Using Neuroscience to Tailor Visual Environments for Infants and Children

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The last thirty years have seen a surge of interest in the effects of the environment on physical and mental health. In recent years, this interest has broadened from a focus on the external environment to include the internal environment of personal living spaces. In a unique applied project, we were commissioned by a Japanese condominium developer to create a set of designs for infant and children's living spaces and a system to match and tailor them to the individual. We grounded our scheme in neuroscientific and behavioral data regarding responses to visual stimuli. For infants (ages birth to 3 years), our designs were based on a large body of work (including our own) showing that the brains of young infants respond best to faces, and to certain patterns that include large high contrast dark/light stimuli and highly saturated colors. Accordingly, infant living spaces were created with these features to promote visual development. For children (ages 3 – 17 years), our designs were based on a large body of work documenting which types of overhead lighting, colors, and visual patterns promote different psychological moods, such as "arousal" versus "tranquility", as well as which colors/patterns are preferred in American cultures. Temperament (which is thought to be fairly stable after age 3) was determined by asking parents 10 questions about their child, based on a standard temperament questionnaire known as the EAS (Emotionality, Activity, Sociability) Survey. These questionnaires score children along three dimensions: 1) High vs. Low Activity, 2) High vs. Low Inhibition, and 3) High vs. Low Negativity. The first two question sets (activity and inhibition) were used to assess the child's arousal, with both high activity and high inhibition indicating high levels of arousal. The third set measures the tendency toward negativity. Based on these assessments, living space recommendations were made for each child to complement his or her individual temperament. In addition to promoting optimal visual development and psychological well-being, our tailored visual environments, and their implementation in Japan, raise cultural awareness regarding the impacts of the environment, including personal living spaces.

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Dr. Dobkins got her PhD in Visual Neuroscience with Dr. Thomas Albright. For her thesis, she used neurophysiological methods in rhesus moneys to investigate how the primate visual system encodes different aspects of visual stimuli, including color and motion. Since obtaining her PhD in 1992, she has been conducting studies that elucidate neural mechanisms underlying visual development in infants and children, as well as the effects of visual experience on visual development. Most relevant to the current paper, in 2002, she led a team (comprised of herself, Drs. Smallman and Heyman) to design Tailored Visual Environments for the "MC Corporation" based in Tokyo, Japan.

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Dr. Smallman is interested in the mechanisms of visual perception and their application to the design of effective visual displays, visualizations and environments. For 13 years he has led a mix of basic and applied research projects into the principles of the human factors of visualization. He is a two-time winner of the Jerome Ely award of the *Human Factors and Ergonomics Society* for the premier article in the society's flagship journal, *Human Factors*.

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Dr. Heyman's research lies at the intersection of social and cognitive development. She has published over 40 scholarly articles on topics such as individual differences in learning and motivation, conceptions of personality traits, and environmental influences on development.