

Increasing Positive Affect: A Test of the Biophilia Hypothesis

Home Ecology Study

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This study investigated whether the introduction of flowers to the home environment increases positive emotions, decreases negative emotions, and leads to positive behaviors within the home.

Background to our study:

E.O. Wilson described biophilia as a human “innate tendency to focus on life and lifelike processes.” As Wilson said, our responses to nature range “from attraction to aversion, from awe to indifference, from peacefulness to fear-driven anxiety.” This research focuses on one aspect of the natural world – flowers – and their ability to increase positive emotions, decrease negative emotions, and influence positive behaviors within the home environment.

The belief that contact with nature is beneficial for people extends throughout history and cultures worldwide. Pollen has been found in Neanderthal graves, suggesting that flowers may have been used at burial. The gardens of ancient Egyptian nobility, the walled gardens of Persian settlements in Mesopotamia, and the gardens of merchants in medieval Chinese cities show that early urban people went to considerable length to maintain contact with nature. For many cultures, flowers in particular have provided solace, tranquility, joy, and sensual pleasure. They have also been known to convey sympathy, guilt, romantic interest, pride, joy, and celebration (Heilmeyer, 2001). Furthermore, the vast majority of personal commercial fragrances that exist today have floral top notes.

Evolutionary psychologists suggest that we are predisposed to respond with liking/approach behaviors to all aspects of the natural world that have reliably cued safety and security throughout the course of human evolution, just as we are predisposed to react with dislike/aversion to aspects of the natural world that have signaled danger or contamination. Certain rewards were so critical for survival that selection has favored individuals with a predisposition to acquire and retain liking/approach to them, cues such as the presence of a body of water, food, prospect and refuge, and flowering plants that signal potential sources of food and the future availability of fruits and honey. These responses are considered aspects of prepared learning.

Research has shown that people from diverse cultures prefer to look at natural landscape scenes over urban or built views devoid of cues such as water and trees (Hull & Revell, 1989). Other evidence for positive responses to natural environments comes from studies of people who view stressful movies and are then assigned to view videotapes of natural scenes vs. urban environments lacking nature. Ulrich et al. (1991) found that both verbal

and physiological measures converged in indicating that recuperation from stress was faster and more thorough when people were exposed to natural settings. People report higher levels of positive feelings; lower levels of anger, aggression and fear; and showed lower blood pressure and greater reduction in muscle tension when viewing natural scenes rather than urban environments. One potential limitation of all of this research is that it has been done via simulations of nature (videos, photographs) rather than with natural stimuli themselves.

The current research builds on recent work by Haviland-Jones, Rosario, Wilson and McGuire (2005) who found flowers to be natural rewards. They elicited smiles of true enjoyment 100% of the time upon receipt and led to more positive social behaviors, more positive moods, and to improved episodic memory in the elderly.

Our plan is to specifically investigate the effects of flowers in the home environment. We will look at a range of positive emotions (such as peacefulness/tranquility, forgiveness, gratitude), negative emotions, and include emotions in response to beauty (awe and elevation). We will also look at the effects of flowers on social behavior and use of the home environment.

Methods:

Participants.

We enrolled 65 women between the ages of 24 and 60 living within the Boston area. Subjects were recruited by advertisement for a study on “use of the home environment and well-being.” The Massachusetts General Hospital IRB approved the study. Subjects were paid \$100.00 for their participation.

Materials and Procedure:

(I) Recruitment pre-screening interview:

All subjects were pre-screened through a phone-interview. We described our purpose: to study people’s moods, emotions, and well-being, their use of the home environment, and how the two may be related. Subjects were told that they would be visited in their homes by our team twice, and that they would be asked to fill out questionnaires. They were also told that they would be given a gift as a token of our appreciation at the half-way mark of our study, between visits, and that they would be paid 100 dollars at the end of the study. The “token” gift was actually the independent variable (flowers vs. control item) used in the study.

Subjects were screened for qualifying information. Screening questions included investigating whether there had been any substantial changes in their life or home environment to assure that there will not be atypical responses to our measures.

If the subject qualified, we scheduled an appointment to visit the subject's place of residence.

Subjects were randomly assigned to the flowers or control (candle and hurricane glass) group.

(II) Initial visit.

After the phone interview, we mailed subjects a consent form. We also brought consent documentation to the initial visit to insure completion before beginning any collection of data. During this visit, a short interview was completed that covered subjects' environmental preferences and behaviors in the home.

Subjects were also asked to fill out 2 self-report instruments.

Engagement with Beauty Scale (Diessner, Solon, Frost & Parsons, 2005)

This scale is a 14-item measure of experience with perceiving and feeling things that are beautiful in the natural environment, in artwork, and in the moral actions of others with responses listed on 7-point scales.

(The Day Reconstruction Method - Revised (DRM – R) (Kahneman, Krueger, Schkade, Schwartz & Stone, 2004)

The original DRM combines a time-use study with a technique for recovering affective experiences. It assesses how people spend their time and how they experience the various activities and settings of their lives combining features of time-budget measurement and experience sampling. Participants systematically reconstruct their activities and experiences of the preceding days with procedures designed to reduce recall biases.

We have modified this instrument slightly into the DRM-R to include a broader range of positive affects, to specify more precisely which room the person is in when experiencing emotions, and to offer a wider array of activities that can be described at home. Changes have also been made to clarify the ranges of time in which experiences take place and to improve the ability to record affective experiences.

The DRM was left with subjects with a stamped self-addressed envelope. We asked them to fill it out over the next 3 days, but not to do so for either the day of our visit or the day after our visit. This way our presence will not be recorded as a factor.

The investigator then requested to be allowed to survey the rooms of the home environment. Investigators were not allowed to move any items of the home. All photographs of residents and references to residents' names were covered to maintain the confidentiality of the residents in photographs. If it was discovered that personally identifying information has been photographed, the images will be

digitally altered to maintain anonymity. Subjects accompanied the investigators within the home.

The investigator coded each room using the PLSCI-R.

The Personal Living Space Cue Inventory - Revised (PLSCI - R) (Gosling, Craik, Martin & Pryor, 2005)

This measure consists of bipolar ratings on seven point scales concerning odor, noise, lighting, general state, and level of organization of the environment as well as several supplemental items to clarify the ratings.

We modified this instrument into the PLSCI-R to make it conceptually easier for coders to fill out the bipolar rating scales and to rate the house as a whole in relation to the individual rooms. Items have also been added to further differentiate objects, odors, and the presence of animals.

Finally, we took photographs of the home environment to:

- (1) Track any changes to the environment such as in neatness, maintenance, aesthetic changes or improvements both before and after the delivery of either the flowers or control item.
- (2) Document where the flowers or control items were placed and in what condition they were maintained.
- (3) Evaluate the accuracy of the home ratings.

(III) Between visits

Upon receipt of the completed DRM through the mail, the subject was contacted and told that we would be sending them a gift as a token of our appreciation for completing the first part of the study. The gift was either a bouquet of cut flowers in a glass vase or a control item in the form of a large candle in a hurricane glass. The bouquet was a mix of roses, gerbera daisies and hydrangea with low fragrance. The control item has been specifically chosen to match the flowers in monetary value and size. These items were sent from Winston's Flowers. We included a note with the flowers or candles expressing our thanks and asking them to call us to confirm receipt.

(IV) Second visit, post-gift

Three days after delivery of the gift, we sent the same self-report measures that were given in the first visit through overnight mail and we called to schedule the last home visit. At this second visit, the investigator collected the self-report measures, and surveyed the home environment for a second time. Visits occurred no later than 6 days post delivery of flowers.

RESULTS

We predicted that there would be evidence of:

- (1) Potentially heightened positive emotions and/or lower negative emotions after the introduction of flowers vs. control item to the home.
- (2) Potential increases in sociability within the home and in tidiness of the home after the introduction of the flowers and possible increases in other aesthetic responses in the home, and in overall home satisfaction
- (4) Possibility that responsiveness to flowers is influenced by overall engagement with beauty as measured.

1. Emotional responses to flowers

We conducted the initial analysis of the data with the first fifty-four participants. Subjects who received a gift of flowers reported a significant increase in compassion in the home ($p < .025$) as well as a significant decline in feelings of depression ($p < .020$) and worry/anxiety ($p < .003$) while at home. They also felt significantly more energetic in the workplace ($p < .004$) and happier in the workplace ($p < .022$). These effects were not found for the group who received candles, suggesting that the effect was due to the presence of flowers, rather than a response to receiving a gift.

The emotion data is being re-analyzed with sixty-six participants where we are also calculating the percentage of time each participant reporting experiencing each emotion and looking for changes in this index pre and post flowers. We computed a daily index for each emotion based on the proportion of the day that each emotion was experienced multiplied by the intensity of that emotion for each episode. For example, if a person reported a five-hour episode when she was happy with a rating of 5 and a second two-hour episode when she was happy with a rating of 3 in a 20-hour day, the index would be:

$$(5/20 \times 5) + (2/20 \times 3) = 1.55$$

We also computed composite indices based on all positive emotions and all negative emotions measured, and on various combinations of related emotions.

We then examined change in each emotion index between baseline and follow-up as a function of group (flower vs. candle) using repeated measures ANOVA.

Among the individual emotions, the mean worry/anxiety index declined between baseline and follow-up for the flower group (17.09, SD = 15.749 to 12.08, SD = 12.062; $t = 2.129$, $p = .041$) and increased slightly but not significantly for the candle group (13.89, SD = 12.80 vs. 15.25, SD = 16.042; $t = -1.006$, $p = .322$). There was no significant main effect of time on the worry/anxiety index, $F(1,66) = .633$, $p = .429$), but there was a significant

interaction between time (baseline vs. follow-up) and group (flower vs. candle), $F(1,66) = 4.907, p = .030$. The flower gift may thus have contributed to a reduction in worry and anxiety that was not experienced by participants who received the candle gift. There were no group differences in changes on the other emotion indices between baseline and follow-up.

One of the composite indices included worry/anxiety and depression. There was no main effect of time on the change in this index, $F(1,66) = .284, p = .596$, but there was a significant interaction between group and time, $F(1, 66) = 4.30, p = .042$. The depression + worry/anxiety index declined slightly for the flower group (11.98, $SD = 13.00$ vs. 9.04, $SD = 10.54, t = 1.684, p = .101$), and increased slightly for the candle group (9.69, $SD = 10.45$ vs. 11.43, $SD = 12.53, t = -1.238, p = .225$), but neither change was significant on its own. There were no group differences in changes on the other emotion composite indices between baseline and follow-up.

We are now analyzing results in the home environment vs. the work environment specifically for the changes originally noted for compassion at home and energy and happiness at work. Initial results suggest that we are replicating these findings.

2. Changes in the home environment.

Although we did not find any significant changes in the home environment for neatness, aesthetic changes or for increased sociability, we did find a number of interesting changes once flowers were introduced to the home. 100% of subjects displayed the flowers in rooms they “visited in the morning” particularly the kitchen, dining room or living room. They reported that they liked to look at the blooms in the morning.

Subjects also reported that they bought more flowers or brought in cut flowers from their gardens to increase the number of flowers in their homes. Subjects expressed delight in receiving the flowers and we got many phone calls thanking us when subjects received their gift. No subject called us to thank us for the candles. One subject kept the flowers in a box for drying; another reported that she broke up the bouquets so that she could see flowers in all of her rooms.

3. The engagement with beauty scale did not impact subjects’ appreciation of flowers or candles.

Discussion:

We found that after only a few days with flowers, subjects reported feeling less anxious, less worried and less depressed when at home, as well as more compassionate. They also reported a surprising boost at work, feeling happier there and more energetic there. These effects appear to be due to flowers per se as these positive emotional effects were not seen with a gift of candles.

