The Art of Feeling Different:

Exploring the Diversity of Emotions Experienced During an Art Museum Visit

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Abstract

The aesthetic experience of a group of artworks—such as an afternoon spent wandering in a museum—is not simply the sum of experiences of the individual works. In the present research, we explored visit-level aesthetic experiences in a field study of 298 visitors to a museum of modern and contemporary art. In particular, we focused on emotional diversity: the richness, complexity, and heterogeneity of the emotions that people experienced during their visit. After their visit, participants reported the degree to which they experienced, if at all, 10 emotions, from which we calculated diversity metrics reflecting their emotional variety (the number of emotions experienced) and emotional balance (the relative evenness between emotions or dominance of a single emotion) during the visit. Overall, the sample reported a rich aesthetic experience, but there was wide and predictable variability. Among other findings, emotional variety was higher for people with greater openness to experience and among first-time visitors to the museum; emotional balance was higher among people high in openness to experience and people with greater interest in art. The concept of diversity—the richness and complexity of someone’s emotional experience of the arts—appears promising for understanding holistic aesthetic experiences, such as entire museum visits rather than single works, as well as for many other questions in empirical aesthetics.

Keywords: aesthetics; museums; emotions; diversity; personality; visitor studies

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Visual art in a research lab is a lonesome thing. The psychology of aesthetics has historically focused on how people experience and understand individual works of art, and great care is taken to isolate unique qualities of the images. The typical research study might present a dozen or more images, for example, but they are presented one at a time and usually randomized to prevent carry-over effects. The field's focus on image-level aesthetics is sensible because most of its research questions concern how people perceive, understand, and feel about individual works, from the effects of low-level features like contour and color to high-level aspects of the work's personal and cultural significance (Chatterjee, 2014; Leder & Nadal, 2014; Silvia, 2012).

Outside the lab, however, in museums, galleries, and city streets, people are encountering groups of artworks, often a set that was intentionally curated or collaboratively created to evoke an experience of the whole that is distinct from the individual works. As Smith (2014) has argued in the context of “the museum effect,” the emotional quality of an afternoon spent in a museum is not simply the sum of people's emotional responses to the individual artworks they encountered.

In the present research, we explored the emotional qualities of an aesthetic “whole”—the emotional experience of an art museum visit. In particular, we examined *emotional diversity*: the richness, complexity, and heterogeneity of the emotions that people experienced during their visit. Instead of focusing on the intensity of single emotions—how enjoyable, for example, the visit was—we quantified and explored the heterogeneity of people's emotions during the visit. Measures of emotional diversity are a general tool that can illuminate unique aspects of aesthetic experience, such as the variety of emotions people experienced, whether people predominantly experienced one emotion, and whether their experience was relatively simple

(e.g., they enjoyed it) or relatively complex and variegated. This study thus explores a new approach to examining a facet of aesthetic experience and illustrates how a new family of outcomes can be quantified and applied to aesthetic questions.

Visit-Level Emotions in Museums

The experience of emotions in museums can be viewed as a multilevel issue: the level of individual works, and the level of the visit as a whole. For single artworks in a museum, people experience a wide range of emotions (Pelowski et al., 2018). These experiences clearly contribute to the emotional quality of the whole visit, but relatively little is known about these visit-level aesthetic responses. In visitor studies research and in institutional program evaluation, it is common to measure global attitudes about a visit, such as a visitor's overall enjoyment or satisfaction (e.g., Mastandrea et al., 2007). Such outcomes provide a useful global summary of a visit, especially for practical purposes, but they provide relatively little information about the expansive family of emotions that people might have experienced.

A good example of studying visit-level emotions comes from Tinio and Gartus's (2018) study of visitors to exhibits in the Whitney Museum of American Art in NYC. After visiting an exhibit, people were asked to pick a single emotion using the Geneva Emotion Wheel to indicate "the primary emotion that they experienced as a reaction to the exhibition" (p. 329). The Geneva Emotion Wheel arranges 20 emotions into four quadrants formed by two dimensions: control and pleasantness (Scherer, 2005). People selected the primary emotion they experienced, and the sample's selections were used to visualize the group's most common primary emotions. The profiles of primary emotions varied based on aspects of the exhibits as well as of the visitors, such as whether they read exhibit labels and their background knowledge about art.

In a comparison of visitors to museums for ancient art and modern art, Mastandrea et al. (2009) assessed the experience of 10 emotions (interest, aesthetic enjoyment, pleasure, well-being, fun, amazement, excitement, melancholy, anxiety, and boredom) that described the visit. They found that visitors to the modern art museum reported more intense emotions overall and

showed significantly higher levels of activated states like excitement, anxiety, and amazement compared to visitors to the ancient art museum. As a foreshadowing to our interest in emotional diversity in museums, Mastandrea et al. (2009) noted that “the constellation of emotions experienced seem wider for [the modern art museum] visitors; modern art appears to be better characterized not only by experiencing positive emotions but also by negative and arousing ones” (p. 172).

The most developed example of aesthetic emotions at the level of whole visits is Smith’s (2014) notion of “the museum effect.” His line of work explores how visits to museums create powerful experiences, usually involving increased self-reflection about oneself and one’s relationships with others and heightened emotional experiences, such as a flow-like state and feelings linked to interest, awe, and inspiration. Key to the museum effect is the notion of a visit-level experience: “It is the entire visit that is the unit of analysis here as opposed to any particular work of art” (Tinio et al., 2014, p. 214). As an example of a visit-level experience, the museum effect is distinctive in a couple respects. First, the experience is complex. Rather than being defined by a single emotion, it has a constellation of cognitive and emotional features. Second, the museum effect is defined by a temporal pattern, rising over the course of the museum visit and then declining as people prepare to re-enter the “real world” again (Smith, 2014; Waszkielewicz, 2007).

The Diversity of Emotional Experience

A fertile addition to the small literature on visit-level emotional experiences is the *diversity* of emotions experienced during the visit. People can point to their most prominent emotion (Tinio & Gartus, 2018), but it seems likely that most people will experience several emotions over the course of their visit (Mastandrea et al., 2009; Pelowski et al., 2018). As a result, researchers can ask questions about people’s emotional portfolio. How many emotions did people experience during the entire visit—only a couple, or many? Was their emotional profile dominated by one or two emotions, or was their experience distributed evenly across

many different emotions?

In the context of museum and gallery visits, the notion of diversity highlights that people's emotional experience during a visit can be relatively "one note" or relatively complex. Some visitors to an exhibit, for example, might have a relatively simple profile of emotional experiences: they might have found it predominantly interesting or relaxing or disturbing, but their emotional profile was largely defined by one main emotion. Other visitors, in contrast, might have more complex and varied profiles: over the course of their visit they might have experienced interest, disgust, sadness, boredom, and inspiration, and these feelings might have been relatively balanced and even.

The issue of diversity in aesthetic emotions—the variety, complexity, and heterogeneity of emotions that people experience in response to the arts—has not yet been examined, and it is a natural extension of the literature on visit-level experiences. The natural question, then, is how to quantify and measure emotional diversity. Drawing upon the family of tools in the study of biodiversity—the variety and relative balance of species in an ecosystem—researchers in emotion science have suggested that the diversity of emotional states can be captured with similar quantitative metrics (Benson et al., 2018; Quidbach et al., 2014).

In general, diversity metrics focus on *variety* and *balance* as diversity's two main facets (Benson et al., 2018; Guevara et al., 2016). Here, variety refers simply to the number of discrete emotions endorsed by a person, regardless of frequency or intensity. Counting the number of emotions present during an experience captures the variety facet of emotional diversity. People who report experiencing six distinct emotions during a museum visit, for example, have greater emotional variety than people who report experiencing two emotions.

Other metrics convey the balance or heterogeneity of the emotions. Many complementary measures have emerged over the decades to measure the balance facet of diversity (Ricotta & Avena, 2003). For our purposes, two balance measures are especially apt: *evenness* (diversity across experienced emotions) and *dominance* (how much the most intense

emotion predominates; Guevara et al., 2016).

The concept of evenness reflects a long lineage of entropy-based diversity metrics gleaned from information theory (Shannon, 1948). Think about a time when you experienced many different emotions within a single event or time span. Imagine that experience as an event composed of N different emotions (first, *happy*; second, *sad*; third, *disgusted*; fourth, *interested*, all the way to the N th emotion) where n_i is the number of times you felt the i th emotion in the list ($i = 1, 2, \dots, N$), and let p_i denote the frequency of n_i , relative to the other emotions you experienced ($p_i = n_i / \sum_{i=1}^N n_i$) such that $0 \leq p_i \leq 1$, and $\sum_{i=1}^N p_i = 1$. The entropy (i.e., volume of statistical information) H expressed for a value n_i is $H(n_i) = -\log p_i$ where $-\log p_i = 0$, for $p_i = 0$ (Shannon, 1948). Therefore, Shannon entropy, when used to describe an experience consisting of N emotions, is the weighted mean of a single emotion's volume of statistical information:

$$H = -\sum_{i=1}^N (p_i \log p_i).$$

This is Shannon Entropy—a foundational equation in information theory that describes the expected amount of information conveyed by identifying the possible outcomes of a variable (Guevara et al., 2016). More information, or higher entropy, implies a greater multiplicity of states (Hildago, 2015). In the context of our study, “states” refer to categories of experienced emotion, and a higher number of categories indicates greater evenness. It follows then, that maximum entropy, or H_{max} (which is equal to $\log N$) is achieved in a uniform distribution (i.e., one where $p_i = p_j$ for all experienced emotions $i \neq j$).

The concept of evenness as a measure of deviation from a uniform distribution of events (in our case, frequency or intensity of emotions) making up an emotional experience with N different emotions describes Pielou Evenness (Pielou, 1969):

$$J = -\frac{\sum_{i=1}^N (p_i \log p_i)}{\log N}.$$

Pielou Evenness builds on the formula of entropy proposed by Shannon (1948) by normalizing

for H (i.e., setting H it on a 0 to 1 scale) with respect to maximum entropy ($J = H/H_{max}$; Ricotta & Avena, 2003). Normalization is important here because measures of balance should reflect the relative evenness of a system in order to be a useful metric against other systems, and the only way to measure relative evenness in a strict sense is to disentangle it from the effects of variety (Jost, 2010). To elaborate with an example from Jost (2010), it is impossible for a community with two species to show as much inequality (the opposite of evenness, i.e., dominance) as a community with sixteen species. Therefore, the community with more species variety may show a greater inequality than the community with less species variety, even if the community with less variety is maximally uneven (i.e., one species dominates while the others approach null; $H_{min} = 0$). Since Pielou Evenness accounts for variety N , Jost (2010) contends that it is the best measure of evenness.

Dominance, a complementary measure of the balance facet of diversity, has a much more straightforward nature than evenness. Expressed as Berger-Parker Dominance (Berger & Parker, 1970) in our study, this metric reports the largest relative frequency p_i achieved by any one emotion i and can be denoted simply:

$$D_{BP} = \max (p_i).$$

This describes the proportion of the total experienced emotions that is contributed by the most frequently experienced emotion. If the Berger-Parker index is high, then the overall emotional portfolio is dominated by one prominent emotion.

Treemaps can illustrate the diversity of emotional experience and highlight the distinction between variety and balance. As an example, Figure 1 depicts four hypothetical treemaps of differing variety and balance levels. For any given treemap, a larger item box implies a higher response for that emotion (i.e., the emotion was experienced more intensely), and a greater number of boxes implies a greater number of different items endorsed (i.e., the emotion was experienced at all). In Figure 1, the top row (plots A and B) illustrates low variety: the small number of boxes (only 3) indicates that a low variety of emotions was experienced. The

bottom row (plots C and D), in contrast, illustrates high variety: the hypothetical respondent endorsed experiencing twice as many emotions.

Figure 1. Treemaps that illustrate different combinations of variety and balance.

The columns illustrate lower balance (left column: A and C) and higher balance (right column: B and D). For the low variety plots in the top row, plot A depicts lower balance: happiness is the predominant emotion. Plot B, in contrast, depicts a more evenly balanced

distribution of emotional experience: the three emotions, while not experienced equally, were experienced more similarly. For the high variety plots, we again see how the balance of emotional experience can vary independently of the variety of emotions. In plot C, one emotion (happy) is relatively dominant, and the others are relatively minor. Emotional experience is thus unevenly distributed across the six emotional states that were experienced. In plot D, however, the emotions are not identical but are nevertheless more evenly balanced—no single emotion predominates.

In short, the treemaps help illustrate the two facets of emotional diversity: (1) the variety (number) of emotions experienced, and (2) the relative balance of the emotions that are experienced (how uniformly they are distributed). Although often correlated in practice, variety and balance are conceptually distinct. Once the variety of emotions experienced reaches two or more, those experiences can be balanced (evenly distributed) or imbalanced (unevenly distributed).

The Present Research

Guided by the notion that the emotional experience of an art museum visit is not simply the sum of experiences to individual artworks (Tinio et al., 2014), the current study examined the diversity of emotions experienced during a museum visit. We sought to illustrate how metrics of emotional diversity can be applied to visitors' experiences in a museum of modern and contemporary art. As a first step, we examined what emotional diversity in museum visits looks like, such as how much people vary in emotional variety, evenness, and dominance and how these metrics relate to each other. As the next step, we explored how these metrics of emotional diversity related to important predictors of aesthetic experience, such as personality traits, art knowledge and interest, and museum-specific knowledge and experiences.

The project was largely exploratory, and we emphasize descriptive statistics and estimates of effect sizes throughout. We had no specific a priori predictions, but the predictor variables were selected to capture prominent variables in aesthetics research. Specifically,

individual differences in openness to experience, art knowledge and interest, and museum-specific knowledge and experiences all have been shown to affect a person's visit experience. Openness to experience has deep connections to emotional responses in many art genres (e.g., Fayn et al., 2015; Feist & Brady, 2004; Rawlings et al., 2000; Silvia et al., 2015). Further, people who choose to go to art museums generally hold greater interest, experience, and expertise in the arts (Agustin & Leder, 2006; Hendon et al., 1989; Leder et al., 2014; Pelowski et al., 2017), which greatly affects how people view and find meaning within artwork (Cupchik & Gebotys, 1988; Falk, 2008). Finally, we explored whether people had visited the museum before. People who rarely visit art museums often feel uncomfortable in or even intimidated by the institutions (Chang, 2006), and first-time visitors to a museum bring different motives and expectations for their visit that affect their engagement with the exhibits (Sheng & Chen, 2012), so it seemed likely that museum-specific experience could shape the emotional quality of the visit.

Method

Participants

The project was reviewed and approved by the University of North Carolina at Greensboro (UNCG) IRB, and all participants provided informed consent. This study involved 304 participants as part of a visitor study collected within the Weatherspoon Art Museum, Greensboro, NC. Participants were unaware of our interest in emotional experiences in art museums. After exclusion criteria were applied, data from a final sample of 298 people were used in this study: 157 were community museum visitors, and 141 were UNCG students recruited as part of a research participation option in a psychology class. In this final sample, 199 identified as female (66.78%), 82 identified as male (27.52%), 12 declined to answer (4.03%), and 5 marked other choices (1.68%). Age ranged from 18 to 88 years ($M = 30.51$, $SD = 17.70$). Within the community group, 69 people (44%) indicated that they had visited the Weatherspoon Art Museum before. Table 1 shows expanded demographics for the sample.

Procedure

Recruitment branches. The project had two recruitment branches. First, community visitors who entered the museum were approached and asked if they would be interested in completing a survey about their visit. This group is a realistic sample of the population of off-the-street visitors who choose to visit the Weatherspoon Art Museum. Data were collected on Saturday and Sunday afternoons because the museum tends to have the most community visitors on weekends. Second, students enrolled in a psychology course could take part in the study as part of a research option. The students first completed roughly 30 minutes of online surveys about personality and art backgrounds, described later. Afterward, they were scheduled for a 60-minute appointment block for a museum visit.

Recruiting two distinct samples had several benefits. First, it allowed us to explore possible differences between people who, out of all the things they could do, chose to visit a museum during their leisure time and people who did not spontaneously decide to go. Second, the constraints of time and visitor goodwill greatly limit the number and scope of predictor variables we can measure during the museum visit. By embedding a trip to the museum within a larger study that recruited a subsample of college students, we could obtain richer information on the students' personalities, backgrounds, and art interest and knowledge. Table 1 notes the assessments that were unique to each sample.

The museum visit. The Weatherspoon Art Museum is located in Greensboro, NC, on the corner of the University of North Carolina at Greensboro campus. Founded in 1941, it is open to the public, free of charge, 6 days a week and has free parking for community visitors. The museum serves over 35,000 visitors per year and is distinctive in its focus on modern and contemporary art (Weatherspoon Art Museum, n.d.).

The data were collected between September 2019 and February 2020. Student visitors were met at an appointed time at the museum; community visitors were greeted at the door by research assistants and asked if they would be interested in taking part in a short study of their museum experience. Participants were not informed of the study's focus on emotions. All

participants first completed a brief pre-visit survey via 7" Android tablets running the Qualtrics Offline app ($n = 234$) or using paper forms ($n = 64$). This pre-visit survey included assessments of demographics, aesthetic fluency (Smith & Smith, 2006), and other constructs not related to the present analysis (see Cotter, Fekete, & Silvia, 2021). Everyone was then asked to enjoy the museum at their own pace for as long as they wished and to please return to the study table at the museum's main entrance for a brief post-visit survey, again completed on tablets or paper surveys. The post-visit survey contained items about their visit satisfaction and emotional experience, among others.

Correlates of Emotional Diversity

Online survey predictors completed by students. Before they were scheduled to visit the museum, the student sample completed a set of online surveys that would be too long or impractical to administer within the museum. We measured personality using the NEO Five Factor Inventory (McCrae & Costa, 2007). The inventory contains 60 items that measure five domains of personality—Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness—using a 5-point scale (1 = *strongly disagree*, 5 = *strongly agree*). The responses were averaged to create overall scores. All five factors play a role in art and aesthetics, but openness to experience was particularly interesting because of its links to art knowledge, artistic interests, and the inclination to experience complex and subtle emotions in response to the arts (Christensen et al., 2019; Oleynick et al., 2017; Swami & Furnham, 2020).

Students also completed the Vienna Art Interest and Art Knowledge questionnaire (VAIAK; Specker et al., 2020), which assesses art interest and knowledge through a two-part questionnaire. The first part, a survey of art interest, asks participants to rate a set of art-related personal statements (from *not at all* to *very much*) and how often they engage in art-related activities (from *less than once per year* to *once per week or more often*) on 7-point scales. The second part of the questionnaire is an inventory of art knowledge that asks participants to objectively identify works of art, their artists, movements or styles, and other relevant

information. The VAIAK yields overall scores for art interest and art knowledge.

Pre-visit assessments completed by everyone. During the pre-visit survey, people completed demographic items and were asked *Have you visited the Weatherspoon Art Museum before?*, using *Yes* (1) and *No* (0) options. This question was useful to include because first-time visitors may not have been expecting the diversity and often confronting nature of artworks and exhibits on display at the Weatherspoon.

Art knowledge was measured using the aesthetic fluency scale (Smith & Smith, 2006), a popular tool for measuring people's art expertise, or *fluency*, through domain-specific knowledge about the arts (Atari et al., 2020; Cotter, Chen et al., in press; Silvia, 2007). The scale asks people to report their knowledge of 10 figures and ideas from art history (e.g., Fauvism, Isamu Noguchi, Mary Cassatt) on a 5-point scale ranging from 0 (*I have never heard of this artist or term*) to 4 (*I can talk intelligently about this artist or idea in art*), resulting in an overall sum score ($\alpha = .94$, $\omega_H = .70$). The scale's brevity and focus make it ideal for time-constrained projects in field settings.

Post-visit assessments. After their visit, participants completed a brief post-visit survey. Visit satisfaction was measured with a single choice item, *How satisfied are you with today's visit?*, rated on a 5-point scale (1 = *Extremely dissatisfied*, 5 = *Extremely satisfied*). According to the museum staff, relatively few visitors know that the museum focuses on contemporary and modern art, and it is a common visitor comment. We thus asked, *Were you aware of the Weatherspoon Art Museum's emphasis on modern art?*, using options of *Yes*, *I'm not sure*, and *No*.

Finally, for the community visitors, visit time was measured (in minutes) using either time stamps from the tablets or start-and-end times recorded by the researchers. We did not calculate visit time for the students because their visits were time constrained (the visit part of the psychology study could not practically last longer than 50 minutes in total), so visit times lack a comparable meaning between the groups.

Emotion Items

The emotional quality of the visit was measured with a block of 10 emotion items contained in the post-visit survey. The items were selected based on the broader literature of aesthetic emotions (Leder & Nadal, 2014; Pelowski, 2015; Silvia, 2012). They contained some prototypical kinds of aesthetic emotions as well as other emotions that visitors might commonly experience during a museum visit (Mastandrea et al., 2009; Tinio & Garts, 2018). Participants were asked to rate “how strongly you experienced each of the following emotions during your visit.” The items were *Happy*, *Sad*, *Interested*, *Disgusted*, *Awe-Inspired*, *Angry*, *Bored*, *Relaxed*, *Curious*, and *Annoyed*. They responded using a 5-point scale that was anchored by not experiencing the emotion, ranging from *I didn’t experience this emotion* (0) to *Extremely* (4). These scores were used to calculate the diversity metrics. Any score greater than 0 indicated that the emotion was experienced and thus contributed to the variety score. The intensity rankings provide the quantity information needed to compute the balance metrics.

Results

Data Preparation

The data were screened, coded, and analyzed using R 4.1 (R Core Team, 2021). Variety, evenness, and dominance were calculated for our entire sample using the *diverse* package (Guevara et al., 2016). The following highly skewed variables were transformed to be more normal using ordered quantile normalization in the *bestNormalize* R package (Peterson & Cavanaugh, 2020): evenness, dominance, aesthetic fluency, art knowledge, art interest, and the total visit time. Gender responses were coded as binary (female = 1, male = 0, other responses = missing). Responses for the question *Were you aware of the Weatherspoon Art Museum's emphasis on modern art?* were also recoded as binary (*Yes* = 1; *I’m not sure* and *No* = 0). Sample group was coded as 0 (community visitors) and 1 (students). The materials and R code are available at Open Science Framework (<https://osf.io/cqgwa/>).

Figure 2. Distributions of emotional variety, evenness, and dominance scores.

Note. Scores are shown in their raw metric. For the analyses, transformed versions of evenness and dominance were used.

Diversity Metrics

We first explored the emotional diversity metrics: variety, evenness, and dominance (see Figure 2 and Table 2). For variety, on average, participants experienced a variety of 7 emotions out of 10 possible emotions during their visits ($M = 7.06$ emotions, $SD = 1.18$), with a wide range from 3 to 10. For balance, accounting for the total number of emotions they experienced, people also experienced discrete emotions rather evenly. The raw evenness scores were high for most participants ($M = .96$, $SD = .02$, range from .83 to .99). Since Pielou's evenness is recorded on a scale between 0 and 1, this indicates that people's distribution of emotions was relatively more uniform than erratic. In line with these results, participants experienced a low dominance (also on a scale from 0 to 1) of their most-endorsed emotion, relative to all the emotions they endorsed ($M = .23$, $SD = .05$). It's noteworthy that dominance had a wide range from .14 (i.e., the most dominant emotion was only 14% of the person's total emotion) to .57 (i.e., the most intensely experienced emotion made up 57% of the person's total emotion). The descriptive statistics for the individual emotions are shown in Table 2.

Figure 3. Correlations between emotional variety, evenness, and dominance.

Correlations between each diversity metric were also calculated (see Figure 3). Variety correlated negatively with evenness ($r = -.27$ [-.39, -.15]) and negatively with dominance ($r = -.52$ [-.60, -.43]). Evenness and dominance correlated negatively with each other ($r = -.44$ [-.53, -.35]). Both balance metrics (evenness and dominance) account for variety in different ways

(Ricotta & Avena, 2003), and evenness appears to be more distinct from variety in this sample.

Exploring Correlates of Emotional Diversity

Taken together, the sample as a whole showed high emotional diversity: they experienced a large variety of emotions and showed relative balance in their emotions. The natural next step, given that people varied in the variety and balance of emotions they experienced during their visit, is to explore how other variables related to these two facets of emotional diversity. Personality, art interest, art knowledge, visit time, and visit satisfaction were explored using Pearson's r (see Table 3), which can be interpreted in effect-size terms using common guidelines of .10/.30/.50 as small, medium and large, respectively (Cumming, 2012). Due to the categorical nature of gender and visit factors like whether the participant had visited the Weatherspoon before and whether they were aware of its focus on modern art, these variables were reported in the Cohen's d metric (see Table 4), which is commonly interpreted using .20/.50/.80 as benchmarks for small, medium, and large effects, respectively (Cumming, 2012). Because of the exploratory nature of the project, we'll note the effects that are at least marginally significant in the text; all effects appear in the figures and tables.

Personality. Among the personality traits (measured only for our student participants), openness to experience—one of the most prominent traits in aesthetics research—stood out (see Table 3 and Figure 4). Openness to experience had a significant negative correlation with dominance ($r = -.31 [-.46, -.16]$, $p < .01$): people higher in openness to experience showed lower emotional dominance, and therefore greater balance of emotion, during their visit to the Weatherspoon Art Museum. People with higher openness to experience also experienced a marginally greater variety of emotions ($r = .13 [-.05, .29]$, $p = .15$). Extraversion, too, was marginally associated with greater evenness of emotional experience ($r = .15 [-.02, .31]$, $p = .08$).

Figure 4. Pearson's r correlations (dots) and their 95% confidence intervals (bars) for the emotional diversity metrics and the continuous variables.

Art interest and knowledge. The participants' art interest and art knowledge were assessed with the aesthetic fluency scale (for all visitors) and with the VAIK (for the student visitors). Aesthetic fluency scores did not appreciably correlate with variety, evenness, or dominance (see Table 3 and Figure 4). For the VAIK art knowledge score, a similar lack of relationships appeared, so both measures of art knowledge behaved similarly. For the VAIK art interest score, however, people with greater interest in the arts had significantly lower dominance ($r = -.21 [-.38, -.04]$, $p = .02$) and marginally higher evenness ($r = .13 [-.03, .29]$, $p = .11$), a pattern that indicates that people with greater interest in art had a more emotionally balanced visit. Overall, it appears that interest in the arts more strongly predicts emotional diversity than knowledge of the arts.

Visit satisfaction and visit factors. Our final steps were to examine the relationship between emotional diversity and general visit factors and outcomes (see Table 4 and Figure 5). First, there were some differences between the community visitors and the students. The community visitors showed a marginally higher variety of emotions ($d = -.17 [-.40, .06]$, $p = .14$) and significantly lower evenness ($d = .26 [.03, .49]$, $p = .03$) compared to the student visitors.

In addition, for visitor gender, women had marginally higher evenness in their emotional experience ($d = .18 [-.08, .44]$, $p = .12$) relative to men. People's emotional experiences were also affected by whether they knew about the Weatherspoon's focus on modern art. The participants who were aware of the museum's focus experienced a marginally lower variety of emotions during their visit ($d = -.18 [-.41, .05]$, $p = .12$). Finally, whether someone had visited the Weatherspoon before had a relationship with the variety of emotions they experienced during this visit. First-time visitors experienced significantly greater emotional variety ($d = -.24 [-.47, -.01]$, $p = .04$) than returning visitors.

Regarding the visit outcomes, neither visit time (for the community sample) nor visit satisfaction correlated notably with variety, evenness, or dominance (see Table 4 and Figure 4).

Figure 5. Cohen's d effect sizes (dots) and their 95% confidence intervals (bars) for emotional diversity metrics and the binary predictor variables.

Discussion

In the present research, we explored the concept of visit-level emotional responses in the context of an art museum visit. In the spirit of a visit being more than the sum of experiencing many individual works of art (Smith, 2014), we sought to quantify the richness and complexity of the emotions people experienced during a visit by applying a family of tools used to quantify

diversity (Guevara et al., 2016). In this approach, the emotional diversity of a museum experience has two facets: *variety* and *balance*.

Variety refers simply to the number of emotions experienced, regardless of their intensity or frequency. In our samples, participants reported a wide range of variety. Out of the 10 emotions, people on average reported experiencing 7 during their visit, but variety ranged from 3 to 10. This facet of emotional diversity thus showed broad variability between the museum visitors. Some aspects of the visitors were associated with their emotional variety. Community visitors, people higher in openness to experience, and visitors who didn't know that the museum had a modern art emphasis had marginally higher variety scores. Intriguingly, first-time visitors had higher emotional variety scores than returning visitors, suggesting that the novelty of a first-time museum visit played a role in the breadth of emotions that visitors experienced.

Balance captures whether the emotions that people experienced were relatively uniform in intensity versus uneven and eccentric. Unlike variety, balance is best assessed with several metrics that can capture different nuances of it. For evenness, a metric that assesses the uniformity of people's emotional experiences, the visitors' emotions were relatively balanced. Evenness was marginally higher for women, people with greater interest in art, and people higher in extraversion; evenness was significantly lower for the community visitors. The findings were sharper for dominance, the other balance metric. Dominance reflects how much the most intensely experienced emotion predominates over all the emotions. Significantly lower dominance scores, reflecting greater emotional balance, were found for people higher in openness to experience and people with greater interest in art. Finding that openness to experience and art interest are associated with a more complex and diverse profile of emotional experience is consistent with the central role that these traits have in other areas of aesthetics research and highlights the value of considering diversity as an aspect of aesthetic experience. Past work, for example, has found that people with high levels of openness tend to experience

more mixed emotions (positive and negative emotions at the same time) and appraisals regarding art (Barford et al., 2017). Curiosity, a key part of the broader openness to experience trait (Christensen et al., 2019), also predicts more nuanced emotional differentiation of art experience for both positive and negative emotions (Fayn et al., 2017).

A main aim of this work was to illustrate the meaning and usefulness of emotional diversity for studying visitors' emotions and for the broader study of aesthetic experience. For the most part, the study of aesthetic experience emphasizes the intensity of single emotions (e.g., Leder et al., 2004; Pelowski et al., 2017; Silvia, 2005). The notion of diversity builds upon the study of individual emotions by quantifying aspects of the whole set of experiences, thus offering a window into the richness and complexity of someone's profile of emotions. When measuring our participants' emotions, our survey indicated that people should reflect on the emotions they felt during their visit. This allowed us to emphasize the holistic nature of visit experiences: while most of the emotions experienced undoubtedly resulted from viewing the artworks, others may have arisen from interactions with other museum patrons, trips to the giftshop, or a variety of other factors unique to the museum environment. This key distinction, which is often lost during in-lab studies of the arts, contributes to greater psychological realism for studies conducted in art museums and more useful measurements of emotional diversity at the visit level.

This work presents several opportunities for future exploration. One fruitful direction would be to get closer to the emotional experiences by repeated sampling (Silvia & Cotter, 2021). This study used a diary method that asked people to recall their emotions during the visit. This shouldn't be hard, given the fairly small time window, but using experience sampling during the visit—repeated assessments as people move through the museum—would enable more precision and illuminate the temporal order of people's emotions (e.g., whether some emotions are more likely early or late in the visit) as well as the context of the experience (e.g., what people were viewing, if anything). In addition, some of the measures of museum-specific experiences hint at

an important role for people's visit motives and expectations in emotional diversity. First-time visitors, for example, had a wider variety of emotions than repeat visitors, and people who knew that the museum focused on modern and contemporary art had a lower variety of emotions. These findings are consistent with research showing that people bring a wide range of expectations to a museum visit (Sheng & Chen, 2012), and it's worth assessing pre-visit knowledge and expectations more thoroughly in future work.

The present research explored emotional diversity within an art museum, but this approach to understanding visit-level emotions can be applied to a wide range of settings, such as natural history museums, science centers, historical and heritage sites, zoos, botanical gardens, street-art neighborhoods, and libraries (Smith, 2014). Additionally, emotional diversity can be applied to a variety of temporal contexts—from a unit of analysis as small as a person's experience with a single object to extended multi-day experiences. Finally, diversity metrics could be fertile tools for future work on many lab-based problems in empirical aesthetics, such as the emotional complexity of responses to single artworks in the lab, the heterogeneity of a person's experiences over time to a single artwork that is encountered many times, and the complexity of a group's collected feelings. We encourage researchers interested in trying them to download the supplementary R code and data files to use as a starting point.

One take-away message for future research is that the diversity metrics likely call for large samples. The effect sizes of note were generally small to medium in size, and few effect sizes greater than $r = .30$ involving predictor variables were observed. When planning future work, particularly in field contexts similar to the present research, researchers can assume that the effect sizes for diversity metrics are likely smaller than the effects for simple differences in the intensity of individual emotions.

Finally, we would like to close by noting that diverse emotional experiences are not necessarily the ideal, and simpler, less complicated profiles of emotional experience are not a worse or diminished kind of experience. Artists and curators may not always seek to evoke a

complex and well-rounded experience, instead aiming for a more focused and pointed impact centered around a handful of similar emotions. To draw parallels with the mirror model of aesthetic reception (Specker et al., 2017; Tinio, 2013), which emphasizes how an artist's intentions are mirrored in a viewer's understanding and experience of the work, it would be worth exploring if curatorial intentions—evoking a wider versus narrower range of emotions in a set of artworks—are mirrored in the eventual diversity of emotions experienced by the visitors who encounter the works.

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Table 1

Demographic Details About the Samples

	Community Visitors	Students
Age	49.12 (19.58), 18–88	19.49 (2.54) 18–33
Gender	88 women, 60 men, and 9 additional responses	111 women, 22 men, and 3 additional responses
Visited Museum Before	44%	42%
Variables unique to the group	Visit time	NEO traits, VAIK interest and knowledge
<i>n</i>	157	141

Note. Age is the mean, *SD*, and range in years. NEO traits are the five subscales of the NEO Five Factor Inventory. VAIK is the Vienna Art Interest and Art Knowledge Questionnaire.

Table 2

Descriptive Statistics for the Emotion Diversity Metrics and the 10 Emotion Items

	<i>M (SD)</i>	<i>Median</i>	<i>Min/Max</i>
Variety	7.06 (1.19)	7	3, 10
Evenness	.96 (.02)	.96	.83, 1.00
Dominance	.23 (.05)	.23	.14, .57
Happy	2.44 (1.08)	2	0, 4
Sad	.92 (1.05)	1	0, 4
Interested	3.18 (.85)	3	1, 4
Disgusted	.28 (.67)	0	0, 4
Awe-inspired	2.34 (1.15)	2	0, 4
Angry	.30 (.65)	0	0, 4
Bored	.45 (.75)	0	0, 4
Relaxed	2.82 (1.09)	3	0, 4
Curious	3.05 (.95)	3	0, 4
Annoyed	.21 (.54)	0	0, 4

Note. $n = 298$. The descriptive statistics are for the raw scores; for the analyses, transformed versions of evenness and dominance were used. The emotion items were completed using a 5-point, 0-4 scale.

Table 3

Correlations for the Continuous Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Variety	1												
2. Evenness	-.27	1											
3. Dominance	-.52	-.44	1										
4. Neuroticism	.08	-.07	-.09	1									
5. Extraversion	-.10	.15	-.05	-.35	1								
6. Openness to Experience	.13	.07	-.31	.21	-.03	1							
7. Agreeableness	.03	.01	-.04	-.37	.32	.08	1						
8. Conscientiousness	.00	.07	-.14	-.37	.27	.01	.42	1					
9. Aesthetic Fluency	.03	-.06	-.02	.21	.01	.39	.08	.02	1				
10. VAIK Knowledge	.00	-.03	-.05	.24	-.13	.28	.00	-.08	.47	1			
11. VAIK Interest	-.05	.13	-.21	.24	.05	.61	.00	-.03	.51	.43	1		
12. Visit Time	.06	-.05	-.03	—	—	—	—	—	.17	—	—	1	
13. Visit Satisfaction	.08	.09	.04	.17	-.06	.01	-.01	-.06	-.07	-.06	.05	.11	1

Note. Pearson r coefficients are reported. Some cells are empty because visit time was computed only for the community visitors, who did not complete the NEO scales or the VAIK. Correlations of .10, .30, and .50 represent small, medium, and large effects, respectively (Cumming, 2012).

Table 4

Effect Sizes (*d*) for Binary Predictors

	Variety	Evenness	Dominance
Gender	-.10 [-.36, .16]	.18 [-.08, .44]	-.13 [-.38, .13]
Visitor Sample	-.17 [-.40, .06]	.26 [.03, .49]	-.01 [-.23, .22]
Visited Before	-.24 [-.47, -.01]	.00 [-.22, .23]	.07 [-.16, .30]
Knew Museum's Modern Emphasis	-.18 [-.41, .05]	.16 [-.07, .39]	-.03 [-.26, .20]

Note. Gender was coded 0 = *men*, 1 = *women*. Visitor sample was coded 0 = *community visitors*, 1 = *student visitors*. Whether people knew beforehand that the museum had a contemporary and modern emphasis was coded 0 = *no*, 0 = *I'm not sure*, 1 = *yes*. Cohen's *d* values of .20, .50, and .80 represent small, medium, and large effects, respectively (Cumming, 2012).