14.0), which assigns tied values their average rank and calculates the correlation as the Pearson coefficient of the ranked variables. Effect sizes were interpreted following Cohen (1988) [38]: $|r_s| < 0.10$, negligible; 0.10–0.29, small; 0.30–0.49, medium; ≥ 0.50 , large.

Holm correction was applied within each family of tests to control the family-wise error rate: (a) acoustic comfort and mood ($M = 1$; no correction needed); (b) six sound source types and mood ($M = 6$); (c) the eight-PA inter-correlation matrix ($M = 28$); and (d) five activities against ISO Pleasant and ISO Eventful coordinates ($M = 10$). The statistical methods and correction procedures for all correlation analyses are summarised in Table 1.

Table 1. Summary of correlation analyses, including variable pairs, statistical methods, and multiple-comparison correction procedures.

Analysis	Variable Pair	Method	Correction
Acoustic comfort & mood	Acoustic comfort; Self-reported mood	Spearman rank correlation	None ($M = 1$)
Sound sources & mood	6 perceived sound source levels (traffic, human, cat, nature, ventilation, music); Self-reported mood	Spearman rank correlation	Holm ($M = 6$)
Activities & soundscape dimensions	5 activities (relax, chat, play with cats, dine, work); ISO Pleasant and ISO Eventful coordinates [36]	Spearman rank correlation	Holm ($M = 10$)
Inter-correlations among 8 PAs	8 PAs [6]	Spearman rank correlation	Holm ($M = 28$)

Despite its very small subsample ($n = 2$), Café 3 was retained in the main analysis. Excluding it would have limited the study to only two cafés, making the findings more specific to the particular circumstances of the two cafés, reducing the extent to which results can be generalised to cat cafés as a category rather than to individual establishments. The low response count reflected Café 3's child-oriented character: most adult visitors were parents supervising young children who were unable to complete the questionnaire.

As a sensitivity check, key analyses were re-run excluding Café 1, Café 2, and Café 3 respectively.

2.6. Ethical Approval

This study was approved on 5 June 2024 by the Local Research Ethics Committee of the UCL Bartlett School of Environment Energy and Resources. All participants provided informed consent in accordance with the Declaration of Helsinki.

2.7. Use of Generative AI Tools

Generative AI (Claude, claude-opus-4-6, Anthropic) was used to assist in polishing language (by improving its grammar, wording, and clarity), developing the data analysis coding script for statistical computations (e.g., calculating median values and p -values) and cross-checking statistical calculations. All AI-generated code and outputs were reviewed, validated, and, where necessary, modified by the authors, who take full responsibility for the accuracy of the statistical results and the content of this publication.

3. Results

Descriptive statistics (median, Q1, Q3, IQR) for all Likert-scale questionnaire items are provided in Appendix B. The following sections report only those results directly relevant to the research questions.

3.1. Café Characteristics and Participant Characteristics

All three cafés shared similar basic features: mechanical ventilation with windows closed, wooden flooring, painted concrete walls, background music, and audible cutlery sounds. A total of 50 responses were collected across four site visits to three cafés: 11 from Café 1, 37 from Café 2 (23 from the first visit and 14 from the second), and 2 from Café 3. The physical and environmental characteristics of each café during the visits are summarised in Table 2.

Table 2. Physical and environmental characteristics of the three sampled cat cafés, as observed during site visits, including recording times.

Characteristic	Café 1	Café 2	Café 3
Location type	Main road	Commercial street	Central London
Participants (<i>n</i>)	11	23 (first visit); 14 (second visit)	2
Glazing type	Single glazing, far from seating area	Large single glazing, far from seating area	Skylight
Windows status during measurement	Closed	Closed	Closed
Ventilation	Mechanical	Mechanical	Mechanical
HVAC location	Ceiling-mounted	Ceiling-mounted	Ceiling-mounted
Floor material	Wooden floor	Wooden floor	Wooden floor
Wall material	Concrete (painted)	Concrete (painted)	Concrete (painted)
Partial carpeting	No	Yes	Yes
Background music	Yes	Yes	Yes
Notable sound sources	Relatively loud cutlery noise	Humidifier with audible water flow	Service hatch connecting kitchen
Number of cats *	10	17	13
Recording time	16:15–17:55	16:15–17:50 (first visit); 16:05–17:55 (second visit)	16:10–17:55

* The figures show only the number of cats reported by café, and do not reflect the number of cats accessible to customers at any given moment.

At Cafés 1 and 2, which admit only visitors aged 12 and above, all customers approached agreed to participate and returned completed questionnaires: 11 at Café 1, 23 at the first visit to Café 2, and 14 at the second visit, yielding a 100% response rate across these three visits. At Café 3, which admits children, 6 customers were approached but 4 declined because they were parents supervising young children and were unable to complete the questionnaire; the remaining 2 participated and returned completed questionnaires. In total, 54 customers were approached and 50 completed the survey, yielding an overall response rate of 93%.

Among the participants, 90% were under 30 years of age, and approximately three-quarters (74%) were female. Roughly two-thirds (64%) were visiting a cat café for the first or second time, and a similar proportion (64%) had stayed for over 30 min before completing the questionnaire.

3.2. Indicative Acoustic Environment

The indicative SPL measurements from the four visits are presented in Table 3. While the maximum SPL varied considerably across cafés, ranging from 84 to 95 dB(A), the other descriptors were relatively consistent: mean SPL ranged from 70 to 76 dB(A), minimum SPL from 58 to 62 dB(A), LA90 from 62 to 66 dB(A), LA50 from 65 to 72 dB(A), LA10 from 72 to 79 dB(A), and LA10–LA90 from 10 to 13 dB(A).

Table 3. Indicative A-weighted sound pressure level descriptors (dB(A)) measured with NoiseCapture across four visits to three cat cafés.

Indicative SPL dB(A)	Min	LA90	LA50	LA10	Max	LAeq	LA10–LA90
Café 1_1	58	63	68	76	88	73	13
Café 2_1	61	66	72	79	95	76	13
Café 3_1	59	62	65	72	84	70	10
Café 2_2	62	65	69	76	90	74	11

Measured results indicate that SPL remained between 65 and 75 dB(A) for more than two-thirds of the recording time in all visits except at Café 3, where levels most commonly stayed between 55 and 65 dB(A), likely because Café 3 had noticeably fewer customers during the visit. Overall, SPLs across all cafés were well above the 45–50 dB(A) recommended by CIBSE Guide A (2015) for cafeterias. It should be noted that the CIBSE criterion refers to noise from building services under unoccupied design conditions, whereas the values reported here represent total sound levels during occupied operation, including speech, music, cat sounds, and other sources; the comparison should therefore be interpreted with this distinction in mind. The percentage of time at each SPL range is presented in Appendix C.

The mean one-third octave band frequency distributions, shown in Figure 2, exhibited similar trends across all four visits. Energy was concentrated primarily between 250 and 5000 Hz, with SPL typically ranging from 55 to 65 dB(A). A slight increase was observed between 5000 and 8000 Hz, reaching approximately 69 dB(A).

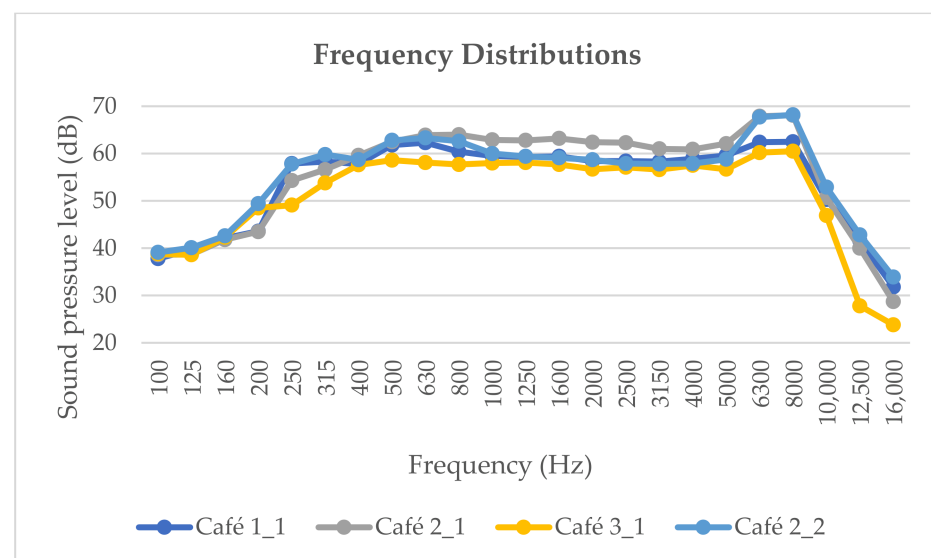


Figure 2. Mean one-third octave band sound pressure level distributions (100 Hz–16 kHz) for each café visit, measured using NoiseCapture.

3.3. Soundscape Perceptions

3.3.1. Acoustic Comfort and Self-Reported Mood

Descriptive statistics for acoustic comfort and self-reported mood are shown in Table 4. Both variables had a median of 4, though self-reported mood exhibited slightly greater variability (IQR = 1) than acoustic comfort (IQR = 0). Overall, 88% of respondents rated the acoustic environment as pleasant or very pleasant (Figure 3), and 84% reported being in a happy or elated mood (Figure 4). The breakdown of acoustic comfort ratings by café visit (Figure 5) indicates that the distribution of ratings was broadly similar across venues. Likewise, the breakdown of self-reported mood by café visit (Figure 6) shows that customers at all cafés predominantly reported happy to elated mood states.

Table 4. Descriptive statistics for acoustic comfort and self-reported mood ratings ($n = 50$).

Variable	n	Median	Q1	Q3	IQR
Acoustic comfort	50	4	4	4	0
Self-reported mood	50	4	4	5	1

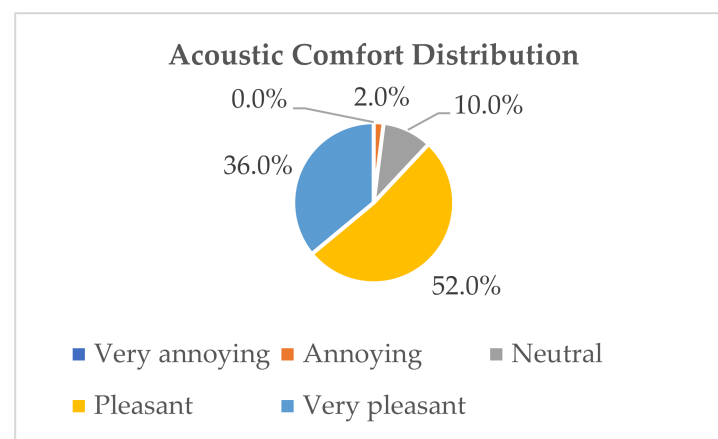


Figure 3. Distribution of acoustic comfort ratings across all respondents ($n = 50$), rated on a five-point scale from “very annoying” (1) to “very pleasant” (5).

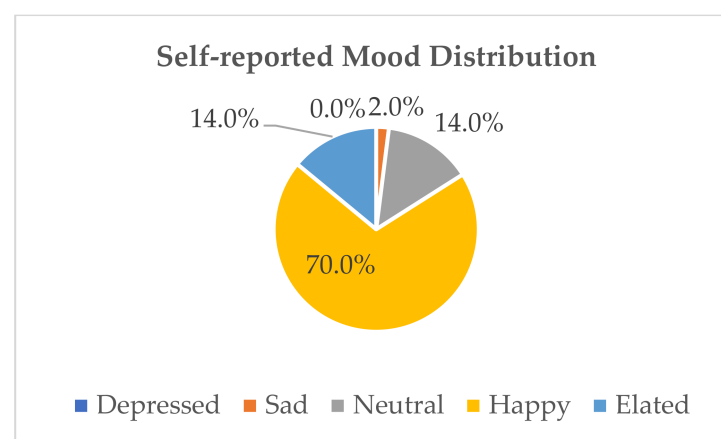


Figure 4. Distribution of self-reported mood ratings across all respondents ($n = 50$), rated on a five-point scale from ‘depressed’ to ‘elated’.

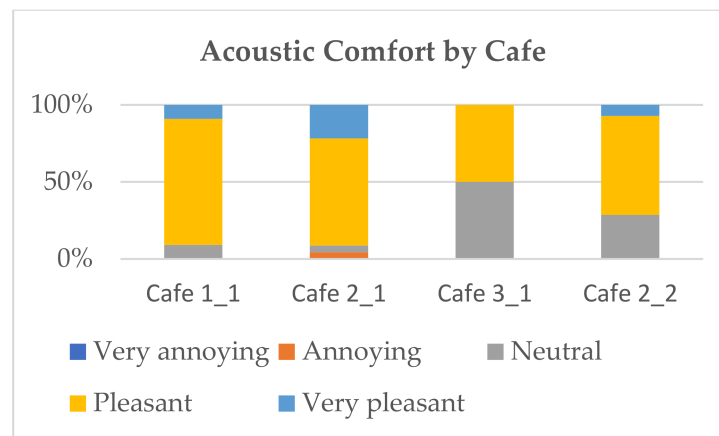


Figure 5. Distribution of acoustic comfort ratings by café visit, rated on a five-point scale from “very annoying” (1) to “very pleasant” (5).

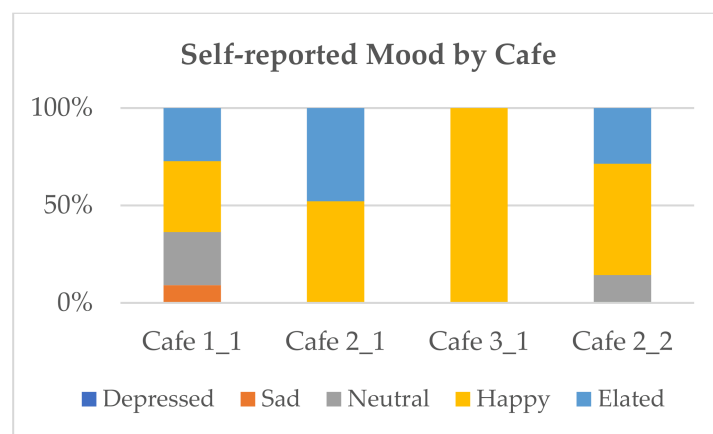


Figure 6. Distribution of self-reported mood ratings by café visit, rated on a five-point scale from “depressed” (1) to “elated” (5).

3.3.2. Sound Source Perception

Table 5 presents the median and IQR for the perceived loudness of each sound source type, and Figure 7 shows the percentage distribution of responses across the five-point scale. Human sounds and background music were the most prominently heard sources, each with a median rating of 3 (“moderately”). All other sound sources had median ratings at the “a little” (2) or “not at all” (1) level. Additionally, three participants provided unsolicited comments about the sound of coffee tableware, rating it at the “a little” level (2 points). The breakdown of cat-sound perception by café visit (Figure 8) indicates that the distribution of perceived cat-sound loudness was broadly similar across venues.

Table 5. Descriptive statistics for perceived loudness of six sound source types ($n = 50$), rated on a five-point scale from “not at all” (1) to “dominates completely” (5).

Sound Source	<i>n</i>	Median	Q1	Q3	IQR
Traffic	50	1	1	1	0
Human	50	3	2	3	1
Cats	50	2	1	2	1
Nature	50	1	1	2	1
Ventilation	50	2	2	3	1
Music	50	3	3	4	1

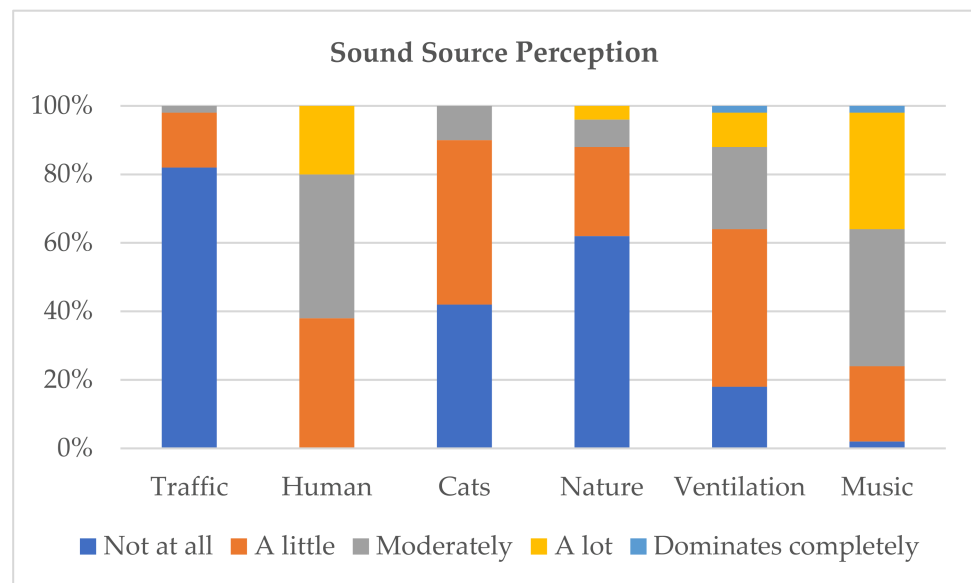


Figure 7. Distribution of perceived loudness for six sound source types, shown as the percentage of respondents selecting each level on a five-point scale from “not at all” (1) to “dominates completely” (5) ($n = 50$).

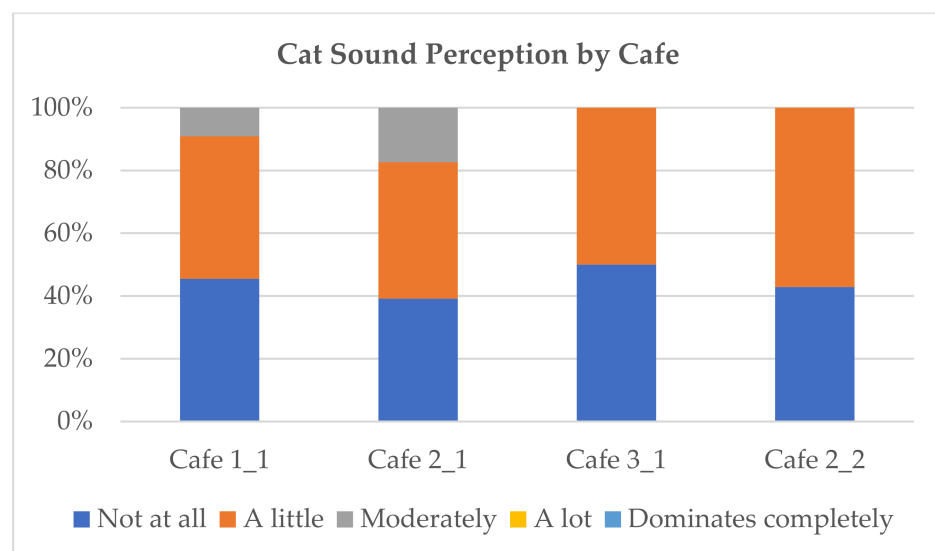


Figure 8. Distribution of perceived cat-sound loudness by café visit, rated on a five-point scale from “not at all” (1) to “dominates completely” (5). Note: The original questionnaire included five response options represented by five colors. Yellow and light blue options received no responses and thus do not appear in the figure.

3.4. Perceptual Attributes and the Pleasant–Eventful Perceptual Space

Table 6 presents the median and IQR for each of the eight perceptual attributes (PAs). Among the eight PAs, pleasant and calm received the highest ratings (both median = 4, IQR = 1), while chaotic and monotonous received the lowest (both median = 1, IQR = 1). Annoying was also rated low (median = 2, IQR = 0.75). The widest spread was observed for uneventful (median = 2, IQR = 2).

ISO Pleasant and ISO Eventful coordinates were calculated for each respondent following Mitchell et al. (2022) [36]. The median ISO Pleasant coordinate was 0.48 (IQR = 0.22; mean = 0.47, SD = 0.22). The median ISO Eventful coordinate was −0.04 (IQR = 0.47; mean = −0.04, SD = 0.34). These values indicate that the overall soundscape of the sampled cat cafés was perceived as pleasant and slightly uneventful.

Table 6. Descriptive statistics for the eight soundscape perceptual attributes ($n = 50$), rated on a five-point scale from “strongly disagree” (1) to “strongly agree” (5).

Perceptual Attributes	n	Median	Q1	Q3	IQR
Eventful	50	3	2	3	1
Vibrant	50	3	2	3	1
Chaotic	50	1	1	2	1
Uneventful	50	2	1	3	2
Calm	50	4	3	4	1
Monotonous	50	1	1	2	1
Pleasant	50	4	4	5	1
Annoying	50	2	1.25	2	0.75

Figure 9 presents the individual responses plotted in the pleasant–eventful perceptual space. The majority of responses fell within the pleasant half of the space, with a concentration towards the calm–pleasant quadrant.

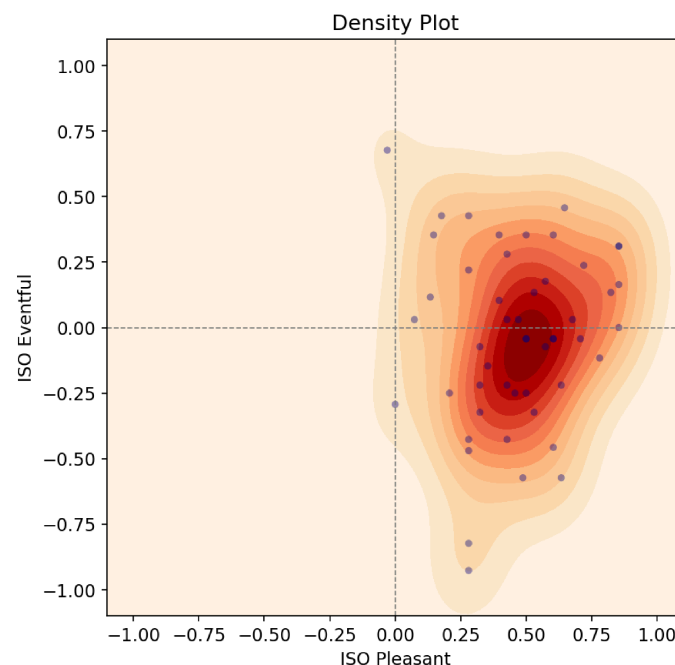


Figure 9. Individual soundscape perception responses plotted in the ISO pleasant–eventful perceptual space ($n = 50$), with coordinates calculated following Mitchell et al. (2022) [36]. Filled contours show bivariate kernel-density estimates divided into nine equal-probability bands ($\sim 10.6\%$ each), forming nested highest-density regions from approximately 10 % (innermost) to 95 % (outermost), with darker shading indicating higher density.

3.5. Core Correlations

3.5.1. Acoustic Comfort, Perceived Sound Sources, and Self-Reported Mood

Table 7 presents Spearman rank correlations between acoustic comfort and self-reported mood, and between the six perceived sound source levels and self-reported mood, with Holm-adjusted p -values. Acoustic comfort showed a significant medium positive association with mood ($r_s = 0.35$, 95% CI [0.08, 0.57], Holm-adjusted $p = 0.01$). Among the six sound source types, only cat-generated sounds were significantly associated with mood, showing a medium positive association ($r_s = 0.41$, 95% CI [0.15, 0.62], Holm-adjusted $p = 0.02$). The remaining sound source types showed no significant associations with mood.

Table 7. Spearman rank correlations of acoustic comfort and six perceived sound source levels with self-reported mood ($n = 50$), with 95% confidence intervals and Holm-adjusted p -values. Significant associations (Holm-adjusted $p < 0.05$) are indicated.

Correlations	n	r_s	p Value	CI Low	CI High	Holm adj p	Significant
Acoustic comfort $\leftrightarrow$ Mood	50	0.35	0.01	0.08	0.57	0.01	Sig.
Traffic sounds $\leftrightarrow$ Mood	50	−0.13	0.37	−0.39	0.15	1.00	n.s.
Human sounds $\leftrightarrow$ Mood	50	−0.26	0.07	−0.50	0.02	0.35	n.s.
Cat sounds $\leftrightarrow$ Mood	50	0.41	0.003	0.15	0.62	0.02	Sig.
Nature sounds $\leftrightarrow$ Mood	50	0.003	0.98	−0.28	0.28	1.00	n.s.
Ventilation sounds $\leftrightarrow$ Mood	50	−0.19	0.19	−0.44	0.09	0.74	n.s.
Music sounds $\leftrightarrow$ Mood	50	−0.14	0.34	−0.40	0.15	1.00	n.s.

A sensitivity analysis excluding each café in turn showed that the direction of the associations was generally preserved, although precision decreased substantially when Café 1 or Café 2 was excluded owing to the reduced sample size. These analyses were interpreted as influence diagnostics rather than confirmatory tests. Full results are presented in Appendix D.

A boxplot of mood by cat-sound perception level is shown in Figure 10. Participants who did not perceive cat sounds at all reported a median mood of happy. Those who perceived cat sounds a little had a higher average mood rating, with most responses ranging from happy to elated. The “moderately” group showed the most positive pattern overall, with a median rating of elated. However, this result should be interpreted cautiously because the group had only five participants.

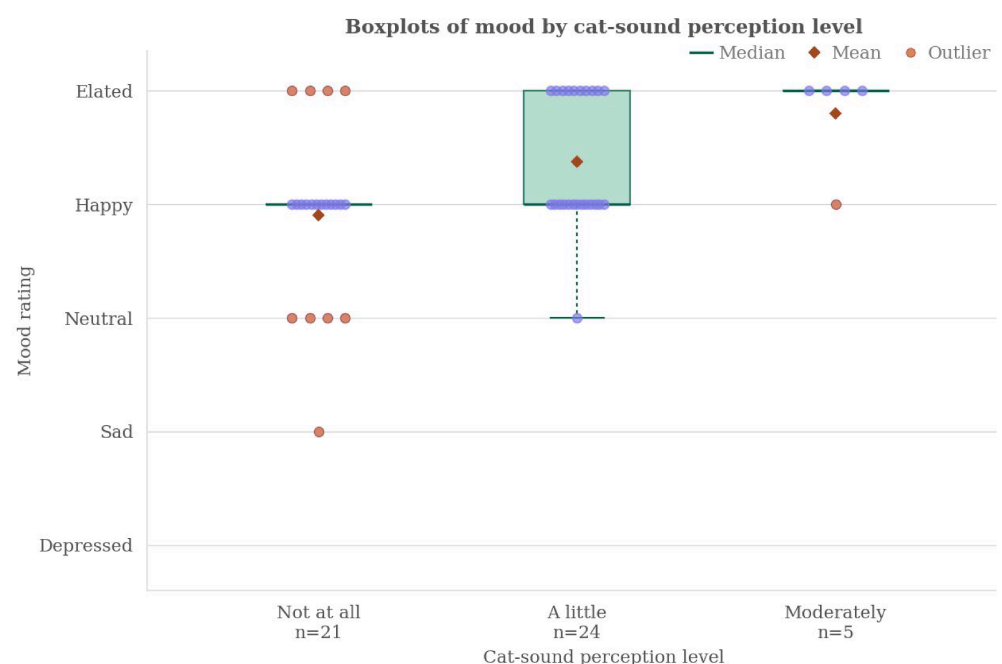


Figure 10. Boxplot of self-reported mood ratings grouped by perceived cat-sound loudness level. Mood was rated on a five-point scale from “depressed” (1) to “elated” (5); cat-sound loudness was rated from “not at all” (1) to “dominates completely” (5).

3.5.2. Exploratory Associations Between Activity Frequency and Soundscape Perceptions

Spearman rank correlations between five usual activities (relaxing, chatting, playing with cats, dining, and working/studying) and the ISO Pleasant and ISO Eventful coordinates were examined to explore whether customers’ usual activity patterns were associated with their soundscape perceptions. After Holm correction ($M = 10$), none of the

associations reached statistical significance. The largest observed coefficients were between working/studying and ISO Eventful ($r_s = 0.30$, raw $p = 0.03$, Holm-adjusted $p = 0.34$) and between relaxing and ISO Eventful ($r_s = -0.26$, raw $p = 0.06$, Holm-adjusted $p = 0.58$), though neither reached statistical significance after correction.

It should be noted that this analysis associates a dispositional measure (usual activity frequency) with a state measure (current soundscape perception). The results should therefore be interpreted with caution, as the two variables operate on different time scales. Full results are provided in Appendix E.

3.5.3. Perceptual Attribute Inter-Correlations

Spearman rank correlations among the eight PAs were examined ($M = 28$ pairs, Holm correction applied). Six pairs remained statistically significant after correction: eventful and vibrant showed a strong positive association ($r_s = 0.69$, Holm-adjusted $p < 0.001$); uneventful and monotonous showed a strong positive association ($r_s = 0.71$, Holm-adjusted $p < 0.001$); and eventful and chaotic showed a medium positive association ($r_s = 0.44$, Holm-adjusted $p = 0.03$). Significant negative associations were observed between pleasant and annoying ($r_s = -0.47$, Holm-adjusted $p = 0.01$), uneventful and vibrant ($r_s = -0.49$, Holm-adjusted $p = 0.01$), and vibrant and monotonous ($r_s = -0.47$, Holm-adjusted $p = 0.01$). The remaining 22 pairs did not reach significance after correction. The full correlation matrix is provided in Appendix F.

3.6. Customer Recommendations

Figure 11 presents customers' ratings of five potential acoustic improvement measures for the cat cafés. The median rating across all measures was 2 ("optional"; IQR = 2), suggesting that the overall acoustic environment generally met most customers' expectations. Among the five measures, layout design received the highest rating, with nearly half of customers considering it "helpful," "important," or "essential." Notably, although most respondents rated ventilation noise reduction as "unnecessary" or "optional," this item received the highest number of "essential" ratings among all five measures, suggesting that perceived ventilation noise may vary considerably across seating locations within the café.

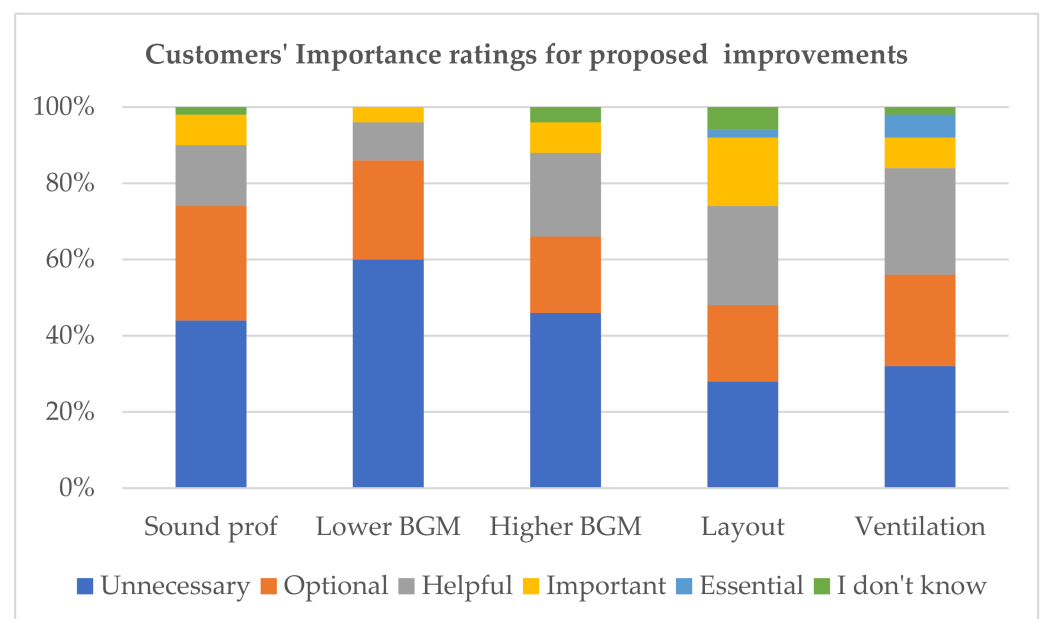


Figure 11. Distribution of customer ratings for five potential acoustic improvement measures, rated on a five-point scale from "unnecessary" (1) to "essential" (5) ($n = 50$).

4. Discussion

This study examined soundscape perception and customer self-reported mood in London cat cafés, a setting where customers and live animals share the same indoor space. Three main findings emerged. First, although measured SPL in all sampled cafés substantially exceeded recommended guidelines, most customers rated the soundscape as pleasant, with responses clustered in the pleasant–uneventful region of the perceptual space. Second, acoustic comfort was positively associated with self-reported mood, and among six sound source types, only sounds generated by cats showed a significant positive association with mood. Third, no significant associations were found between typical activities and soundscape perceptions after correction for multiple comparisons, though some directional trends were observed. The following sections discuss these findings in relation to the existing literature, consider preliminary design implications, and identify limitations and directions for future research.

4.1. Indicative Acoustic Conditions

The indicative acoustic measurements revealed broadly consistent conditions across all sampled cafés in both SPL and frequency distribution. LA50 ranged from 65 to 72 dB(A), comparable to levels reported in traditional cafés by Wright et al. (2016) [7], but approximately 20 dB(A) above the 45–50 dB(A) recommended by CIBSE Guide A (2015) for cafeterias [39]. This comparison should be interpreted with caution, as the CIBSE criterion represents unoccupied design-stage background noise, whereas the measured values include all sources present during occupied operation. Nevertheless, the observed exceedance is consistent with Wright et al. (2016) and Christie (2004), who similarly compared occupied café sound levels against guideline values and reported that café environments commonly exceed these thresholds [7,8]. The LA10–LA90 difference of 10 to 13 dB(A) across all four visits indicates moderate temporal fluctuation in the acoustic environment. Energy was concentrated primarily between 250 and 5000 Hz; a slight increase observed between 5000 and 8000 Hz may partly reflect contact noise between the phone microphone and the researcher’s clothing rather than a genuine environmental feature.

4.2. Divergence Between Measured SPL and Perceived Soundscape

Despite these elevated SPLs, 88% of respondents rated the acoustic environment as pleasant or very pleasant. This divergence between indicative acoustic conditions and subjective evaluations is consistent with findings from traditional café settings [7,8] and reinforces the growing evidence that soundscape perception cannot be fully predicted from physical parameters alone [1,6]. In the pleasant–eventful perceptual space, responses clustered in the pleasant region with a slight inclination towards the uneventful side (median ISO Pleasant = 0.48; median ISO Eventful = −0.04), consistent with the relaxation-oriented character of cat cafés [40]. The high prevalence of positive soundscape ratings despite objectively elevated indicative SPL suggests that context-specific factors, such as visitor expectations, the presence of animals, and the social atmosphere, may play a substantial role in shaping acoustic experience in these settings. This point is further supported by the customer recommendation data: the median rating across five potential acoustic improvement measures was 2 (“optional”; IQR = 2), indicating that most customers did not perceive a strong need for acoustic intervention.

4.3. Applicability of the ISO 12913 Pleasant–Eventful Framework

The inter-correlations among the eight perceptual attributes appeared consistent with the circumplex structure reported by Axelsson et al. (2010) [6], with expected positive associations (e.g., eventful–vibrant, $r_s = 0.69$; uneventful–monotonous, $r_s = 0.71$) and neg-

ative associations (e.g., pleasant–annoying, $r_s = -0.47$; uneventful–vibrant, $r_s = -0.49$) reaching significance after Holm correction. Although only 6 of 28 pairs remained significant, this may partly reflect the limited statistical power of the small sample rather than substantive deviations from the established framework. Overall, these results suggest that the ISO 12913 pleasant–eventful perceptual framework appeared applicable in this novel animal-themed indoor setting, though further validation with larger samples is warranted.

4.4. Acoustic Comfort, Cat-Generated Sounds, and Self-Reported Mood

Acoustic comfort showed a medium positive association with self-reported mood ($r_s = 0.35$, Holm-adjusted $p = 0.01$), indicating that customers who perceived the acoustic environment as more comfortable also tended to report better mood. However, because acoustic comfort ratings exhibited a pronounced ceiling effect (median = 4, IQR = 0), with 88% of respondents selecting “pleasant” or “very pleasant,” the restricted variance may have attenuated the observed association.

Among the six sound source types assessed, only cat-generated sounds showed a significant positive association with self-reported mood ($r_s = 0.41$, Holm-adjusted $p = 0.02$). Traffic noise, human sounds, natural sounds, ventilation noise, and background music showed no significant associations. One possible explanation for this finding is biophilia theory [9], which posits that humans have an innate tendency to attend and respond positively to natural and animal-related stimuli. While previous biophilia research has focused predominantly on wild animal sounds in outdoor or laboratory settings [10–15], the present finding provides preliminary evidence that sounds from domesticated animals in real-world indoor environments may also be positively associated with mood, a possibility that warrants further exploration.

However, several alternative explanations must be considered. First, reverse causality cannot be ruled out: customers already in a positive mood may have perceived and rated cat sounds more favourably. Second, most visitors in the sample were likely self-selected cat enthusiasts with pre-existing positive attitudes towards cats, so the observed association may reflect personal preference rather than a general biophilic response. Third, hearing more cat sounds typically coincides with greater physical proximity to cats, more cat–human interaction, and increased visual contact; the cross-sectional design cannot disentangle whether the association reflects an acoustic effect, a social interaction effect, a visual effect, or some combination. These interpretive constraints apply, to varying degrees, to both the acoustic comfort–mood and cat sound–mood associations. A sensitivity analysis excluding each café in turn showed that the direction of the associations was generally preserved, although precision decreased substantially with reduced sample sizes (Appendix D). Controlled experimental designs, such as comparing conditions with and without cats present, or using recorded audiovisual stimuli to independently manipulate acoustic and visual variables, are needed to isolate the specific contribution of cat sounds.

4.5. Activities and Soundscape Perception

Despite the relatively large variation in ISO Eventful coordinates (IQR = 0.47) and the theoretical expectation that different activities may favour different soundscape characteristics [34], none of the associations between usual activity frequency and soundscape perception reached statistical significance after Holm correction ($M = 10$). Directional trends were observed—for instance, a positive association between working/studying and ISO Eventful ($r_s = 0.30$, raw $p = 0.03$, Holm-adjusted $p = 0.34$) and a negative association between relaxing and ISO Eventful ($r_s = -0.26$, raw $p = 0.06$, Holm-adjusted $p = 0.58$), that are directionally plausible: customers who usually work or study at cat cafés may be more sensitive to surrounding activity, while those who primarily relax may perceive the

environment as less eventful. However, these results should be interpreted with particular caution, as this analysis associates a dispositional measure (usual activity frequency) with a state measure (current soundscape perception), and the small sample may have provided insufficient statistical power to detect moderate effects.

4.6. Preliminary Design Considerations

Given the exploratory nature of this study, the small sample, and the cross-sectional design, the following points are offered as preliminary design considerations rather than prescriptive recommendations. They should be tested in future work with larger samples and controlled designs before being adopted as guidance.

The overall acoustic environment of the sampled cat cafés generally met customer expectations, as reflected by the high proportion of positive soundscape ratings and the modest median rating (2, “optional”; IQR = 2) for proposed improvement measures. Nevertheless, several specific observations point to potential areas for acoustic refinement.

Layout design received the highest ratings among the five improvement measures, with nearly half of respondents considering it “helpful,” “important,” or “essential.” Given that cat-generated sounds were the only source type positively associated with mood, one approach may be to strategically position cat-preferred resting and activity features—such as cat trees, cushioned platforms, and warm or sunlit spots—in closer proximity to customer seating areas, thereby increasing opportunities for natural cat–human acoustic and visual contact. However, because the present study cannot determine whether the observed mood association is driven by cat sounds per se, by co-occurring visual contact, or by direct interaction, the effectiveness of such layout modifications would need to be empirically verified. Any such changes would also need to account for hygiene requirements and animal welfare considerations.

Three participants provided unsolicited comments identifying the sound of coffee tableware as a noticeable source, and a service hatch connecting the kitchen to the customer area was observed. Although based on anecdotal evidence, these observations suggest that improved acoustic separation between kitchen and customer areas, for example, through the use of solid partitions rather than open service hatches, may merit consideration and further investigation.

Ventilation noise presented a polarised pattern in customer ratings: while most respondents rated ventilation noise reduction as “unnecessary” or “optional,” this measure received the highest number of “essential” ratings among all five improvement measures. Given that all three cafés employed ceiling-mounted mechanical ventilation, this polarised response likely reflects spatial variation in exposure, with customers seated directly beneath or near HVAC outlets experiencing substantially more ventilation noise than those seated further away. Positioning ventilation outlets away from customer seating areas and from zones where cats frequently rest or play may help mitigate this localised concern.

More broadly, the findings of this study suggest that acoustic design for animal-themed hospitality environments need not be solely guided by the minimisation of SPL. The substantial divergence between measured SPL and perceived acoustic comfort indicates that the meaning and context of sounds, including visitor expectations, the sounds and presence of animals, and the social atmosphere, play a significant role in shaping acoustic experience [6]. Design strategies that attend to these contextual factors, alongside conventional acoustic parameters, may be more effective in creating environments that are perceived as comfortable and that support positive mood.

4.7. Limitations and Future Directions

Several limitations should be acknowledged, along with corresponding directions for future research.

The sample was small ($n = 50$) and demographically homogeneous (90% aged under 30, 74% female), likely reflecting the customer profile of cat cafés rather than a sampling bias, but nonetheless limiting generalisability. Data were collected from only three cafés in a single city, with one café contributing only two responses, and only during weekday afternoons (16:00–18:00); acoustic conditions and customer profiles may differ at weekends, at other times of day, or in other cities. Additionally, responses within the same café and visit were not statistically independent. Multilevel modelling would ideally account for this clustering, but the small number of clusters (three cafés, four visits) precluded this approach. Future research should employ larger and more demographically diverse samples spanning different cities, cultural backgrounds, genders, and critically varying levels of pre-existing cat affinity (positive, neutral, and negative). Participants who are neutral towards cats would be particularly valuable for clarifying whether the observed associations reflect a general biophilic response or are driven by the attitudes of a self-selected sample. Extending this work to other animal-themed hospitality settings (e.g., dog or rabbit cafés), as well as to ordinary residential settings with pets, would further test the generalisability of the findings.

Acoustic data were collected using a calibrated smartphone application rather than professional-grade equipment and should therefore be treated as indicative. Future studies should employ calibrated Class 1 sound level meters, which would enable more reliable measurements, spatial analysis within venues, and individual-level acoustic exposure matching, potentially explaining outlying perceptual responses by linking them to localised acoustic conditions.

The cross-sectional design establishes associations but cannot determine causation. As discussed in Section 4.4, the positive association between perceived cat sounds and mood may be attributable to reverse causality, personal preference, or confounding from co-occurring cat–human interaction and visual contact. Future research should adopt controlled experimental designs, for example, comparing conditions with and without cats present, or contrasting periods when cats are active and visible versus absent from the customer area. To further isolate the acoustic contribution of cat sounds from co-occurring social and visual factors, presenting recorded audiovisual stimuli with and without a cat-sound component would allow independent manipulation of these variables. Whether incorporating naturalistic cat vocalisations into the ambient soundscape of a cat café could independently enhance mood remains an open question that warrants controlled experimental investigation. Additionally, measuring mood and soundscape perception at multiple time points during a visit (e.g., upon arrival, after 15 min, and before departure) would help establish a baseline mood and clarify the temporal direction of the mood–perception relationship. Physiological indicators such as heart rate variability or skin conductance could complement self-reported measures.

Other indoor environmental quality factors known to influence mood and occupant experience, including lighting, thermal comfort, and air quality, were not assessed. Future studies incorporating these variables would provide a more complete account of the factors shaping indoor soundscape perception.

Finally, the acoustic comfort and behavioural responses of the resident animals themselves remain an underexplored dimension that merits investigation for both animal welfare and acoustic environment design.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/buildings16152985/s1>, Table S1: Anonymised questionnaire response data.

Author Contributions: Conceptualization, X.Y. and F.A.; methodology, X.Y. and F.A.; software, X.Y.; validation, X.Y.; formal analysis, X.Y.; investigation, X.Y.; resources, X.Y.; data curation, X.Y.; writing—original draft preparation, X.Y.; writing—review and editing, X.Y. and F.A.; visualization, X.Y.; supervision, F.A.; project administration, X.Y. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Local Research Ethics Committee of the UCL Bartlett School of Environment, Energy and Resources on 5 June 2024.

Informed Consent Statement: Informed consent for participation was obtained from all subjects involved in the study.

Data Availability Statement: The original contributions presented in this study are included in the article/Supplementary Materials. Further inquiries can be directed to the corresponding author.

Acknowledgments: During the preparation of this manuscript/study, Generative AI (Claude, claude-opus-4-6, Anthropic) was used to assist in polishing language, developing the data analysis coding script for statistical computations and cross-checking statistical calculations. The authors have reviewed and edited the output and take full responsibility for the content of this publication. The authors gratefully acknowledge the management and staff of the participating cat cafés for granting permission to conduct the study on their premises and for their cooperation during on-site data collection. The authors would also like to thank all participants who generously contributed their time and completed the questionnaire.

Conflicts of Interest: The authors declare no conflicts of interest. The participating cafés granted permission for on-site data collection but provided no funding, compensation, preferential treatment, or other material support. The authors have no financial or other competing interests in relation to the participating cafés, NoiseCapture, or Soundscapey.

Abbreviations

The following abbreviations are used in this manuscript:

SPL	Sound Pressure Level
PA	Perceptual Attribute
IQR	Interquartile Range
ISO	International Organization for Standardization
CIBSE	Chartered Institution of Building Services Engineers
HVAC	Heating, Ventilation, and Air Conditioning
CI	Confidence Interval
SD	Standard Deviation

Appendix A

1. May we ask your age?
 - ☐ 18–20
 - ☐ 21–30
 - ☐ 31–40
 - ☐ 41–50
 - ☐ >50
 - ☐ Not prefer to say

2. How would you describe your gender?
 - ☐ Male (including transgender men)
 - ☐ Female (including transgender women)
 - ☐ Prefer to self-describe as _____ (non-binary, gender-fluid, agender, please specify)
 - ☐ Prefer not to say
3. How many times have you been to a cat café?
 - ☐ 1–2
 - ☐ 3–10
 - ☐ More than 10
4. How long have you been staying here?
 - ☐ Just arrived
 - ☐ 5–10 min
 - ☐ 10–20 min
 - ☐ 20–30 min
 - ☐ 30 min
5. How would you describe the overall acoustic environment of the café?
 - ☐ Very pleasant
 - ☐ Pleasant
 - ☐ Neutral
 - ☐ Annoying
 - ☐ Very annoying
6. How are you feeling right now?
 - ☐ Elated
 - ☐ Happy
 - ☐ Neutral
 - ☐ Sad
 - ☐ Depressed

7. To what extent do you presently hear the following types of sounds?

	Not at all	A little	Moderately	A lot	Dominates completely
Traffic noise (e.g., cars, buses, trains, airplanes)					
Sounds from human beings (e.g., conversation, laughter, children at play, footsteps)					
Sounds from cats (e.g., meow, sounds from cats eating, jumping and running)					
Natural sounds (e.g., singing birds, flowing water, wind in vegetation)					
Mechanical ventilation sounds (sounds from ventilation and air conditioning)					
Music or background audio					
Other (please specify): _____					

8. To what extent do you agree or disagree that the present surrounding sound environment is . . .

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
Eventful					
Vibrant (lively)					
Chaotic (Disordered, confusing)					
Uneventful					
Calm					
Monotonous (Unchanging, boring)					
Pleasant					
ANNOYING					

9. How does the sounds influence your experience in the cat cafe?

	Detrimental	Negative	Neutral	Positive	Beneficial
Traffic noise (e.g., cars, buses, trains, airplanes)					
Sounds from human beings (e.g., conversation, laughter, children at play, footsteps)					
Sounds from cats (e.g., meow, sounds from cats eating, jumping and running)					
Natural sounds (e.g., singing birds, flowing water, wind in vegetation)					
Mechanical ventilation sounds (sounds from ventilation and air conditioning)					
Music or background audio					
Other (Please specify): _____					

10. What do you usually do at a cat cafe?

	Never	Rarely	Occasionally	Often	Very often
Relax					
Chat					
Play with cats					
Eat and drink					
Work or study					
Other (please specify): _____					

11. How does the current acoustic environment influence your experience in the following aspects?

	Detrimental	Negative	Neutral	Positive	Beneficial	I don't know
Relax						
Clarity of conversation						
Privacy of conversation (heard by others)						
Play with cats						
Eat and drink						
Work or study						
Other (please specify): _____						

12. What improvements would you suggest to enhance the acoustic environment in the café?

	Unnecessary	Optional	Helpful	Important	Essential	I don't know
Better soundproofing between indoor and outdoor						
Lower background music volume						
Higher background music volume						
Enhanced layout design						
Improved ventilation						
noise management						
Other (please specify): _____						

Appendix B

Variable	<i>n</i>	Median	Q1	Q3	IQR
Q5_Aco env	50	4	4	4	0
Q6_Mood	50	4	4	5	1
Q7_Traffic	50	1	1	1	0
Q7_Human	50	3	2	3	1
Q7_Cats	50	2	1	2	1
Q7_Nature	50	1	1	2	1
Q7_Vent	50	2	2	3	1
Q7_Music	50	3	3	4	1
Q8_Eventful	50	3	2	3	1
Q8_Vibrant	50	3	2	3	1
Q8_Chaotic	50	1	1	2	1
Q8_Uneventful	50	2	1	3	2
Q8_Calm	50	4	3	4	1
Q8_Monotonous	50	1	1	2	1
Q8_Pleasant	50	4	4	5	1
Q8_Annoying	50	2	1.25	2	0.75
Q10_Relax	50	4	4	4	0
Q10_Chat	50	4	3	4	1
Q10_Cat	50	4	4	5	1
Q10_Dine	50	4	3	4	1
Q10_Work	50	1	1	2	1

Variable	<i>n</i>	Median	Q1	Q3	IQR
Q11_Relax	50	4	4	5	1
Q11_Clarify	50	4	3	4	1
Q11_Privacy	50	3	3	4	1
Q11_Cat	50	4	4	5	1
Q11_Dine	50	4	4	4	0
Q11_Work	50	3	1	3	2
Q12_Sound prof	50	2	1	2	1
Q12_Low bgm	50	1	1	2	1
Q12_High bgm	50	1.5	1	3	2
Q12_Layout	50	2	1	3	2
Q12_Vent	50	2	1	3	2

Appendix C

	55–65 dB(A)	65–75 dB(A)	>75 dB(A)
Café 1_1	23.5%	64.5%	12.0%
Café 2_1	5.7%	65.7%	28.6%
Café 3_1	52.6%	43.1%	4.3%
Café 2_2	7.7%	77.5%	14.8%
Average	22.4%	62.7%	14.9%

Appendix D

Excluded_Cafe	Name	<i>n</i>	<i>r_s</i>	<i>p</i> _Value	ci_low	ci_high	holm_adj_p	Significant
Café 1	Acoustic comfort ↔ Mood	39	0.42	0.01	0.12	0.65	0.01	Sig.
Café 1	Traffic sounds ↔ Mood	39	−0.19	0.26	−0.47	0.14	0.77	n.s.
Café 1	Human sounds ↔ Mood	39	−0.09	0.59	−0.39	0.23	0.78	n.s.
Café 1	Cat sounds ↔ Mood	39	0.33	0.04	0.02	0.58	0.20	n.s.
Café 1	Nature sounds ↔ Mood	39	−0.14	0.39	−0.44	0.18	0.78	n.s.
Café 1	Ventilation sounds ↔ Mood	39	−0.26	0.11	−0.53	0.06	0.45	n.s.
Café 1	Music sounds ↔ Mood	39	−0.38	0.02	−0.62	−0.07	0.11	n.s.
Café 2	Acoustic comfort ↔ Mood	13	0.19	0.54	−0.40	0.67	0.54	n.s.
Café 2	Traffic sounds ↔ Mood	13	0.06	0.84	−0.51	0.59	1.00	n.s.
Café 2	Human sounds ↔ Mood	13	−0.67	0.01	−0.89	−0.19	0.06	n.s.
Café 2	Cat sounds ↔ Mood	13	0.60	0.03	0.08	0.87	0.12	n.s.
Café 2	Nature sounds ↔ Mood *	13	/	/	/	/	/	/
Café 2	Ventilation sounds ↔ Mood	13	−0.34	0.26	−0.75	0.26	0.77	n.s.
Café 2	Music sounds ↔ Mood	13	0.18	0.55	−0.41	0.67	1.00	n.s.
Café 3	Acoustic comfort ↔ Mood	48	0.34	0.02	0.07	0.57	0.02	Sig.
Café 3	Traffic sounds ↔ Mood	48	−0.14	0.34	−0.41	0.15	1.00	n.s.
Café 3	Human sounds ↔ Mood	48	−0.24	0.10	−0.49	0.05	0.51	n.s.
Café 3	Cat sounds ↔ Mood	48	0.42	3.12×10^{-3}	0.15	0.63	0.02	Sig.
Café 3	Nature sounds ↔ Mood	48	−0.02	0.90	−0.30	0.27	1.00	n.s.
Café 3	Ventilation sounds ↔ Mood	48	−0.19	0.20	−0.45	0.10	0.81	n.s.
Café 3	Music sounds ↔ Mood	48	−0.13	0.38	−0.40	0.16	1.00	n.s.

* Natural sounds were excluded from the sensitivity analysis because all participants in the retained sample gave the same response, resulting in zero variance and making Spearman's correlation coefficient undefined.

Appendix E

Name	<i>n</i>	<i>r_s</i>	<i>p</i> _Value	ci_low	ci_high	holm_adj_p	Significant
Relax ↔ ISOPleasant	50	0.18	0.20	−0.10	0.44	1.00	n.s.
Relax ↔ ISOEventful	50	−0.26	0.06	−0.51	0.02	0.58	n.s.
Chat ↔ ISOPleasant	50	0.16	0.27	−0.12	0.42	1.00	n.s.
Chat ↔ ISOEventful	50	0.07	0.62	−0.21	0.34	1.00	n.s.
Cat ↔ ISOPleasant	50	0.14	0.35	−0.15	0.40	1.00	n.s.
Cat ↔ ISOEventful	50	0.08	0.57	−0.20	0.35	1.00	n.s.
Dine ↔ ISOPleasant	50	0.14	0.33	−0.14	0.40	1.00	n.s.
Dine ↔ ISOEventful	50	0.02	0.91	−0.26	0.29	1.00	n.s.
Work ↔ ISOPleasant	50	−0.07	0.64	−0.34	0.21	1.00	n.s.
Work ↔ ISOEventful	50	0.30	0.03	0.02	0.53	0.34	n.s.

Appendix F

Name	<i>n</i>	<i>r_s</i>	<i>p</i> _Value	ci_low	ci_high	holm_adj_p	Significant
Pleasant ↔ Annoying	50	−0.47	5×10^{-4}	−0.66	−0.22	0.01	Sig.
Pleasant ↔ Eventful	50	−0.04	0.78	−0.31	0.24	1.00	n.s.
Pleasant ↔ Uneventful	50	−0.18	0.21	−0.44	0.11	1.00	n.s.
Pleasant ↔ Calm	50	0.39	0.01	0.13	0.60	0.11	n.s.
Pleasant ↔ Chaotic	50	−0.36	0.01	−0.58	−0.10	0.17	n.s.
Pleasant ↔ Vibrant	50	0.09	0.54	−0.19	0.36	1.00	n.s.
Pleasant ↔ Monotonous	50	−0.26	0.06	−0.51	0.01	0.69	n.s.
Annoying ↔ Eventful	50	0.36	0.01	0.09	0.58	0.19	n.s.
Annoying ↔ Uneventful	50	0.12	0.40	−0.16	0.39	1.00	n.s.
Annoying ↔ Calm	50	−0.39	0.01	−0.60	−0.12	0.11	n.s.
Annoying ↔ Chaotic	50	0.34	0.01	0.07	0.57	0.23	n.s.
Annoying ↔ Vibrant	50	0.30	0.03	0.03	0.54	0.43	n.s.
Annoying ↔ Monotonous	50	0.05	0.74	−0.23	0.32	1.00	n.s.
Eventful ↔ Uneventful	50	−0.31	0.03	−0.54	−0.03	0.43	n.s.
Eventful ↔ Calm	50	−0.32	0.02	−0.55	−0.05	0.35	n.s.
Eventful ↔ Chaotic	50	0.44	1×10^{-3}	0.18	0.64	0.03	Sig.
Eventful ↔ Vibrant	50	0.69	2.2×10^{-8}	0.52	0.82	6.0×10^{-7}	Sig.
Eventful ↔ Monotonous	50	−0.29	0.04	−0.53	−0.01	0.48	n.s.
Uneventful ↔ Calm	50	0.22	0.13	−0.06	0.47	1.00	n.s.
Uneventful ↔ Chaotic	50	0.22	0.12	−0.06	0.47	1.00	n.s.
Uneventful ↔ Vibrant	50	−0.49	0.0003	−0.68	−0.25	0.01	Sig.
Uneventful ↔ Monotonous	50	0.71	1.0×10^{-8}	0.53	0.82	2.9×10^{-7}	Sig.
Calm ↔ Chaotic	50	−0.38	0.01	−0.60	−0.11	0.12	n.s.
Calm ↔ Vibrant	50	−0.39	0.01	−0.60	−0.12	0.11	n.s.
Calm ↔ Monotonous	50	0.21	0.13	−0.07	0.47	1.00	n.s.
Chaotic ↔ Vibrant	50	0.22	0.13	−0.07	0.47	1.00	n.s.
Chaotic ↔ Monotonous	50	0.07	0.63	−0.21	0.34	1.00	n.s.
Vibrant ↔ Monotonous	50	−0.47	5×10^{-4}	−0.66	−0.22	0.01	Sig.

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