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Probing the Person-Patina Relationship: A Correlational Study on the Psychology of Senescent Environments

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Abstract:
There is a lack of research on people's psychological perceptions to decay or patina that is part of the historic environment. Built heritage conservation doctrine and law are based on the assumption that all people have a similar, positive aesthetic perception to patina in the built environment, although there are very few empirical studies that have attempted to confirm or challenge this assumption. This study is based on the statistical analysis of survey data from 864 people in the United States who ranked 24 images of old, decayed building materials and 7 control images of new building materials based on aesthetic qualities, condition, and perceived age. The results indicate that people do not like decayed earthen building materials, concrete, or ferrous metals and have a neutral opinion of the aesthetic qualities of aged brick, preferring new brick as well as aged wood. While there are small differences based on race, ethnicity, and gender, the largest difference in responses is between people who work in the historic preservation/CRM field and those who do not. This finding appears to indicate that people who work in these fields have a different psychological response to decay/patina in the built environment than laypeople, which has important ramifications in terms of decision-making processes regarding interventions in the older built environment.

Introduction

For a number of years, there has been an increased interest in the use of various methods from the social sciences to understand people's relationship with heritage, including built heritage. While most of these perspectives tend to be anthropological in nature, very few look at the individual's relationship with heritage through a psychological lens with the goal of generating empirical evidence that can influence conservation practice. The purpose of this study, therefore, is to build upon the nascent field of the psychology of senescent environments (environments defined by their physical age), which uses an environmental psychology perspective within the setting of the old or historic environment. The specific study described here explores the positive and negative perceptions of the decay (or patina) of surfaces commonly found in the older built environment. It will therefore explore what I refer to as the person-patina relationship from a correlational perspective.

While the value of patina found on historic buildings has long been incorporated into the various doctrines, charters, and rules and regulations found in historic preservation/built heritage conservation practice, its value has always been assumed to be self-evident. Most of our understanding of the value of built environment patina is therefore from a rationalistic rather than empirical perspective (Wells 2019). We actually know very little, from an empirical perspective, about how people value or do not value patina or decay in the historic environment, which is a deficit this study specifically addresses. Moreover, these doctrines assume that all people, regardless of cultural, professional, or lay backgrounds perceive the value of patina equally. From the results of this study, however, this appears to not be the case; professionals who work in the field of built heritage conservation may have a very different perception of patina and decay than the lay person. In addition, there are some racial, ethnic, and gender differences that will be explored.

This particular study seeks to identify particular phenomena that appear to be uniquely associated with environmental decay to help disentangle decay/patina from design or other, larger and more complex environmental variables. In order to isolate specific aspects of environmental perception, the research method, therefore, does not consider larger environmental contexts, such as the design of buildings and landscapes, which have been done elsewhere, independently of surface decay or patina (e.g., Stamps 2000). The author acknowledges that the results of this research may be different if the visual stimuli were presented within this broader environmental context. We will now look at the extant literature on the topic, followed by an analysis of the data, discussion, and conclusion.

Literature on the psychological perception of surface decay and patina in the historic environment

In the field of historic preservation/built heritage conservation, decay (or, in a more positive sense, patina) on the surface of building materials is seen as desirable because it gives buildings and places a sense of authenticity and informs what Riegl (1903/1996) refers to as "age value". The retention or removal of patina often plays a central role in interventions with historic buildings, leading to much debate about how much removal is appropriate or inappropriate (Quist and van Bommel 2018). Proponents of built heritage conservation have, since the nineteenth century, placed a high importance on the retention of certain kinds of decay in buildings, especially when doing so relates in some way to the perceived authenticity of the resource (e.g., Ruskin 1849/1907; Morris & Webb 1877; Riegl 1903/1996). The literature, however, is sparse on specific, contextually-driven recommendations for the treatment of patina, especially from an empirical, human-centered (or psychological) perspective, although many of the Italian conservationists developed many elaborate rationalistic theories on the topic (e.g., Boito 1884; Baldini 1978/1996; Brandi 1977; Carbonara 1976/1996).

As far as the author is aware, there are no published studies where laypeople are asked to assess the aesthetic, condition, and age-related qualities of a variety decayed materials commonly found in the older built environment within a psychological frame. There are, however, a small number of studies that address the aesthetic perception of soiling on buildings, which the present study under consideration does not directly address. Carlota and Brimblecombe (2004, 2005) conclude that soiling is necessary to some degree to lend a sense of authenticity to ancient monuments; a monument that is too clean or too light in color will therefore lack this authenticity. Where present, soiling has an increased aesthetic quality where it is minimal and does not obscure architectural details. Andrew (2002) found that people thought that the aesthetic quality of sandstone buildings were improved with a small amount of soiling. Other researchers have looked at the impact of small-scale damage to masonry on buildings. Quist et al. (2007, 2008) found a similar correlation between small-scale damage to stone and increased aesthetic qualities among laypeople. But beyond these few studies, there is little in the literature that addresses the psychological perception of decayed or soiled building materials. Moreover, none of the authors of these studies relate their findings to known aspects of people's psychological responses to color, form, material, or ornament from the field of cognitive and environmental psychology. Literature from cognitive and environmental psychology is largely absent on this topic as well.

Method

Data for this study were acquired through an online survey instrument, using photo elicitation techniques. Participants were recruited via the Mechanical Turk (MTurk) service (see Buhrmester et al. [2011] for details on the relevancy of using Mechanical Turk in behavioral research studies). Funding for the study came from the School of Architecture, Planning and Preservation at the University of Maryland to be able to offer approximately 900 adults US$1.67 to take a 10-minute survey. Other than the requirements that all participants must be adults from the United States capable of informed consent, there were no other criteria in order to participate.

It was known that participants would self-select to participate in this study. The author created a Human Intelligence Task (HIT) in MTurk asking for a subject to participate in a 10-minute "Academic survey on how you like/dislike patina or decay of materials around you." Participants can search for HITs based on specific task characteristics as well as the "reward" offered when completing the task; there was no mention of "historic preservation" or "built heritage conservation" in the HIT. When the participant located the HIT for this study and indicated his/her desire to complete the task (through the online interface), the participant was presented with a link to an external Google Forms survey web site.

The survey consisted of questions asking the subject to look at a photograph of the surface of stone, brick, stucco, wood, paint, or metal in various states of decay. Upon viewing the photograph, the subject was asked to assess, via a 5-point Likert scale, the overall degree to which the material is visually pleasing, the degree to which the material appears to be decayed, and how old or new the material appears. Additional questions were asked to collect basic demographic information on the participant.

24 photographs of old stone, brick, stucco, wood, paint, or metal were chosen based on the following criteria. The photograph needed to be of:

1) a similar distance from target: standing, about 3-4 feet away;
2) a similar perspective: flat, direct, head on;
3) the same orientation;
4) a similar lighting;
5) a similar level of moderate decay.

With the exception of item 5, 7 photos of new materials, which served as controls, had to adhere to the same criteria. These images consisted of a new:

1) brick wall
2) stone wall

3) wood floor
4) concrete wall
5) metal surface
6) painted surface
7) stucco wall

Survey responses were then analyzed using the JASP statistical analysis program. Techniques used included descriptive statistics along with binary logistic regression and a correlation matrix to create models to explain the variation in the data and the extent to which the three variables—the overall aesthetic rating of the material, its condition, and its age—correlated with each other.

Results and analysis

In total, 864 people participated in the survey. Compared to the US population, the respondents were much younger with slightly more males participating than females (tables 1, 2). Racial and ethnic demographics, however, were fairly close to the US population as a whole (table 3). Income tracked fairly close to 2010 US census data (table 4). Respondents were asked if they collected antiques, which created an “antiquarian” demographic variable. Similarly, respondents were asked how likely, when traveling for pleasure, they would be to choose an “historic” place to visit. A dichotomous variable called “HeritageTourist” was created based on a response higher than 3 (in a 5 point Likert scale). Lastly, respondents were asked if they worked in public history, historic preservation, or cultural resource management which resulted in a “Work-In-HP” variable. The results of these last three demographic variables indicate that the sample is much higher in antiquarians and people who work in the historic preservation field than the US population as a whole (table 5). The fact that 60.3% of the respondents were heritage tourists, however, is consistent with the US population as a whole (US Dept. of Commerce 2005).

Individual variables assessing the same material, but across the three material categories — assessment of material likes, conditions, and ages — were all strongly positively correlated with each other. A pairwise comparison of variables using Pearson’s r showed that the correlation between individual variables in these three groups (e.g., like-Brick1 and cond-Brick1) ranged from 0.391 to 0.741 ($p < 0.001$). No inverse relationships were found between these categories. Thus, it could be assumed that the degree to which someone likes a material is a proxy for its perceived age and condition. In other words, someone who is likely to have a strong visual preference for a specific material will also rate that material as younger and in better condition. Conversely, a person who likes a material less is more likely to rate the material as older and in poorer condition.

Overall, the respondents preferred the surfaces of new materials, especially Brick3 and Stone3 (table 6). Of the old materials, Stone2, Biogrowth1, Copper1, Copper2, and Wood2 received the highest likability ratings (tables 7-11). Of these materials, the copper and wood photos exhibited rather smooth, homogenous surfaces compared to the other old materials. Conversely, Stone2 had one of the most eroded surfaces of any of the materials, while Biogrowth1 exhibited the only moss (growing on brick) in any of the photos. The other material exhibiting higher order (i.e., bryophytes as opposed to algae or liches) plant growth also received a higher rating, which was Biogrowth2, in which ferns were also growing on brick, but no moss. Respondents did not like surfaces covered with lichen, however, based on responses to Biogrowth3 and Biogrowth4. These represent, however, different materials (stone and wood, respectively), but are so covered in the lichen as to make the underlying material difficult to identity. The least liked materials were Concrete1, ExposedEarth1, Ferrous1, and Paint2. With the exception of Stone2, which was liked, the surfaces of these materials were the most eroded, degraded, and irregular of the materials presented to respondents.

Binary logistical regression was used to select the most successful models that resulted in a reduction of the overall variability using pseudo-R^2 scores based on McFadden R^2, Nagelkerke R^2, and Tjur R^2. The dependent variables, created as dichotomous variables, tested in these models were Gender-female, Gender-male, AgeYoung (18 to 34 years), AgeMid (35 to 64 years), IncomeLow (less than $50,000), IncomeMid ($50,000 to $124,999), IncomeHigh (more than $125,000), AfricanAmerican, Asian, Latino, Antiquarian, HeritageTourist, and Work-In-HP. Based on these tests, there were no statistically significant differences in the responses of respondents based on age, income, or if they self-identified as Asian.

There was, however, a small, but statistically significant, difference in the responses of males and females (tables 12, 13). Females were slightly more likely to dislike ExposedEarth1 and concrete (Concrete1 and Concrete2) than males and slightly more likely to prefer Stone3 and Stucco1 than males. In terms of race, there were small, but significant differences in the responses of African Americans and Latinos. African Americans were more likely (1.552, 1.478, 1.866 times) to have a favorable perception of ExposedEarth1. Paint2, and Paint3 and were less likely to like Stone3 and BioGrowth1 (0.691 and 0.649 times) (table 14). Latinos were more likely to appreciate Paint1, Concrete2, and Paint3 (1.671, 1.413, 1.405 times) and less likely to like Stone3 (0.676). Of note is that the response of African Americans and Latinos to Stone3, which is a new material, is very similar.

Overall, antiquarians had a slightly more favorable rating of a number of old materials: Paint2, ExposedEarth1, Biogrowth1, Biogrowth2, Biogrowth3, Brick2, and Ferrous 2, but a less favorable rating of Stone3 and Stone2 (table 16). Heritage tourists had a slightly more favorable rating of Rubble1, Wood1, Biogrowth1, Brick2, and Copper2 (table 17). Of note is the categorical dislike of new and old stone and new and old wood, relative to the other respondents. The largest factor that resulted in the most reduction of variability in the model, however, was whether or not the respondent worked in the historic preservation field. This particular factor was the largest of any that were tested. Whether or people worked in the preservation field could be reliably predicted based on their preference for ExposedEarth1, Paint2, Metal3, Paint1, Concrete3, Concrete1, Biogrowth4, Paint3, and increased dislike of Stone3, Stone2, Wood2, and Wood3 (table 18).

There were a few statistically significant factors in terms of how Latinos, antiquarians, heritage tourists, and people who work in historic preservation responded to rating the condition of materials. Latinos were slightly more likely to more favorably rate the condition of Biogrowth2, Wood1, ExposedEarth1, and Copper2 and downgrade the condition of Stone3 (the new material) (table 19). Antiquarians were significantly more likely to favorably rate the condition of Ferrous1, somewhat more likely to favorably rate ExposedEarth2 and, like, Latinos, downgrade the condition of Stone 3 (table 20). Heritage tourists were also likely to rank Ferrous1 in better condition, along with Biogrowth1 and Biogrowth4 (table 21). Lastly, the model for people who work in historic preservation had the most factors which also explained a high amount of variability (0.522 to 0.622, depending on the R^2 measure; see table 22). The variables were mostly the same as the preceding category of respondents with some additional ones, including more favorably rating Concrete1 and Paint1 and downgrading the condition of Wood3 and Concrete2.

Lastly, when looking at responses to the perceived age of materials, only models associated with Latinos, antiquarians, and people who worked in historic preservation were significant. In terms of material age, Latinos tended to rate Stone2, Concrete1, Biogrowth1, and Ferrous2 as being younger in age, which Stone3 was rated as older (table 23). Antiquarians were more likely to rate Stone2, Biogrowth4, ExposedEarth1, Copper1, and Biogrwowth1 as younger in age while Wood3 was rated as older in age (table 24). For people who work in historic preservation, Wood3 as well as Stone3 were rated as older in age while Stone2, Biogrowth4, and Biogrowth1 were rated as younger in age (table 25).

Discussion

While the sample does not exactly match the US population—primarily in terms of ages—the fact that there were no factors based on age that contributed to the variability of the responses helps in establishing the generalizability of the results. Indeed, in addition to age, the income and Asian demographic indicators also had no factors associated with them and did not contribute to the sample's variability. The question, therefore, in terms of the preference of materials, is why African Americans and Latinos responded differently than other racial and ethnic groups, including the dominant white group. In both groups, the preference for Paint3 (positive correlation) and Stone3 (negative correlation) were significant and both of these materials were new and therefore did not exhibit obvious signs of age. The old materials in the African American model (ExposedEarth1) and Latino model (Concrete2) were rated in more neutral terms in comparison to the negative ratings shared by most of the respondents in the study. Conversely, there was slightly less visual appreciation for new stone surfaces compared to other groups. Two theories, which are Palmer & Schloss's (2010) "ecological valence theory" (EVT) and Zajonc's (1968) observation that people tend to like objects that are normally in their environment, may explain this result. EVT states that people like or dislike colors based on the colors of liked or disliked objects in their normal environment. If the colors in the environments of African American and Latinx people are, in fact, different, this could explain this result. No data, however, were collected or analyzed that would help establish whether this is the case, or not; moreover, the author is not aware of any literature that concisely identifies if such differences exist.

Why did the respondents, as a whole, prefer Stone2, Biogrowth1, Copper1, Copper2, and Wood2 over all of the other old materials? Other than the two copper images, there is no common material between these five images, but in comparison to the materials with a neutral or negative rating, they have more smoothly curved contours (as opposed to angular ones), an aesthetic preference supported in psychological studies (Bar & Neta 2006; Silvia & Barona 2009; Leder et al. 2011). Stone2 and Copper 1 contain the only images with obvious ornamentation, which implies that respondents are being influenced more by the design than the material or its decay. One could argue that Biogrowth1 is similarly "ornamented", but the pattern was not created by humans alone, but rather by the way in which moss chose to grow on the surface of the brick. This is consistent with research by Stamps (2000), Salingaros (2003, 2006), Crompton

(2002), and Forsythe et al. (2011) that indicates people prefer ornamentation, especially with reference to biophilic mimicry, to visually plain surfaces. In general, people prefer “cool” colors (cyan, green, blue) to “warm” colors (orange, yellow, red) (Hurlbert & Ling 2007; Ling & Hurlbert 2009; Palmer & Schloss 2010), which might also explain the selection of the Copper1 and Copper2 images because they contain the only cool colors in the selection of images presented to respondents.

The least liked materials, which were Concrete1, ExposedEarth1, Ferrous1, and Paint2, represent the most degraded surfaces of all of the images as well as highly angular contours. Angular contours are associated with danger and threats, which result in lower aesthetic ratings (Bar & Neta 2006; Silvia & Barona 2009; Leder et al. 2011). This is especially true for Concrete1 and ExposedEarth1, which have significant cracking and surface erosion absent from the other images. Moreover, with the exception of Ferrous1, all of the images have very irregular features and lack symmetry. Generally speaking, people prefer images with symmetrical features to images with random features (Jacobson & Hofel 2002; Palmer & Griscom 2013). This may indicate that people prefer surface decay that is more subtle and contains elements of symmetry without significant random qualities. It is important to note that while Ferrous1 was one of the most disliked images, Ferrous2 also had a low mean rating relative to the other images; both ferrous images were significantly less liked that the copper images. It might be reasonable to conclude, therefore, that people do not particularly like the appearance of rust, which has long been assumed in the literature (e.g., Dekkers 2000, 51). To wit, in the late nineteenth century, Eugene Wood (1898, 467) observed that “The powers of nature take their revenge upon iron. They rust it and the rust is ugly. But to bronze they are kind.” In addition, people have a general dislike of concrete versus other masonry materials, such as brick or stone (Van Wegen 1970; De Jonge 1971; Brunsman 1976; Steffen 1983), which is supported by the respondents’ general dislike of both concrete (Concrete1 and Concrete2) images.

Also well supported in the literature is people’s affinity for nature, or biophilia. Nature in urban settings has been found to be therapeutic, reducing stress and improving overall well-being (Berman et al., 2008; Bratman et al. 2015; Ulrich 1979, 1981, 1984). Respondents, in general, did give a positive rating to Biogrowth1, which is an image of old brick with a significant growth of moss in the mortar joints, but only assigned a neutral rating to Biogrowth2, which was composed of similar appearing bricks, but instead had ferns growing in the mortar joints. Respondents did not like the other two biogrowth images (Biogrowth3 and Biogrowth4) which consisted of significant encrustations of lichen and algae over stone and wood. More research is necessary to establish whether or not the ratings of Biogrowth3 and Biogrowth4 are due to not being able to see the underlying construction material clearly or if people, in general, do not like the appearance of lichen. It is also not clear why the appearance of higher-order plants, such as ferns, did not result in a stronger positive rating while moss did. It is important to note that in the studies of nature in urban settings, much larger contexts have been involved, such as being able to see entire landscapes, which were not part of this study.

Based on the literature that equates some soiling with positive connotations of authenticity (e.g., Andrew 2002; Carlota and Brimblecombe 2004, 2005), it would have been expected that the respondents would have liked Stone1, Stucco1, and Stucco2. Overall, however, respondents were neutral on the aesthetic qualities of Stone1 and slightly negative for Stucco1 and Succo2, which might be due to the fact that the stone is presented without any context for authenticity—i.e., the building itself. In none of the cases is the soiling excessive, in that it would have the capability of obscuring architecture detail, however.

There is little in the literature to provide context for the differences between male and female responses. To recap, females were slightly more likely to dislike ExposedEarth1 and concrete (Concrete1 and Concrete2) than males and slightly more likely to prefer Stone3 and Stucco1 than males. One potential piece of evidence is that men appear to prefer more saturated colors than women (Palmer & Schloss 2011). The saturation differences between ExposedEarth1, Concrete1, Concrete2, Stone3, and Stucco one are rather minimal. Moreover, the most saturated images are Brick3, Ferrous1, and Ferrous2, which did not exhibit any statistically relevant variance between genders. It can be concluded, therefore, that saturation is not likely to be related to the results.

The large role of Stone3 in all of these results is unusual (it tends to appear in all of the models unlike the other variables). Stone3 represents both an unblemished sandstone surface along with a contemporary design, consisting of a geometric bonding pattern applied as a veneer over the base wall with no obvious mortar in the joints. Where respondents like older materials more, there was a correspondingly large factor to like Stone3 *less*. What is not known is if this is a rejection of the newness of the material or, instead, a rejection of the contemporary design, which is significantly different than traditional stone masonry construction that would have had an ashlar (regular) or random bonding pattern with obvious mortar joints. Other material images that occur with a frequency of more than 3 in the models are shown in figure 2. Two themes are readily apparent: more than half of the new materials are represented in these images and, as a category of old materials, 2 of the 4 biogrowth images and 2 of the 4 concrete images are represented.

Although it was not expected that such a large portion of the sample would represent people who worked in the historic preservation field, it provides a unique opportunity to understand if and how these individuals respond significantly differently to images of surface decay and patina in the built environment. Based on the analysis of the results, it is quite clear that the majority of the variability in the responses can indeed be attributed to individuals who work in the field. To be sure, people who work in historic preservation do find surface decay/patina to be more pleasing, rank the condition of these materials better, and downgrade the overall age of materials in comparison to the general population. This leads to the conclusion that preservationists are DIFFERENT because, for them, “Decay Instills Feelings of Fondness for Environments Related to Entropy, Nostalgia, and Time” (DIFFERENT). The use of this acronym neatly encapsulates some of the important qualities of people who are highly attracted to old environments, including aspects of emotional attachment which are related by the concept of nostalgia.

In my earlier research (Wells & Baldwin, 2012; Wells 2017), I established that people who live in an historic neighborhood (and thus have self-selected this environment over others in which to live) experience a higher degree of emotional attachment to this kind neighborhood versus people who live in a new neighborhood with the same overall urban design, but which lacks any obvious signs of physical age, such as decay or patina. Further, I was able to establish a correlation between the appearance of patina in the old neighborhood and the propensity of people to experience spontaneous fantasies about the past, which helped to emotionally bond them with the place. The question, which the current study lacks sufficient data to answer, is if people who live in old or historic neighborhoods exhibit the same increased like of old, decayed materials as do people who work in the historic preservation field.

Conclusion

An important limitation of this study is that it only examined people's visual preferences of the surfaces—decayed and new—of various materials found in the built environment. As such, it is not possible to extrapolate if and how the results would have been different if the surfaces were presented in context with an entire environment, such as a building. In designing this study, however, the author sought to bracket this environmental context to focus specifically, and only, on patina (in a positive sense) or decay (in a more negative or neutral sense). Future research can then repeat this study with the environmental context intact. Because this study provides necessary grounding on the elusive psychological concept of age value, it will potentially be easier to tease out confounding variables in this future research in order to understand age value more holistically.

Based on the results of this study, people generally prefer new materials in the built environment without obvious decay to the same kind of materials that do have evidence of age. The exception is when, as in the case of significantly decayed stone, an obvious ornamental pattern is evident, which appears to significantly increase the positive rating of the material; without the ornament the material is rated lower. People do not, in general, like decayed earthen building materials, concrete, or ferrous metals. They do like copper surfaces with a patina, regardless of the appearance of an ornamental pattern, but the ornamental pattern increases the positive rating. In general, people have a neutral opinion of the aesthetic qualities of aged brick, preferring new brick, overall as well as aged wood.

While there were no statistically significant differences in the responses based on age, income, or self-identification as Asian, there were small differences based on self-identification as African American and Latino. In these latter two cases, respondents appeared to rate some categories of building materials as slightly more or less aesthetically pleasing, which likely relates to differences in the environment in which they live and work. There were also small differences, based on gender, observed in the data.

The largest and most significant difference, however, was that respondents who indicate they work in the historic preservation or CRM fields were much more likely to rate old, decayed building materials as aesthetically pleasing and new building materials as less aesthetically pleasing than the other respondents, including people who were self-described as antiquarians or heritage tourists. The ramification of this finding is that the emphasis put on the retention and treatment of patina in historic preservation/built heritage conservation practice may not reflect the meanings and values of the general population. Considering that built heritage conservation doctrine was developed by people who had a high affinity for patina and decay, it would therefore make sense that the retention of this characteristic in the built environment would be important, but it would make it equally as possible that other values held by laypeople are likely being ignored. We do know that from a cultural perspective, which is now well established through the authorized heritage discourse (AHD) (Smith 2006), that the meanings and values of heritage practitioners do differ from laypeople. Building on Smith's (2006) research, from a psychological perspective, a similar phenomenon might be at work that could perhaps be referred to as the "authorized heritage perception" (AHP). If, as a layperson, one does not find patina aesthetically pleasing, then from the perspective of the AHP, built heritage practitioners discount or sideline one's experience.

What if the perceptual foundation for orthodox built heritage conservation practice was developed by people who were literally DIFFERENT in their psychological response to the built environment? If this is the case, do heritage practitioners have the right to enforce their psychological perceptions on others who do not share their experiences? To be sure, we lack sufficient data to answer this question, but the hope is that this study has opened the door to future research on the psychology of senescent environments.

Works cited

Baldini, U. (1996). Theory of restoration and methodological unity. In N. S. Price, M. K. J. Talley, & A. M. Vaccaro (Eds.), *Historical and philosophical issues on the conservation of cultural heritage* (355-357). Los Angeles: The Getty Conservation Institute. Originally published 1978.

Bar, M., Neta, M. (2006). Humans prefer curved visual objects. *Psychological Science* 17:645–48

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science*, 19(12), 1207-1212.

Boito, C. (1884*). I restauratori, conferenza tenuta all'esposizione di torino, il 7 giugno 1884*. Florence.

Brandi, C. (1977). *Teoria del restauro*. Turin: Einaudi.

Bratman, G.N., Daily, G.C., Levy, B.J., Gross, J.J. (2015). The benefits of nature experience: Improved affect and cognition. *Landscape and Urban Planning* 138, 41-50.

Brunsman, P. (1976*). Beleving van monumenten*. Amsterdam: Dr. E. Broekmanstichting.

Buhrmester, M., Kwang, T., and Gosling, S.D. (2011). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*, 6(1), 3-5.

Carbonara, G. (1996). The integration of image: Problems in the restoration of monuments. In N. S. Price, M. K. J. Talley, & A. M. Vaccaro (Eds.), *Historical and philosophical issues on the conservation of cultural heritage* (236-243). Los Angeles: The Getty Conservation Institute. Originally published 1976.

Crompton, A. (2002). Fractals and the picturesque. E*nvironment and Planning B: Planning and Design* 29, 451– 459.

De Jonge, D. (1971). *Over de belevingswaarde van enige bouwmaterialen*. Delft: Technische Hogeschool Delft.

Dekkers, M. (2000). *The way of all flesh: The romance of ruins* (S. Marx-Macdonald, Trans.). New York: Ferrar, Straus and Giroux.

Forsythe, A., Nadal, M., Sheehy, N., Cela-Conde, J.J., Sawey, M. (2011). Predicting beauty: Fractal dimension and visual complexity in art. *British Journal of Psychology* 102(1), 49-70

Hurlbert, A.C., Ling, Y. (2007). Biological components of sex differences in color preference. *Current Biology* 17(16), R623–R625.

Jacobson, T., Hofel, L.A. (2002). Aesthetic judgments of novel graphic patterns: Analyses of individual judgments. *Perceptual and Motor Skills* 95(3 pt 1):755–766.

Leder, H., Tinio, P.P., Bar, M. (2011). Emotional valence modulates the preference for curved objects. *Perception* 40(6), 649–665.

Ling, Y.L., Hurlbert, A.C. (2009). A new model for color preference: Universality and individuality. *Proceedings of the 15th color imaging conference*, 8–11.

Morris, W., Webb, P. (1877). SPAB manifesto. https://www.spab.org.uk/about-us/spab-manifesto

Palmer, S.E., Griscom, W.S. (2013). Accounting for taste: Individual differences in preference for harmony. *Psychonomic Bulletin & Review* 20(3), 453-461.

Palmer, S.E., Schloss, K.B. (2010). An ecological valence theory of human color preference. *Proceedings of the National Academy of Sciences of the United States of America* 107(19), 8877–8882.

Palmer, S.E., Schloss, K.B. (2011). Ecological valence and human color preference. In C.P. Biggam, C.A. Hough, C.J. Kay, D.R. Simmons (eds.), *New Directions in Colour Studies* (361–376). Amsterdam: Benjamins.

Quist, W.J., van Bommel, A.J. (2018). The Noble Patina of Age. In K. van Breugel, D. Koleva, T. van Beek (eds), *The ageing of materials and structures towards scientific solutions for the ageing of our assets*. Cham, Switzerland: Springer.

Quist, W.J., van Hees, R.P.J., Naldini, S, Nijland, T.G. (2007). De beleving van schade en reparaties aan natuursteen. *Praktijkboek Instandhouding Monumenten* (30), 1-15.

Quist, W. J., van Hees, R.P.J., S. Naldini, and T.G. Nijland. (2008). The Perception of Small Scale Damage and Repairs of Natural Stone. Paper T15 from the Proceedings of the 11th International Conference on Durability of Materials and Components, Istanbul.

Riegl, A. (1996). The modern cult of monuments: Its essence and its development. In N. S. Price, M. K. J. Talley, & A. M. Vaccaro (Eds.), *Historical and philosophical issues on the conservation of cultural heritage* (69-83). Los Angeles: The Getty Conservation Institute. (Original work published 1903.)

Ruskin, J. (1907). *The seven lamps of architecture*. Leipzig: Bernhard Tauchintz. (Original work published 1849)

Salingaros, N. A. (2003). The sensory value of ornament. *Communication & Cognition*, 36, 331–351

Salingaros, N. A. (2006). *A theory of architecture. Solingen*. Germany: Umbau.

Silvia, P.J., Barona ,C.M. (2009). Do people prefer curved objects? Angularity, expertise, and aesthetic preference. *Empirical Studies of the Arts* 27(1), 25–42.

Stamps, A. E. (2000). *Psychology and the aesthetics of the built environment*. Boston: Kluwer Academic.

Steffen, C. (1983). *De beleving van gevelvervuiling*. Delft: Centrum voor Architectuuronderzoek.

Smith, L. (2006). *Uses of heritage*. London: Routledge.

Ulrich, R. S. (1979). Visual landscapes and psychological well-being. *Landscape Research*, 4 (1), 17-23.

Ulrich, R. S. (1981). Natural versus urban spaces: Some psychological effects*. Environment and Behavior*, 13 (5), 523-556.

Ulrich, R. S. (1984). View through a window may influence recovery from surgery. *Science*, 224 (4647), 420-421.

US Dept. of Commerce. (2005). *Cultural and heritage tourism in the United States*. Washington, DC: US Department of Commerce and the President's Committee on the Arts and Humanities. https://www.oregon.gov/oprd/HCD/FINASST/docs/05WhitePaperCultHeritTourism.pdf

Van Wegen, H.B.R. (1970) *Onderzoek naar de belevingswaarde van vier bouwmaterialen met behulp van de semantische differentiaal – techniek*. Delft: Technische Hogeschool Delft.

Wood, E. (1898). Expression through bronze. *Werner's Magazine* 21(1), 463-476,

Wells, J. C. (2017). How are old places different from new places? A psychological investigation of the correlation between patina, spontaneous fantasies, and place attachment. *International Journal of Heritage Studies*, *23*(5), 445-469.

Wells, J. C., & Baldwin, E. D. (2012). Historic preservation, significance, and age value: A comparative phenomenology of historic Charleston and the nearby new-urbanist community of I'On. *Journal of Environmental Psychology*, *32*(4), 384-400.

Wells, J.C., Stiefel, B.L. (2019). Moving past conflicts to foster an evidence-based, human-centric built heritage conservation practice. In J.C. Wells, B.L. Stiefel (eds.), *Human-centered built environment heritage preservation: Theory and evidence-based practice*. London: Routledge.

Zajonc, R.B. (1968). Attitudinal effects of mere exposure. *Journal of Personality and Social Psychology* 9(2), 1–27.

Probing the Person-Patina Relationship: A Correlational Study on the Psychology of Senescent Environments

Tables and figures

Table 1. Age of respondents. N=864.

	18 to 24	*25 to 34*	*35 to 44*	*45 to 54*	*55 to 64*	*75 to 84*	*85 or older*
N	77	456	180	73	51	2	3
Frequency	8.9%	52.8%	20.8%	8.4%	5.9%	0.2%	0.3%

Table 2. Gender of respondents. N=864.

	Male	*Female*	*Non-binary*	*Prefer not to say*
N	486	370	3	5
Frequency	56.2%	42.8%	0.3%	0.6%

Table 3. Race and ethnicity of respondents. N=864.

	White	*African American*	*Asian*	*Two or more races*	*American Indian*	*Other race*	*Latino*
N	599	155	49	26	16	19	165
Frequency	69.3%	17.9%	5.7%	3.0%	1.9%	2.2%	19.1%

Table 4. Income of respondents. N=864.

	Less than $25,000	*$25,000 to $49,999*	*$50,000 to $74,999*	*$75,000 to $99,999*	*$100,000 to $124,999*	*$125,000 to $149,999*	*More than $150,000*	*Prefer not to say*
N	112	285	219	142	55	22	18	11
Frequency	13.0%	33.1%	25.3%	16.4%	6.4%	2.5%	2.1%	1.3%

Table 5. Basic characteristics of respondents. N=864.

	Antiquarian	*Heritage tourist*	*Work in HP field*
N	285	521	198
Frequency	33.0%	60.3%	22.9%

Table 6. Degree to which respondents liked new surfaces of various materials.

	like-Brick3	*like-Stone3*	*like-Metal3*	*like-Paint3*	*like-Concrete3*	*like-Stucco3*	*like-Wood3*
N	864	864	864	864	864	864	864
Mean	4.144	4.197	3.096	3.543	3.405	3.884	3.987
Median	4.000	4.000	3.000	4.000	4.000	4.000	4.000
Std. Deviation	1.003	0.9326	1.190	1.159	1.125	1.019	0.9705
Minimum	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Maximum	5.000	5.000	5.000	5.000	5.000	5.000	5.000

Table 7. Degree to which respondents liked old masonry surfaces.

	like-Brick1	*like-Brick2*	*like-Stone1*	*like-Stone2*	*like-Concrete1*	*like-Concrete2*
N	864	864	864	864	864	864
Mean	3.007	2.959	2.860	3.618	2.396	2.663
Median	3.000	3.000	3.000	4.000	2.000	3.000
Std. Deviation	1.125	1.156	1.193	1.148	1.268	1.139
Minimum	1.000	1.000	1.000	1.000	1.000	1.000
Maximum	5.000	5.000	5.000	5.000	5.000	5.000

Table 8. Degree to which respondents liked biological growth on the surface of old materials.

	like-Biogrowth1	*like-Biogrowth2*	*like-Biogrowth3*	*like-Biogrowth4*
N	864	864	864	864
Mean	3.354	3.022	2.515	2.605
Median	4.000	3.000	2.000	2.000
Std. Deviation	1.223	1.210	1.325	1.308
Minimum	1.000	1.000	1.000	1.000
Maximum	5.000	5.000	5.000	5.000

Table 9. Degree to which respondents liked old materials commonly found within traditional wall construction.

	like-ExposedEarth1	*like-ExposedEarth2*	*like-Rubble1*	*like-Rubble2*
N	864	864	864	864
Mean	2.321	2.508	2.597	2.767
Median	2.000	2.000	3.000	3.000
Std. Deviation	1.241	1.169	1.223	1.354
Minimum	1.000	1.000	1.000	1.000
Maximum	5.000	5.000	5.000	5.000

Table 10. Degree to which respondents liked the surfaces of old metals.

	like-Copper1	*like-Copper2*	*like-Ferrous1*	*like-Ferrous2*
N	864	864	864	864
Mean	3.355	3.422	2.241	2.448
Median	3.000	4.000	2.000	2.000
Std. Deviation	1.143	1.161	1.327	1.346
Minimum	1.000	1.000	1.000	1.000
Maximum	5.000	5.000	5.000	5.000

Table 11. Degree to which respondents liked old materials used for surface finishes.

	like-Paint1	*like-Paint2*	*like-Stucco2*	*like-Stucco1*	*like-Wood1*	*like-Wood2*
N	864	864	864	864	864	864
Mean	2.409	2.183	2.664	2.674	3.122	3.505
Median	2.000	2.000	3.000	3.000	3.000	4.000
Std. Deviation	1.241	1.249	1.263	1.221	1.106	1.112
Minimum	1.000	1.000	1.000	1.000	1.000	1.000
Maximum	5.000	5.000	5.000	5.000	5.000	5.000

Table 12. Most successful model comparing female gender (dependent variable) against liked materials.

Variables	*Coefficient*	*Odds ratio*	*p*
like-ExposedEarth1	-0.282	0.754	< .001
like-Stone3	0.242	1.274	0.005
like-Concrete1	-0.339	0.713	< .001
like-Biogrowth1	0.154	1.167	0.021
like-Copper2	0.137	1.147	0.061
like-Concrete2	-0.238	0.788	0.005
like-Stucco1	0.205	1.228	0.011

Model summary: p=0.011; McFadden R^2 = 0.091; Nagelkerke R^2 = 0.156; Tjur R^2 = 0.293.

Table 13. Most successful model comparing male gender (dependent variable) against liked materials.

Variables	*Coefficient*	*Odds ratio*	*p*
like-ExposedEarth1	0.320	1.377	< .001
like-Stone3	-0.290	0.748	< .001
like-Concrete1	0.320	1.377	< .001
like-Biogrowth4	-0.194	0.824	0.008
like-Concrete2	0.239	1.271	0.005
like-Stucco1	-0.208	0.812	0.010

Model summary: p=0.009; McFadden R^2 = 0.086; Nagelkerke R^2 = 0.150; Tjur R^2 = 0.214.

Table 14. Most successful model comparing African American (dependent variable) against liked materials.

Variables	*Coefficient*	*Odds ratio*	*p*
like-ExposedEarth1	0.440	1.552	< .001
like-Paint3	0.624	1.866	< .001
like-Stone3	-0.369	0.691	< .001
like-Biogrowth1	-0.432	0.649	< .001
like-Paint2	0.390	1.478	< .001

Model summary: p=< .001; McFadden R^2 = 0.170; Nagelkerke R^2 = 0.242; Tjur R^2 = 0.096.

Table 15. Most successful model comparing Latino (dependent variable) against liked materials.

Variables	*Coefficient*	*Odds ratio*	*p*
like-Paint1	0.513	1.671	< .001
like-Concrete2	0.346	1.413	0.001
like-Stone3	-0.391	0.676	< .001
like-Paint3	0.340	1.405	< .001

Model summary: p=< .001; McFadden R^2 = 0.162; Nagelkerke R^2 = 0.235; Tjur R^2 = 0.017.

Table 16. Most successful model comparing antiquarian (dependent variable) against liked materials.

Variables	*Coefficient*	*Odds ratio*	*p*
like-Paint2	0.219	1.245	0.033
like-ExposedEarth1	0.270	1.310	0.003
like-Stone3	-0.421	0.657	< .001
like-Biogrowth3	0.216	1.241	0.016
like-Paint3	0.280	1.323	< .001
like-Brick2	0.232	1.261	0.008
like-Biogrowth1	0.254	1.289	0.005
like-Stone2	-0.237	0.789	0.009
like-Ferrous1	0.225	1.252	0.013

Model summary: p=0.014; McFadden R^2 = 0.247; Nagelkerke R^2 = 0.375; Tjur R^2 = 0.143.

Table 17. Most successful model comparing heritage tourist (dependent variable) against liked materials.

Variables	*Coefficient*	*Odds ratio*	*p*
like-Rubble1	0.262	1.299	< .001
like-Wood1	0.280	1.323	< .001
like-Biogrowth1	0.185	1.203	0.005
like-Brick2	0.186	1.205	0.009
like-Copper2	0.142	1.152	0.045

Model summary: p=< .001; McFadden R^2 = 0.104; Nagelkerke R^2 = 0.177; Tjur R^2 = 0.217.

Table 18. Most successful model comparing working in HP field (dependent variable) against liked materials.

Variables	*Coefficient*	*Odds ratio*	*p*
like-ExposedEarth1	0.461	1.585	< .001
like-Paint2	0.365	1.441	0.011
like-Stone3	-0.729	0.482	< .001
like-Metal3	0.493	1.637	< .001
like-Paint1	0.451	1.570	0.003
like-Stone2	-0.396	0.673	0.003
like-Concrete3	0.439	1.551	0.002
like-Concrete1	0.246	1.279	0.058
like-Biogrowth4	0.287	1.333	0.036
like-Wood2	-0.312	0.732	0.033
like-Paint3	0.286	1.331	0.022
like-Wood3	-0.295	0.745	0.037

Model summary: p=0.037; McFadden $R^2 = 0.473$; Nagelkerke $R^2 = 0.606$; Tjur $R^2 = 0.349$.

Table 19. Most successful model comparing Latino (dependent variable) against rating of materials' condition.

Variables	*Coefficient*	*Odds ratio*	*p*
cond-Biogrowth2	0.501	1.650	< .001
cond-Wood1	0.471	1.602	< .001
cond-Stone3	-0.461	0.631	< .001
cond-ExposedEarth1	0.260	1.297	0.008
cond-Copper2	0.237	1.267	0.035

Model summary: p=< .001; McFadden $R^2 = 0.235$; Nagelkerke $R^2 = 0.329$; Tjur $R^2 = 0.080$.

Table 20. Most successful model comparing antiquarian (dependent variable) against rating of materials' condition.

Variables	*Coefficient*	*Odds ratio*	*p*
cond-Ferrous1	0.751	2.120	< .001
cond-ExposedEarth1	0.439	1.551	< .001
cond-Stone3	-0.433	0.649	< .001

Model summary: p=< .001; McFadden $R^2 = 0.265$; Nagelkerke $R^2 = 0.397$; Tjur $R^2 = 0.018$.

Table 21. Most successful model comparing heritage tourist (dependent variable) against rating of materials' condition.

Variables	*Coefficient*	*Odds ratio*	*p*
cond-Ferrous1	0.521	1.684	< .001
cond-Biogrowth1	0.399	1.490	< .001
cond-Biogrowth4	0.336	1.399	< .001

Model summary: p=< .001; McFadden $R^2 = 0.220$; Nagelkerke $R^2 = 0.331$; Tjur $R^2 = 0.041$.

Table 22. Most successful model comparing working in HP field (dependent variable) against rating of materials' condition.

Variables	*Coefficient*	*Odds ratio*	*p*
cond-Ferrous1	0.475	1.609	< .001
cond-ExposedEarth1	0.283	1.328	0.032
cond-Stone3	-0.546	0.579	< .001
cond-Biogrowth2	0.441	1.555	0.005
cond-Biogrowth1	0.387	1.473	0.002
cond-Concrete1	0.434	1.544	0.008
cond-Wood3	-0.276	0.759	0.038
cond-Concrete2	-0.443	0.642	0.005
cond-Paint1	0.448	1.565	0.006

Model summary: p=0.006; McFadden $R^2 = 0.522$; Nagelkerke $R^2 = 0.652$; Tjur $R^2 = 0.172$.

Table 23. Most successful model comparing Latino (dependent variable) against rating of materials' age.

Variables	*Coefficient*	*Odds ratio*	*p*
age-Stone2	0.418	1.519	< .001
age-Concrete1	0.331	1.392	0.006
age-Biogrowth1	0.275	1.316	0.021
age-Stone3	-0.258	0.772	0.008
age-Ferrous2	0.286	1.330	0.018

Model summary: p=0.017; McFadden $R^2 = 0.220$; Nagelkerke $R^2 = 0.311$; Tjur $R^2 = 0.021$.

Table 24. Most successful model comparing antiquarian (dependent variable) against rating of materials' age.

Variables	*Coefficient*	*Odds ratio*	*p*
age-Stone2	0.339	1.403	< .001
age-Biogrowth4	0.303	1.354	0.009
age-Wood3	-0.490	0.613	< .001
age-ExposedEarth1	0.275	1.316	0.006
age-Copper1	0.282	1.325	0.011
age-Biogrowth1	0.236	1.266	0.031

Model summary: p=0.031; McFadden $R^2 = 0.261$; Nagelkerke $R^2 = 0.392$; Tjur $R^2 = 0.381$.

Table 25. Most successful model comparing working in HP field (dependent variable) against rating of materials' age.

Variables	*Coefficient*	*Odds ratio*	*p*
age-Stone2	0.778	2.177	< .001
age-Biogrowth4	0.802	2.229	< .001
age-Wood3	-0.519	0.595	< .001
age-Stone3	-0.554	0.575	< .001
age-Biogrowth1	0.597	1.817	< .001

Model summary: p=< .001; McFadden $R^2 = 0.467$; Nagelkerke $R^2 = 0.599$; Tjur $R^2 = 0.252$.

Figures 1a through 1ae. Photos of decayed and new surfaces found in the built environment. All photos by the author.

Figure 1a. Biogrowth1: Approximately seven bricks with significant growth of moss and discolored surfaces.

Figure 1b. Biogrowth2: Approximately seven bricks with decayed surfaces and mortar with small ferns growing in mortar joints.

Figure 1c. Biogrowth3: Close-up of stone wall with significant lichen growth.

Figure 1d. Biogrowth4: Close-up of wood fence with significant lichen growth.

Figure 1e. Brick1: Approximately seven bricks with decayed (rough) surfaces and damaged mortar.

Figure 1d. Brick2: Approximately twelve bricks with eroded mortar and one damaged brick.

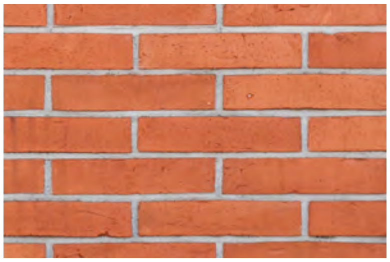

Figure 1g. Brick3: New wall with approximately ten bricks.

Figure 1h. Stone1: Close-up of limestone block wall with gypsum crust soiling.

Figure 1i. Stone2: Close-up of carved sandstone (face-bedded) wall with significant surface detail loss due to erosion.

Figure 1j. Stone3: Close-up of new stone wall construction.

Figure 1k. Concrete1: Close-up of concrete wall with deep, irregular cracks and surface soiling.

Figure 1l. Concrete2: Close-up of concrete wall with surface erosion.

Figure 1m. Concrete3: Close-of new concrete wall with regular, smooth surface.

Figure 1n. ExposedRubble2: Close-up of interior brick and stone rubble wall construction (surface stucco has been removed) with beige lime/earth mortar containing lime blebs.

Figure 1o. ExposedRubble2: Close-up of interior of brick and stone rubble wall construction (stucco surface has been removed) with white lime mortar.

Figure 1p. ExposedEarth1: Close-up of adobe (earth) wall with lower section significantly eroded, exposing interior straw reinforcement.

Figure 1q. ExposedEarth2: Approximately four large adobe blocks with some surface erosion.

Figure 1r. Copper1: Close-up detail of decorative copper geometrically designed, architectural detail with significant blue-colored patina.

Figure 1s. Copper2: Close-up detail of smooth, irregular copper surface with significant blue-green patina.

Figure 1t. Ferrous1: Corrugated steel roof with significant surface rust.

Figure 1u. Ferrous2: Close-up of steel sheet with significant surface rust and eroded blue paint.

Figure 1v. Metal3: New corrugated steel sheet.

Figure 1w. Stucco1: Smooth stucco wall with significant soiling and irregular surface discoloration.

Figure 1x. Stucco2: Slightly irregular stucco wall with significant soiling and surface erosion.

Figure 1y. Stucco3: New stucco wall with smooth, regular features.

Figure 1z. Paint1: Close-up of painted piece of wood with alligator cracking.

Figure 1aa. Paint2: Close-up of patient wall with significant paint loss due to alligator cracking.

Figure 1ab. Paint3: Close-up of new painted wall with slight, even surface texture.

Figure 1ac. Wood1: Close-up of unpainted wood floor with UV-damaged (gray) surface and cracks.

Figure 1ad. Wood2: Close-up of unpainted wood floor with eroded, darkened surface closely following wood grain.

Figure 1ae. Wood3: New wood (oak) floor.

Figure 2. Top material images by frequency of occurrence in models. (Number of times in parenthesis.) All photos by author.

Stone3 (11)

Exposed earth1 (9)

Biogrowth1 (8)

Biogrowth4 (5)

Concrete1 (5)

Concrete2 (4)

Figure 2. Top material images by frequency of occurrence in models. (Number of times in parenthesis.) All photos by author.

Wood3 (4)

Paint3 (4)

Paint1 (4)

Ferrous1 (4)