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Seeking Evidence-Based Photographs for “Art on the Walls” Program: Why is that?

Evidence-based design is the process of basing decisions about the built environment on credible research to achieve the best possible atmosphere and outcomes. Much of the research on evidence-based design has been done with an eye toward healthcare, with the intent of reducing the stress and anxiety that may be associated with unfamiliar and intimidating settings. Evidence-based design is being introduced across the country in our most effective and prestigious healthcare settings as a tool to calm, soothe, generate positive feelings, and promote a state of mind conducive to productive interactions.

Sources of stress (such as health worries, unfamiliar facilities and routines, any situation out of our control) produce an internal state of tension or anxiety at some level, which translates to an experience of uneasiness or discomfort. As we have all realized, anxiety or tension (running from mild to a state of panic) can affect our thoughts and behaviors. High levels of frustration can sometimes even lead to violent reactions (Hathorn, 2000).

Visual art, both as stand-alone pieces and as landmarking cues, has been increasingly introduced as an effective evidence-based design tool for alleviating stress and consequent anxiety in people experiencing this in a setting (such as a healthcare facility) that is not under their control (Hathorn & Nanda, 2008). This calming influence of visual art can positively affect the experience within such a setting, with possible impact on communication, cooperation, and perception of interactions (Nanda, Chanaud, Nelson, Bajema, & Jansen, 2012).

It is, however, not just any old picture that will elicit favorable responses. Scenes of nature are key. Furthermore, research in both laboratories and real-world settings has demonstrated that, while surrogate “views” of nature (photographic representations) may substitute for actual views of nature through windows (e.g., Verderber, 1986), those surrogate “views” must have carefully selected content and complexity. Images depicting nonthreatening scenes of nature, composed with careful attention to included features, to general shapes, to color contrasts, and to mathematically determined complexity have been demonstrated across more than 30 years of

experimentation to be the most effective at evoking desirable psychological and physiological responses, across ethnicities and despite an individual's current home location or location of upbringing. Lack of art (no distraction) or abstract art (difficult to interpret) or art depicting urban scenes dominated by linearity (perceived as more threatening) can all have the exact opposite effects.

But why is this? What is the theory and current understanding of why art in healthcare settings should be composed with certain content to be most helpful?

Psychoevolutionary Theory

Several theorists have proposed a connection between human evolutionary development and derivation of pleasure and relaxation from natural settings. The human brain, they say, adapted to best appreciate natural configurations that appear to favor survival and well-being (Appleton, 1975; Orians, 1980; Orians, 1986; Orians & Heerwagen, 1992; Wilson, 1993; Wohlwill, 1983). Wilson hypothesized a condition of "biophilia" associated with this evolutionary perspective: Humans have an innate attraction to living things, a predisposition to focus on and respond to scenes of natural content. Wohlwill suggested that the human brain and senses developed in natural environments and, therefore, have an easier time processing information from such environments, being relatively fatigued by information from the historically very recent alternative constructed environments.

Evolutionary theory about human relationship to landscape has expanded to include not only the idea that humans have been genetically steered to favor natural content over man-made structures and objects, but also to encompass the idea that humans are inclined to respond to certain types of landscape most positively. Many researchers have demonstrated this (Chang & Perng, 1998; Parsons, Lohr & Pearson-Mims, 2006; Tassinary, Ulrich, Hebl, & Grossman-Alexander, 1998; Ulrich, 1979; Ulrich, 1981; Ulrich et al., 1991): Savannah-like (park-like) settings, especially with fresh, calm waters included, are favored over other types of scenes cross-culturally (Ulrich, 1993), as seen with American, British, Canadian, Chinese, Swedish, and Ugandan (Ulrich, 1983), as well as Australian (Hertzog, Herbert, Kaplan, & Crooks, 2000) research participants. An ongoing series of survey studies spanning several years was begun to investigate "most liked" and "least liked" features of pictures in as many countries across the globe as would participate (Wypijewski, 1997). To date, this research has demonstrated that park-like setting with blues, greens, and fresh water is the most favorite type of scene, while linear abstract is the least favorite. This has held true universally to date, including Asian, Middle

Eastern, East African, European (eastern and western), and North American samplings. Orians (1986) suggested that this type of natural setting may be empirically shown to offer high potential for yielding basic human needs – food, water, and components for shelter. These features, in turn, suggest the ability to rest. Evolutionary theory and the hypothesis of biophilia provide an initial theoretical framework to suggest that nature is an important ingredient in healing environments where it is desirable to evoke a sense of well-being.

Ulrich (1993) called on stress theory to extend the implications of biophilia and its evolutionary foundation. Stressors ("aversive agents," including situations that are taxing or threatening; Evans & Cohen, 1987, p. 575) lead to a stress reaction, which entails psychological responses and multiple organ system physiological responses (Selye, 1946; Selye, 1976c) that may affect mental and physical health. Evans and Cohen pointed out that "the conditions of the physical environment weigh significantly in the stress and coping process" (p. 571). Ulrich (1993) proposed that security and "restoration" (recovery from stress response; p. 88) are the subjective qualities identified with evolutionary advantage (survival and health) that underlie the objective elements in the preferred settings – low growth mixed with trees (possible food sources and shelter), flat areas through which to move (safety, egress), and water to drink. Flowers may also be part of a preferred setting because of their evolutionary association with food resources (Heerwagen & Orians, 1993; Kim & Mattson, 2002). Ulrich referred to the linking of stress theory, evolutionary theory, and the hypothesized condition of biophilia as a "psychoevolutionary framework" (Ulrich, 1983, p. 89) and this framework has been used to explain results of research that came before and to inform hypotheses that followed.

Kaplan (1978) contributed to the development of thought on the psychoevolutionary basis for human response to natural landscapes by providing a more specific idea about the cognitive mechanism through which viewing natural settings might work to reduce stress and provide a restorative experience. He distinguished "voluntary attention," or attention requiring effort, from "involuntary attention," or attention requiring no effort (p.85). According to Kaplan, voluntary attention (to time schedules, to behavior, to conversation, to health care regimens, to environmental and social cues, to tasks, etc.) requires internal suppression of distraction and creates mental fatigue. Resting this overworked cognitive state may be achieved by having attention be taken up involuntarily – by environments or environmental images that are innately interesting and that fascinate without conscious effort. Kaplan also incorporated evolutionary predisposition into his explanation at this point. From evolutionary theory, he concluded that certain images evoke involuntary attention as a survival mechanism. These images include

"green things ... gardens ... patterns of natural vegetation ... water" (p. 88) and are "innately fascinating, ... attention [to them] requir[ing] no effort," (p. 86) as "survival may well have depended upon paying immediate attention to stimuli of this kind" (p. 86). This sort of attention would be instinctual and immediate, not consciously directed (Ulrich, 1983).

Kaplan's premise is that attending to natural settings or images of them dispenses with conscious effort, thereby reduces stress, and leads to survival advantages associated with psychological rest. From such reflections on cognitive states, stress, and restorative requirements came the idea that viewing select natural settings (innately associated with stress-reducing factors of safety, rest, and satisfaction of hunger and thirst) may counteract the stress reaction and provide some health benefit to patients in stressful situations (Ulrich & Parsons, 1992).

Many studies have tested this idea that certain images can have positive physical and psychological effects on people. In the '80s, Moore (1981) and Ulrich (1984) kicked off this line of inquiry. They each researched the effects of actual views using windows that faced landscape settings versus windows that faced constructed areas (e.g., walls and concrete lots). In both cases, viewing natural scenes had positive effects on health outcomes (fewer episodes of "sick call" in prison, and shorter stays, fewer negative chart notes, and fewer doses of mild to moderate analgesics in a post-surgical unit), while viewing the man-made artifacts had opposite effects.

Excited by these results, Ulrich and others did research in laboratories to examine more specifically the physiological and psychological parameters affected by viewing natural scenes.

Laboratory Studies Using Photographic Images

Consistent with the psychoevolutionary theoretical framework, these researchers showed that emotional and physiological measures of the stress response can be rapidly reduced by exposure to natural scenes, and that real views are unnecessary: Exposure to pictorial representations can reduce these measures also (Chang & Perng, 1998; Parsons, Tassinary, Ulrich, Hebl, & Grossman-Alexander, 1998; Ulrich, 1979; Ulrich, 1981; Ulrich et al., 1991; Wise & Rosenberg, 1988). Importantly, the reaction is measured in seconds. Even short visual contact can result in positive effects. Our brains may be "hard-wired" to quickly recognize a "safe" scene and relax in light of no warning signs of a possibly dangerous situation (Bar & Neta, 2007). Collectively, these studies looked at heart rate, blood pressure, alpha brain waves, skin conductance, finger temperature, and muscle tension (all measured with biofeedback equipment), and at self-reported affect (with the Zuckerman Inventory of Personal Reactions or, in two cases, an investigator-

made Likert scale rating experience of viewing the scenes). Results of these studies included: (a) more complete and faster recovery from a stress reaction induced prior to viewing any photos by viewing natural scenes versus urban/man-made scenes, (b) more desirable affect descriptors from viewers of natural scenes versus viewers of urban/man-made scenes, and (c) greater resistance to a stressor introduced after viewing natural scenes versus urban/man-made scenes – all reaching statistical significance.

Other laboratory studies had a more singular focus than the above referenced experiments – looking at particular health-related measures such as pain tolerance, pain threshold, and requests for p.r.n. pain medications (Tse, Ng, Chung, and Wong, 2002; Vincent, Battisto, Grimes, and McCubbin, 2010). In the groups that viewed natural landscape imagery, pain tolerance increased; pain threshold increased; and requests for pain medication decreased.

Studies in Clinical Settings Using Photographic Images

Having seen these positive findings in laboratory settings - physiological indications of stress reduction after viewing content-specific, photographic representations of natural scenes - researchers took their work into clinical settings. Several studies have demonstrated similarly desirable results in real-world scenarios. Viewing the nature images (as opposed to other types of images or no images) was associated with less anxiety and less call for p.r.n. medications in a psychiatric situation and in a post-surgical unit (Nanda, Eisen, Zadeh, and Owen, 2010; Ulrich, Lunden, and Eltinge, 1993), less self-rated pain and anxiety in a burn unit (Miller, Hickman, and Lemasters, 1992), less anxiety in a dental clinic for people with fear of dental procedures (Heerwagen, 1990), less documented agitation in a dementia care facility (Whall et al., 1997; Martin, 2011), better perception of pain control post bronchoscopy procedure (Diette, Lechtzin, Haponik, Devrotes, and Rubin, 2003), a better labor experience (including better Apgar scores, lower heart rate, and less pain medication associated with better scores on the Quality from Patient's Perspective Questionnaire; Abduras, Pati, Gaines, Gilinsky, & Casanova, 2014), and an increase in desirable socialization (calm conversation), which may promote supportive interactions (Nanda, Chenaud, Nelson, Bajema, & Jansen, 2012).

Notably, stress reaction is not confined to patients. A hospital or clinic situation may be stress inducing for visitors and staff as well. The research would suggest that introduction of evidence-based imagery in areas where these populations may spend time could have desirable effects on their state of mind and physiological reflections of that also. In turn, this then could impact interactions with the patient and with other members of the caregiving team (outside the

scope of this article, there is research on how caregiver well-being affects interactions with patients and, therefore, patient perceptions and outcomes).

In addition to having positive outcomes for individuals (patients, staff, and visitors alike), it seems that imagery and other design that makes a room “appealing” may be able to affect a facility itself. Swan, Richardson, and Hutton (2003) undertook a study that suggested rooms with added touches in décor and finishes could make a difference to patient evaluations of caregivers, other staff, and facility services and affect likelihood of using the facility again and of recommending the facility to others. While their study had several limitations (one important one being the need for a tighter definition of what constitutes “appealing”), it offers an interesting possibility that needs to be followed up with further research. If imagery can be a part of the puzzle that generates better patient evaluations and ratings, it could be a relatively inexpensive and effective component of a program of design that could affect the well-being of the facility itself, as well as that of the patients and other users.

Possible Mechanism – Pattern Recognition

We do know that many natural scenes are fractal – having patterns of shape that recur on finer and finer scales throughout the visual frame (Taylor et al., 2005). A fractal dimension may be calculated for photographic images and will range between 1.0 (a line) and 2.0 (a plane) on a logarithmic scale (Wise & Taylor, 2002). This range represents a progression in complexity, for example, an image of fluffy clouds might have a fractal dimension of 1.3, while a briar patch might have a fractal dimension of 1.8 (Wise & Taylor). Wise and Taylor hypothesized that the calming effect of natural landscape images might have to do with brain neurocircuitry evolutionarily programmed to recognize a fractal range in these scenes that corresponds to the fractal range of environments in which humans developed as a species.

Wise and Rosenberg (1988) noted, "Although certain types of trees, foliage and landforms may be highly preferred or particularly evocative, this does not imply that the active agent is in the thing itself rather than in what the thing displays" (p. 11). This idea was demonstrated by VanTonder, Lyons, and Ejima (2002). These investigators mathematically analyzed a Japanese meditation garden renowned for its meditative and relaxing character and found that, although the objects in the visual field they examined are rocks, what is seen may actually be pattern, not individual features. These rocks make the shape of a tree with extended limbs when geometric functions are applied to their positioning. VanTonder, Lyons, and Ejima suggested the brain may interpret and respond to “tree” rather than “rocks” when viewing such a

scene.

In a head-to-head comparison of the stress-reducing effect of two different natural landscape scenes (Wise & Rosenberg, 1988), the one having a fractal dimension comparable to the range in the African savannah (1.3 to 1.5; Wise & Taylor, 2002) was the more effective at reducing a physiological manifestation of stress response (skin conductance). Kaplan (1978) mentioned the significance of pattern and stated, "An individual's likelihood of survival would be enhanced if certain kinds of patterns ... were innately fascinating, if attention [to them] required no effort" (p.86). With their finding about pattern, quantified as fractal dimension, Wise and Taylor demonstrated mathematically what the earlier theorists and researchers had proposed intuitively.

Carry on

While findings in both laboratory and clinical arenas are all encouraging and point in the same direction, more research would be welcomed to continue to verify and clarify how properly constructed imagery can be put to best use as a care tool. As more knowledge is accumulated on this topic, we may act now on a good foundation of evidence suggesting that imagery can partner with other instruments of care to be an ally to both patient and caregiver in addressing emotional and physical discomfort. There has never been an adverse reaction noted in the literature in connection with evidence-based art as defined herein.

We hope you now better understand our reasoning for seeking evidence-based content in the photographic submissions to the "Call for Artists." If your interest is piqued, seek out a landscape with criteria discussed above and submit your *Perfect Picture!*

Examples of Evidence-Based Imagery



Roman Nikulenkov/Shutterstock



Christopher Elwell/Shutterstock

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