



ANFA 2014 CONFERENCE

PRESENTER ABSTRACTS
ACADEMY OF NEUROSCIENCE FOR ARCHITECTURE

A Preference Study Among Four Interior Architectural Geometries in a Semi-Immersive Virtual Environment

HANNAH HOBBS, M.ARCH
 hannah@hannahhobbs.com
 San Diego, CA 92101

KURT HUNKER, FAIA; VUSLAT DEMIRCIY, Ph.D.; TIFFANY RODRIQUEZ, Ph.D.; RAJAA ISSA
 NewSchool of Architecture + Design
 San Diego, CA

The present study tested preference levels, using six sets of bipolar adjectives in what was called the vSubjective Survey, of four different architectural geometries and building forms in an innovative semi-immersive virtual environment ("CAVEtte"), designed and built by the author and a collaborator. All four buildings chosen in the study were built "Maggie's Centers" (cancer care centers) around the United Kingdom designed by different architects, all of whom were given the same architectural brief. The designs were digitally modeled in Rhino based on available plans, sections, elevations and images, and presented to 65 students and employees (19 females and 46 males) at NewSchool of Architecture + Design. Each participant watched four walk-through videos, one of each building, in a randomly selected order. After each video, participants filled out a subjective survey; four surveys in total. After running an Analysis of Variance (ANOVA) on the data collected, the immersive experiment findings suggest people prefer curved buildings to other geometric architectural interior environments.

1. EXTENDED ABSTRACT

Problem. As technology advances, architectural design methodology changes in response; most significantly the design process in recent years has been bolstered by computer technology, and digital fabrication. As this process often gives rise to non-rectilinear buildings, scrutiny continues over the appropriateness of the resultant architectural forms. In turn, this gives impetus to study the new forms generated for their effects on the inhabitants' wellbeing.

Neuroscientific studies show more positive responses to curved contoured objects than to sharp contoured objects (Bar and Neta 2006; Leder, Tinio and Bar, 2011), and more activation in the amygdala when subjects view images of sharp objects versus curved objects (Bar and Neta 2007). Nanda and Pati (2009) explored the relevance of the aforementioned studies to architecture and made a case for further research. A subsequent architectonic study suggests participants viewed curved architecture as more beautiful than its rectilinear counterpart (Vartanian et al., 2013).

Method. The present study tested preference levels, using six sets of bipolar adjectives, of four different architectural geometries and building forms in an innovative semi-immersive virtual environment ("CAVEtte"), designed and built by the author and a collaborator. All four buildings chosen in the study were built "Maggie's Centres" (cancer care centers) around the United Kingdom designed by different architects, all of whom were given the same architectural brief. There were currently 15 Maggie's Centres at the time of the development of the study and were vetted with individual thesis committee members in a three-stage process. The selected Maggie's Centres were: (curved) Southwest Wales by the late Kisho Kurokawa; {mixed} Aberdeen by Snohetta; [rectilinear] Cheltenham by MJP Architects; and <angled> Fife by Zaha Hadid. All testing models were built and later rendered out for walk-through videos in Rhinoceros (a 3D modeling and rendering program) based off of available plans, sections, elevations, and photographs of the buildings. The following alterations were made to control for uncontrollable variables: models were generated without textures and furniture and walls were all given the same neutral color throughout.

65 students and employees (19 females and 46 males) at NewSchool of Architecture + Design (NSAD) participated in the main study (Experiment 1), watching four walk-through videos, one of each building, in a randomly selected order. After each video, participants filled out a subjective survey. The subjective survey helped define "preference" by using six sets of bipolar adjectives of semantic differentials with an added "neutral" between each bipolar word. The words chosen for each set were adopted from Hesselgren (1987) as referenced in Madani Nejad's 2007 Ph.D. study. In order, the word set were: 1) pleasant, neutral, unpleasant; 2) exciting, neutral, depressing; 3) relaxing, neutral, stressful; 4) friendly, neutral, unfriendly; 5) like, neutral, dislike; 6) beautiful, neutral, ugly. Positive preference was noted as the first set of words, while negative preference, the last word.

Results. Due to limitations in Experiment 1, a second similar study was conducted to ensure the limitations found did not affect the results. An Analysis of Variance (ANOVA) was conducted to compare the results

between the two immersive studies and found there was no statistical difference among the curved, mixed and angled walk-through videos. Based on the ANOVA results, the immersive experiment findings suggest people prefer curved buildings to other geometric architectural interior environments. While these findings are consistent with the aforementioned contour-focused studies, there were some intriguing novel results when the data were parsed demographically along the lines of age, gender, education level, designers versus non-designers and years in the profession. These results demonstrate the need for future studies in a highly-immersive virtual environment to continue examining the effects of architectural contours at a physiological level.

ACKNOWLEDGMENTS

This study was made possible in part by the support of NewSchool of Architecture + Design faculty, staff and students. Additionally, I would like to acknowledge Kevin Sullivan for financial and developmental support of the CAVEtte, in addition to providing aid during the testing phase.

2. REFERENCES

- Bar, M., & Neta, M. (2006). Humans Prefer Curved Visual Objects. *Psychological Sciences*, 103, 449-454.
- Bar, M., & Neta, M. (2007). Visual Elements of Subjective Preference Modulate Amygdala Activation. *Neuropsychologia*, 45, 2191-2200.
- Leder, H., Tinio, P.P.L., Bar, M. (2011). Emotional Valence Modulates the Preference for Curved Objects. *Perception*, 40, 649-655. doi: 10.1068/p6845
- Madani Nejad, K. (2007). *Curvilinearity in Architecture: Emotional Effect of Curvilinear Forms in Interior Design* (Doctoral Dissertation). Retrieved from <http://repository.tamu.edu/handle/1969.1/5750>
- Nanda, U., Pati, D., & McCurry, K. (2009, February 1). Neuroesthetics and Healthcare Design. *Health Environments Research & Design Journal*. Retrieved from www.herdjournal.com/article/neuroesthetics-and-healthcare-design
- Vartanian, O. et al. (2013, June 18). Impact of Contour on Aesthetic Judgments and Approach-Avoidance decisions in Architecture. *PNAS*, 110(2).

3. AUTHOR BIOS

PRESENTER: HANNAH HOBBS, M.ARCH

Ms. Hobbs graduated Summa Cum Laude and was awarded the AIA Henry Adams Medal and Certificate of Merit in 2014 for her completion of a Master of Architecture degree from NewSchool of Architecture + Design (NSAD) with a focus in Neuroscience. During her tenure at NSAD, Ms. Hobbs served as a research assistant in both NeuroArchitecture and Parametric Design. Additionally, she assisted in visualizations at the StarCAVE at UCSD, gaining working knowledge of the technology and digital programs needed to simulate architectural environment.

THESIS COMMITTEE MEMBERS (NON-PRESENTERS):

Kurt Hunker, FAIA: Professor Hunker collaborated with Ms. Hobbs before the study began. He provided insight to relevance in today's architectural debates, along with expertise in building case studies, final building selection and fresh ideas on relating the findings back to architecture.

Vuslat Demircay, Ph.D.: Dr. Demircay provided constant feedback in the study topic, methodology of the study, final building selection, data analysis, and conclusions. Additionally, Dr. Demircay helped to elevate the study's comprehensiveness through a critical eye and challenged each step of the process.

Tiffany Rodriguez, Ph.D.: Dr. Rodriguez has a Ph.D. in Motor Neuroscience with an emphasis in Biomechanics and has worked on several scientific studies testing various aspects of the neural control of movement. She currently works as a Manager of Institutional Research for Laureate International Universities (the parent company of NSAD). Dr. Rodriguez provided constant feedback and support during the testing phase and the data analysis phase of this study.

Rajaa Issa: Mrs. Issa is one of the developers of Rhino, the program used in the study to model the four buildings. Additionally, she provided a critical eye for detail and challenged all ideas to ensure a well thought-out study.