

Perception and Sensitivity to Colour and Office Space Characteristics After a Work Week

N. Kwallek, K. Soon

*School of Architecture, Interior Design,
The University of Texas at Austin*

Austin, Texas 78712 (USA)

Corresponding author: N. Kwallek (n.kwallek@mail.utexas.edu)

ABSTRACT

An earlier study found that individual screening ability (i.e., automatic filtering of irrelevant stimuli) moderates the relationship between color scheme and worker performance. This study investigated the effects of screening ability and color scheme on workers' perception of color and spatial characteristics. Contrary to the expectation, no moderating effect of screening ability was found. However, separate effects of color scheme and screening ability on workers' perception were identified. High screeners demonstrated greater preference toward their office space than low screeners. Workers in a predominantly medium blue-green office did not show greater preference toward their office color than workers in a predominantly bright red or a monochromatic white office.

1. INTRODUCTION

Colour has been shown to be related to spatial perception.¹ In general, interiors with light colours are perceived to be more spacious, while darker spaces are seen as smaller. The "openness" of an area is often determined by the lightness in either the interior details or the walls.² These differences in colour will also influence an individual's perception of the interior's capacity. It has been shown that light-colour spaces would increase the perceived threshold of crowding, while darker rooms would be deemed more crowded, even though there were actually fewer people in them compared to lighter rooms.¹

However, a more current study suggests that colour schemes alone may not have a discernible impact on the perception of office workers.³ An important variable that may interact with how workers perceive office colour may be how individuals differ in their ability to screen out irrelevant stimuli within their environment. Mehrabian concluded that individual differences in arousability can be regarded as being related to less selectivity on the part of more aroused persons.⁴ Individuals who are most adept at screening less relevant stimuli from their environments are referred to as high screeners, while individuals who typically have more difficulty screening incoming sensory information are referred to as low screeners.

In addition, individuals may have different optimal levels of arousal and performance, such that any decrease and increase in arousal from the optimal level may result in decreased performance.⁵ Studies that have explored the effects of environmental stimuli on an individual's state of arousal and test response have found that some individuals are more easily distracted by irrelevant stimuli which negatively affects their performance.⁶ In contrast, other individuals actually improve their test response when irrelevant or extraneous stimuli are introduced. Kwallek et al. demonstrated that high screeners had better performance on office tasks in a predominantly bright red office and performed worse in a predominantly medium blue-green office than low screeners, suggesting that high screeners were less likely to be overwhelmed by the red colour scheme, whereas they tended to be under-aroused by the blue-green colour scheme compared to low screeners.³

In this study, we hypothesized that individual differences in stimulus screening ability might influence an individual's perception of the spatial characteristics with regard to the influences of the colour of the space. Specifically, low screeners would have a less favorable perception about the red office interior (e.g., feelings of less spacious and less adequate work surface area) and a more favorable perception about the interior characteristics (e.g., more spacious and more adequate work surface) of the predominately medium blue-green office compared to the high screeners. In contrast, high screeners would have a more favorable perception about the interior of the red office but less

favorable perception of the medium blue-green office than low screeners. In addition, the separate effects of each colour and screening ability were investigated. We hypothesized that, in general, workers would rate as less favorable the predominantly bright red office colour scheme (e.g., too bright), whereas those in the predominantly medium blue-green office would rate their office color as more favorable. Finally, we hypothesized that high screeners would evaluate as more favorable the office interiors they worked in than would the low screeners, regardless of the predominate color of the room.

2. METHOD

A total of ninety participants (67 women, 74%; and 23 men, 26%) were recruited for the experiment. All prospective subjects were screened on the Friday prior to being assigned to the experiment. They were given a timed typing task, a self-report questionnaire related to their general psychological and physical conditions and several questionnaires, including the Mehrabian's Stimulus Screening Questionnaire (SSQ)⁴. Subjects were chosen based on their speed and accuracy of a typing task, a color-blindness test, and other psychological and physiological criteria. The mean age of the subjects was 33.2 years ($SD=11.5$). Subjects were paid \$200 upon completion of the experiment.

Subjects were matched across office conditions on screening criteria and were assigned to one of three offices (30 subjects in each room). In addition, subjects' scores on Mehrabian's Stimulus Screening Questionnaire (SSQ)⁴ were used to determine whether they were low or high screeners (45 subjects in each category). The SSQ is a 40-item, 9-point scale instrument, and has a range of X-X possible scores. Those who scored 146 or lower were assigned as "low screeners," whereas those who scored higher than 146 were assigned as "high screeners."

The office workers performed in one of three offices of different colour palettes. Each of the three offices, 2.63 m wide (8 ft 8 in.), 3.52 m long (11 ft 6-1/2 in.), and 2.44 m high (8 ft), was identically furnished. One office was a ubiquitous office colour of monochromatic white (Munsell Colour Notation 2GY 9/5). Another office was predominately bright red (Munsell Colour Notation 5R 5/12) with a second area of colour being medium blue-green (5BG 7/5) and accents or trim of very light red or pale pink (5R 9/2). The third office was predominately medium blue-green (5BG 9/2), with a second area of colour being medium red (5R 7/7) and accents or trim of strong bluish-green (5BG 5/8).

All subjects worked from 9:00 a.m. to 5:00 p.m. in the controlled office environment for one work week. For four consecutive days they performed a variety of typical office tasks such as answering the phone and taking messages, typing manuscripts, and proofreading manuscripts and lists of terms and figures. The results of the worker performance of these tasks were reported in an earlier study.³ At the end of the work week (i.e., Friday) a questionnaire was administered where subjects responded to questions about how they perceived the colour scheme and office area characteristics of their enclosed office.

3. RESULTS AND CONCLUSIONS

Based on the Multiple Analysis of Variance (MANOVA) test, there was no interaction between the office colour scheme and workers' screening ability on both their perception of office colour (Wilk's Λ , $F = 1.37$, $p = .17$) and office spatial characteristics (Wilk's Λ , $F = 0.87$, $p = .64$). Thus, our hypothesis that low and high screeners have differential favorable ratings under different color schemes was not supported.

However, analysis with only the office colour scheme showed that office workers in different offices had different perceptions of office colour (Wilk's Λ , $F = 3.21$, $p < .001$) and office space characteristics (Wilk's Λ , $F = 5.29$, $p < .001$) in which they worked. Inspection of individual items showed that workers in the red office were more likely to perceive their office to be brighter ($F = 14.59$, $p < .001$) and to rate their office as less dull than the workers in two other offices ($F = 4.36$, $p = .016$). In contrast, workers in the white office believed that they would enjoy working in an office with the existing colour scheme more than those in the red office ($F = 2.93$, $p = .059$, marginally significant). In terms of office space characteristics, workers in the white office were more likely to rate the colour scheme of their office to be more drab than workers in the other offices ($F = 53.97$, $p <$

.001; See Table 1). In short, our hypothesis that workers in the red office have less favorable ratings about their office colour scheme and workers in blue-green office have more favorable ratings about their office colour scheme was not supported because of the mix results. While workers in the red or white offices had both favorable and unfavorable ratings about their office colour, workers in the blue-green office had ratings that were between workers in the red and white offices.

Based on stimulus screening ability, there was also an overall significant result regarding the workers' perception of the office spatial characteristics (Wilk's Λ , $F = 2.87$, $p = .003$) but not of the color scheme (Wilk's Λ , $F = 0.93$, $p = .49$). Inspection of individual items showed that the high screeners were more likely to perceive their office space as adequate in size ($F = 10.46$, $p = .002$) and their work surface area to be adequate ($F = 8.54$, $p = .004$) compared to the low screeners. The high screeners were also more likely to agree that their office seemed more spacious ($F = 5.46$, $p = .022$) and preferred the physical arrangement of their office ($F = 6.21$, $p = .015$) than the low screeners. In contrast, the low screeners were more likely to perceive their office as more cramped ($F = 12.84$, $p = .001$) than the high screeners (See Table 2). In sum, our hypothesis that high screeners rate more favorably their office interior was supported.

Table 1: Means and standard deviations of workers in the offices of each color scheme

| | Office Colour Scheme | | | | | |
|---|----------------------|-----------|-------------------|-----------|---------------------|-----------|
| | White | | Red | | Blue-Green | |
| | (n = 30) | | (n = 30) | | (n = 30) | |
| | <u>M</u> | <u>SD</u> | <u>M</u> | <u>SD</u> | <u>M</u> | <u>SD</u> |
| Color scheme characteristics | | | | | | |
| Office colour was too bright | 3.60 ^a | 1.90 | 6.20 ^b | 1.52 | 4.43 ^a | 2.22 |
| Office colour was too dull | 2.90 ^a | 1.83 | 1.63 ^b | 1.47 | 2.38 ^{a,b} | 1.69 |
| Enjoyed working in an office with this colour scheme ¹ | 3.53 ^a | 2.24 | 2.20 ^b | 1.90 | 3.17 ^{a,b} | 2.44 |
| Office area characteristics | | | | | | |
| Felt drab in the office | 4.07 ^a | 1.91 | 3.53 ^b | 1.68 | 3.17 ^b | 1.82 |

For each item, means that do not share superscripts are significantly different at $p < .05$.

¹ Marginally significant at $p = 0.59$.

Table 2: Means and standard deviations of high and low screeners

| | Screening Ability | | | |
|--|-------------------|-----------|-------------------|-----------|
| | Low | | High | |
| | (n = 45) | | (n = 45) | |
| | <u>M</u> | <u>SD</u> | <u>M</u> | <u>SD</u> |
| Office area characteristics | | | | |
| Work surface is adequate in size | 3.27 ^a | 1.05 | 3.78 ^b | 0.52 |
| Office is adequate in size | 3.33 ^a | 1.02 | 3.89 ^b | 0.53 |
| Office seems spacious | 3.08 ^a | 1.58 | 3.85 ^b | 1.57 |
| Liked the physical arrangement of the office | 4.64 ^a | 1.61 | 5.47 ^b | 1.52 |
| Felt cramped in the office | 3.22 ^a | 1.04 | 3.84 ^b | 0.52 |

For each item, means that do not share superscripts are significantly different at $p < .05$.

4. DISCUSSION

Although an earlier study found that worker task performance, depending on individual's screening ability, was affected differently under different colour schemes,³ this study shows that an individual's perception about the colour and office interiors may not have the same colour-screening ability joint effect as seen in the task performance. Rather, each colour scheme and screening ability has independent influences on a subject's perception of the office interiors. Specifically, individual screening ability affects whether the worker perceived the office interior as favorable or unfavorable. According to Mehrabian⁷, low screeners are more highly aroused to novel stimuli and take a longer time to return to the baseline arousal levels than high screeners. Since the experimental settings were new to the workers and easily evoked the feeling of uncertainty (on the workers' part), low screeners

might have been over-aroused by the experiment and thus felt less satisfied with the office space, regardless of the office colour scheme.

In terms of colour schemes, workers in the blue-green office did not have greater preference toward their office colour scheme than workers in either the red or the white colour scheme. This result could be due to the complimentary colour used in the lower one-third of the wall area in the red and blue-green offices, which neutralized some of the effect of the main colour schemes (see Kwallek et al.³ for pictures of each office). Surprisingly, although not statistically significant, workers in the white office tended to prefer to work in their office more than workers in the blue-green or red office. This might be due to the fact that white is the prototypical colour scheme used in many offices, and the white office matched closest to the workers' schema of what a typical working office should be. In contrast, although blue has been shown to be the most preferred colour in isolation,⁸ the idea of actually working in a blue (or blue-green) environment might not be that appealing to many people. More research should be conducted to examine the relationship between the office colour scheme and workers' preference and perception about the office space.

Keywords: colour sensitivity; office workers; colour perception; colour and space characteristics.

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