

# Brush the stress away and light the way to a happier life: The effects of light, color and paint on nonhuman primate behavior

Arlene Gross<sup>1</sup>, Crystal Markiewicz<sup>1</sup>, Ryan McCrory<sup>1</sup>, Madison Deffinger<sup>1</sup>, Shelby Earley<sup>1</sup>, Jennifer Thompson<sup>1</sup>, Genevieve Andrews-Kelly<sup>1</sup> and Akhil Sebastian Thazhathuvarikkayil<sup>2</sup>  
<sup>1</sup>Labcorp, Greenfield, IN, US; <sup>2</sup>Labcorp, Bangalore, India

## Abstract

In our industry, we are always searching for different ways to reduce or prevent stereotypic behaviors and to increase normal species-specific behaviors. Abnormal behaviors can be linked to anxiety or stress, which negatively affects the animal and study data. Human studies have shown that specific room color and art can positively affect mood and potentially help reduce stress and anxiety. As soon as the idea was approved by IACUC, we created a three-phase study to test if this would similarly affect our nonhuman primates. An ethogram was created to score normal and abnormal behaviors while providing window paintings and lighting effects. Behavior was monitored prior to any environmental changes for a baseline, during each enrichment phase and during a “washout” period between each phase. Blue and green polyvinyl chloride light covers were used to filter the lighting in the room and murals were created using washable paint applied to two-way mirror windows. Established social groups exhibiting normal and abnormal behaviors were selected. All routine enrichment and room activity was maintained during all study phases with the only change being the color of lighting used or the paint application to the windows. Testing was performed to assure that the necessary level of light was maintained within the room. The room was kept at ~30 footcandles of light while the light covers were in use to allow maximum amount of color impact without compromising the required amount of light for the animals. All behaviors and amount of time each was demonstrated were recorded during observations. There were noticeable differences in the amount of time animals spent on various behaviors during each study phase versus the baseline timeframe. Decreased abnormal behaviors and increased species-specific behaviors were seen for animals during times the environmental enrichment was provided. The results show that these simple environmental enrichments could be a low-cost and non-invasive way to improve animal welfare and encourage positive behavior.

## Methods

- Lighting levels were tested in the room prior to the study and a minimum of 30 footcandles of light were present in the rooms with the light covers in place. The maximum number of light panels were used that fit this requirement.
- Two-way mirrors were painted with washable watercolor paint (Figures 1-3).
- Established social groups of cynomolgus macaques were chosen for this study. Some individuals had a known history of stereotypic behavior.
- Animal care and use was performed in accordance with applicable animal welfare regulations at our AAALAC International accredited animal program.
- The animals were observed for 10 minutes twice daily for five consecutive days in the following study phases: baseline (no additional enrichment provided), blue lighting, green lighting and painting.
- All behaviors observed during the 10 minutes were logged for each animal.
- Scoring was consistently performed by the same team of individuals over the course of the study.
- A washout period of three days was observed after the additional enrichment was removed from the room with behaviors scored during this time as well.
- Minutes observed of normal, species-specific behaviors and of abnormal behaviors were tallied for comparison.



Figures 1-3. Paintings on two-way mirror windows used during the project.



Figure 4. Blue light cover.

## Materials

- Amylove Fluorescent Light Covers Classroom Ceiling Panels Light Filters with Backlit Film Material (Figure 4)
- AT5ZR4PD Fluorescent Light Decorative Covers for Classroom Office School Abstract Blue Blurred Ceiling Light Covers Light Filters (Figure 5)
- Crayola BIN54120BN Washable Kid’s Watercolor Paint
- Artify Paint Brush Set

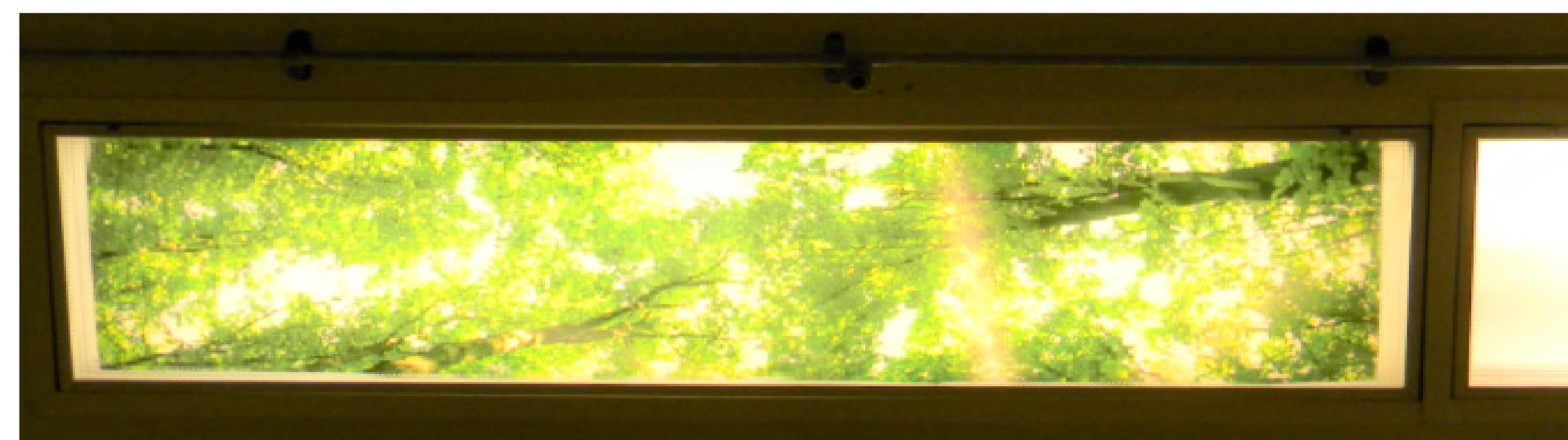


Figure 5. Green light cover.

## Results

- Increases in normal behaviors were seen over the baseline numbers for both the blue light (4.3% increase) and the painting (5.2% increase) phases of the study. There was a 1.3% decrease in normal behaviors with the green light cover.
- Decreases in abnormal behaviors were significantly larger in two of the enrichment types. With the blue lighting, there was a 43.5% decrease in abnormal behavior, and we recorded a 48.3% decrease with the painting phase.
- The decrease with the green lighting was significantly less than the blue light or painting, with only a 1.7% decrease.
- Data showed that even during the washout period after the blue light and painting, there was a continued decrease in abnormal behavior.

Normal Behaviors (in minutes)				
	baseline	Blue	Green	Painting
Resting Alone	15797	24556	26858	14120
Resting w/cage mate	11667	12416	3994	16443
Moving around cage	5780	2780	4751	2315
Grooming self	3757	2144	3052	5041
Interacting with room	4507	4725	1596	2238
Allogrooming	4407	464	2561	3245
Interacting with enrich	308	845	1453	4102
Playing alone	969	1300	1535	1445
Eating	755	220	1015	1480
Play with partner	255	605	495	190
Foraging	90	385	365	296
Total:	48292	50440	47675	50915
% difference from baseline		4.3% increase	1.3% decrease	5.2% increase

Table 1. Differences in normal behaviors observed during the various phases of the project.

Abnormal Behaviors (in minutes)				
	baseline	blue	green	painting
Circling	0	0	5	235
Flipping	45	279	45	205
Involuntary Hand Movement	175	0	0	0
Head Flip	0	0	0	0
Fecal Painting	0	0	0	120
Bouncing	5	0	0	15
Mock Biting	5	0	0	30
Retropulsion	0	5	0	0
Rocking	5	0	0	0
Pacing	5393	2892	5255	2450
Total:	5628	3181	5535	2910
% difference from baseline		43.5% decrease	1.7% decrease	48.3% decrease

Table 2. Differences in abnormal behaviors observed during the various phases of the project.

## Conclusions

The enrichments used in this study proved effective in reducing abnormal behaviors, with blue light panels and window paintings yielding the most favorable outcomes. These findings highlight the potential benefits of simple, non-invasive environmental enhancements in improving animal welfare.

Affordable and easy to implement, these enrichments are unlikely to interfere with study results and may even enhance them by creating a less stressful environment. Anecdotally, they offered a human enrichment component, as technicians reported they enjoyed painting the windows and appreciated the resulting artwork.

The stark contrast in outcomes between blue and green light panels underscores how even minor environmental changes can have a significant impact. Based on these positive results, we’ve updated our colony protocols to include these enrichments for all colony animals. We also plan to extend their use to client study rooms whenever feasible, recognizing the potential welfare benefits for animals on study.