HARLEQUIN

WHITE PAPER

IS THE COLOUR OF YOUR HOME MAKING YOU HAPPY?

In collaboration with Stephen Westland & Soojin

HARLEQUIN.SANDERSONDESIGNGROUP.COM

A PROUD MEMBER OF **SANDERSON DESIGN GROUP**

There is convincing evidence that colour and light can affect our health and wellbeing and nowhere is this more important than in our homes. Use of colour in the home could make a difference in our daily lives but there are two problems: (1) people to tend to prefer bland colours such as white and magnolia (in part this might be to avoid imparting their own personality on the space for fear that this could affect resale values) and (2) people may be unsure about which colours they should use. There is a plethora of advice in consumer magazines and on the internet about the effect of colours on people. Often this is presented under the guise of "The Psychology of Colour". However, much of this advice confuses people and is too simplistic; for example, we can paraphrase the advice as being 'red means this and blue means that'. However, the meanings that colours have are complex and depend upon the context (and even the culture) in which the colours are used. The effect of colour on people is also complex. For example, on the one hand we can readily read that blue is a calming colour and should be used in bedrooms, for example. Yet, we can also hear that blue light stimulates us and prevents us from sleeping. How can consumers reconcile such seemingly contradictory information?

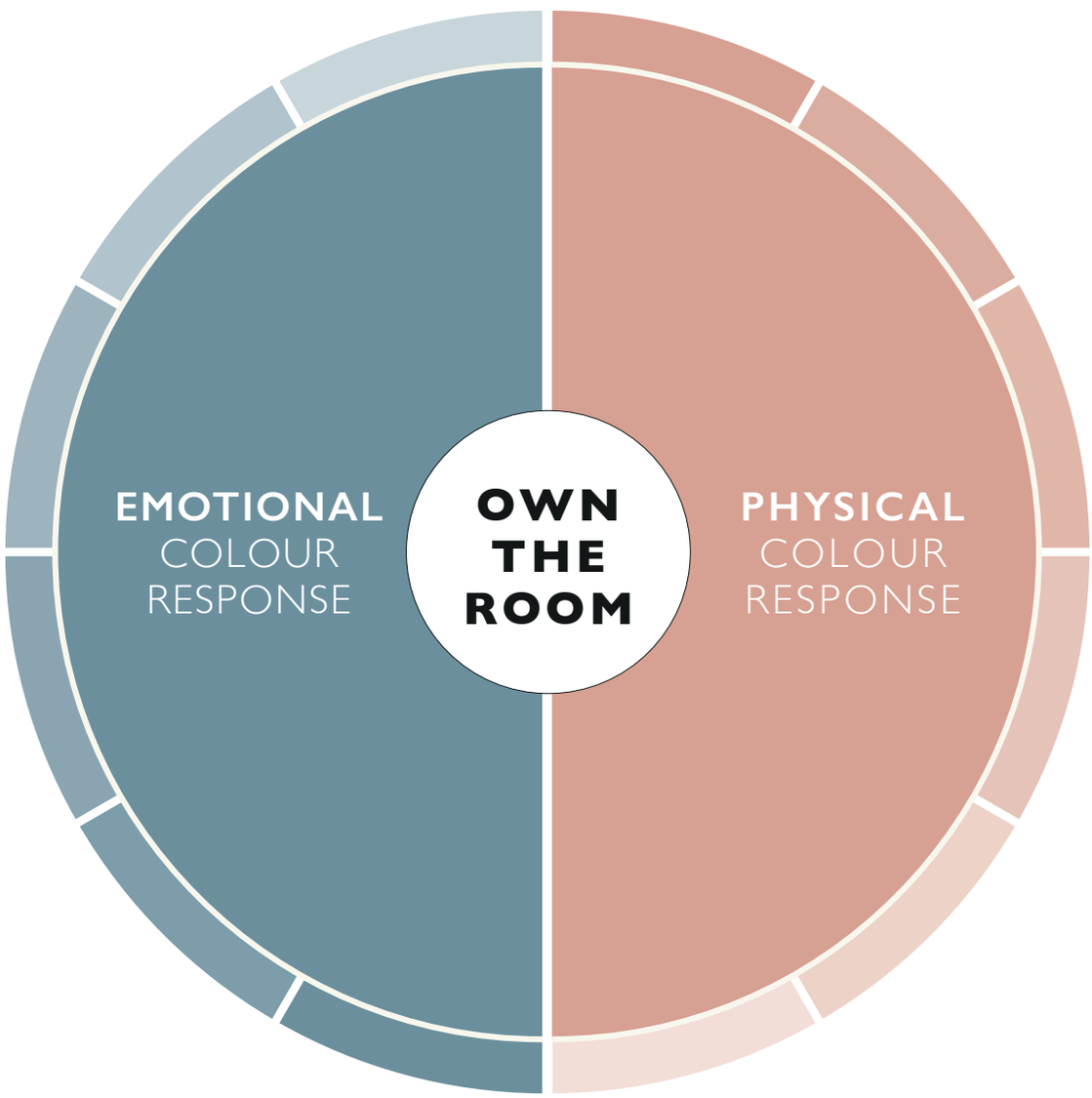
The key observation in this white paper is that there are at least two distinct mechanisms (or routes) by which colour can impact on our wellbeing and emotions. These are illustrated in Figure 1. Firstly, we have psychological effects. Colours can impact us because they generate emotions that stem from our associations of colour; associations that stem from our shared cultural backgrounds but which also relate to our personal experience and history. Colour preference is an example of such an effect. If asked, most people have a preference for one colour over others. In general, statistically the population tends to prefer cooler colours such as blue to warmer colours such as red and yellow. However, there is substantial variability in colour preference between individuals; for example, not everybody likes blue. On the other hand, we have physiological effects. For example, we now know that the activation of light-sensitive cells in our eyes not only leads to vision, but stimulates the brain in a way that can regulate, for example, body temperature, the secretion of various hormones and our patterns of sleep. Exposure to bright blue light, for example, late in the evening has been shown to make us more alert and disrupt our sleep. These physiological effects are more likely to be consistent between individuals. The framework presented in Figure 1 can help to understand why blue can be both a relaxing colour and an alerting colour depending upon the circumstances. For ease of understanding the terms physical and emotional effects will be used to refer to the physiological and psychological mechanisms respectively. Much more research needs to be carried out in these areas since there is much that is still to be determined. However, as Figure 1 implies, it is likely that the colour effects produced by lighting and, for example, our use of emissive displays such as smart pads fall into the physical category whereas the colour effects produced by interior design and soft furnishings fall into the emotional category. The implication of this is that the effects that the colours of our living spaces have may be quite variable between individuals. To some extent we all share some common history and culture but, despite this, individual differences remain. This dual explanation explains why some effects of colour are fairly consistent across individuals whereas other effects vary to a greater degree between individuals.

The implication of this white paper is that the use of colour in our homes can have beneficial effects on our health and wellbeing. However, these effects can be quite complex and can vary between individuals. For example, though some colours might tend to be more relaxing than others, at the same time there can be differences between individuals in that what is optimally relaxing for one person might be different for someone else. If we wish to maximise the positive effects of colour in the home, consumers should be encouraged to be brave in their use of colour and to select colours that match their individual characteristics, preferences and ambitions.

RETREAT COLLECTION

OWN THE ROOM QUIZ

CRACK YOUR COLOUR CODE



EMOTIONAL
COLOUR RESPONSE

- Emotional responses are highly individualised, varying depending on a person's age, culture, and personal history.
- Choose the colours, patterns and designs you love and make you feel your best! Get personalised recommendations based upon your colour-preferences and unique style.

PHYSICAL
COLOUR RESPONSE

- Physical responses to colour intensity impact everything from sleep quality to internal body temperature.
- Get top tips on lighting and colour to promote wellbeing, creating your unique interior and happy place.

RENEW COLLECTION

Colour vision is one of the most important of our senses. It allows us to make reliable identification of objects, to quickly evaluate whether someone is ill, and to visually communicate ideas. But what role does colour play in our health and wellbeing? How important is the colour of our home and working environment to our psychological, our emotional resilience and our health? These are the issues that are explored in this paper.

A long history of research has established that colour and light in homes and offices can affect mood and wellbeing , .There is a general consensus that warmer colours tend to stimulate, activate and energise whereas cooler colours tend to calm and relax .The idea that blue is calming and red is more energising is widespread. For example, when colour-adjustable lighting was recently introduced to aeroplane cabins, airlines chose to use blue light for the cabin to help passengers during periods of sleep . Many studies have focussed on the effect of lighting rather than, for example, the effect of the colour of walls or other interior components; the likely reason for this is that lighting is a convenient way to change the colour of an environment quickly and easily during a study. Although some studies explore the use of coloured lighting, other studies use lighting that is described as being 'white' but which can be warmer or cooler in its appearance. Warm lighting has a more reddish appearance and is associated with a lower so-called correlated colour temperature whereas cool lighting is more bluish in appearance and is associated with a higher correlated colour temperature. In one such typical study to explore the colour temperature of 'white' lighting, participants performed better in short-term memory and problem-solving tasks in warm environments than they did in cool environments . Nevertheless, one would expect many of the findings about the colour of lighting on mood and wellbeing would translate to the effect of the colour of a room, particularly with wall paint or wall coverings. Studies of room interiors that have been carried out have generally shown similar results to studies that have varied the colour of the lighting. For example, one study explored the effect of three rooms (one with warm-coloured walls and furniture, one with cool-coloured walls and furniture, and one with achromatic walls and furniture) on the perceived atmosphere of the rooms . Participants rated the warm room higher for arousal, exciting and stimulating whereas the cool room was rated higher for being spacious and restful. Interestingly, the same study also found that participants responded higher when asked to rate happiness in the warm rooms than in the cool room. Both the warm- and cool-coloured rooms were rated higher for happiness than the achromatic room, suggesting that colour per se can lead to more positive emotional experiences. The authors of that study argued that colour has a predominant effect on interior design that is greater than other factors. This finding is consistent with the claims of design practitioners; for example, Lennon stated that 'Color is the first thing that you perceive when you walk into a room, and it speaks louder than almost any object in a given space'. In the context of colour design, Haller claimed that 'people at transitional or stressful times of their life may wish to temporarily create extreme environments'. Haller gives quite detailed descriptions of the effects of colour on the mood or atmosphere of a room from a practitioner's perspective. Her statements are broadly consistent with those from more formal studies (for example, the idea of cool colours being calming and warm colours being more energising). However, Haller notes that hue is not the only attribute of colours that is relevant and that other factors such as how light or dark the colour is can also be important. Studies have shown that weaker colours give a room an impression of calmness and stronger colours give a room an impression of excitement . Despite the overwhelming evidence that red colours are arousing and blue colours calming, there is recent evidence of the opposite effect when applied to light . This raises some interesting questions about why these different effects might be observed and what the mechanisms that underlie these effects are. This requires a more detailed analysis of colour vision.

The basis of colour vision has been established for at least 100 years. Our eyes contain three types of light-sensitive receptors, called cones, that respond to light and send signals to the brain where the experience of colour (and vision, more generally) is produced (a fourth photoreceptor, known as the rods, is also involved in low-light or night vision). However, for many decades it has been less clear what role colour has on our emotions and our wellbeing. A clear example of the importance of light and colour is seasonal affective disorder (also known as SAD or winter-based depression) which is type of depression that occurs mainly in winter. Although most people in the Northern Hemisphere experience some seasonal changes in mood and behaviour, it has been estimated that about 5% of the population in USA, for example, experience stress and difficulties in functioning both at home and at work . It has been suggested that as many as 50% of the population in northern countries such as Sweden and UK could exhibit serious symptoms of SAD8. Symptoms of SAD can include problems with sleep, weight, appetite and relationships to name just a few . SAD has been treated with bright-light therapy since the 1980s when it was identified as a treatable condition . The physiological basis of SAD has become more clear since the discovery at the turn of the Century that the human eye contains a fifth photoreceptor . Unlike the cones and rods that send their signals to the back of the brain (an area known as the visual cortex), these receptors mainly send signals to a central part of the brain (the hypothalamus) that is responsible for the release of hormones and the regulation of several body functions including body temperature. It is now established that these photoreceptors respond to light and help to regulate our circadian system; an approximately 24-hour cycle of waking and sleeping . Sleep is an essential activity. Lack of sleep is associated with increased risk of diabetes, obesity, heart disease and cancer . It is now established that having the right light at the right time is important for healthy sleeping patterns. Exposure to bright light in the morning and limited exposure to light in the evening (especially close to bedtime) is important for consistent and high-quality sleep. Studies have shown that both short-wavelength light and long-wavelength light in the evening can increase alertness ; increased alertness late in the evening could affect sleep quality.

The effect of light through the fifth photoreceptor, the so-called intrinsically photosensitive retinal ganglion cells, is sometimes referred to as a non-visual process since these retinal cells do not send their output to the part of the brain that is concerned with vision. These non-visual processes are distinction from the more traditional processes that lead to vision (and colour vision specifically) in the visual cortex at the back of the brain. It is interesting then to note that the eye performs two functions (visual processes and non-visual processes) in just the same way that the ear also performs two functions (hearing and balance). Non-visual processes are related to sleep, body temperature, and the release of hormones (such as cortisol, serotonin and melatonin) that can affect our physiological and psychological state.

In this paper we will refer to physical and emotional effects (see Figure 2).

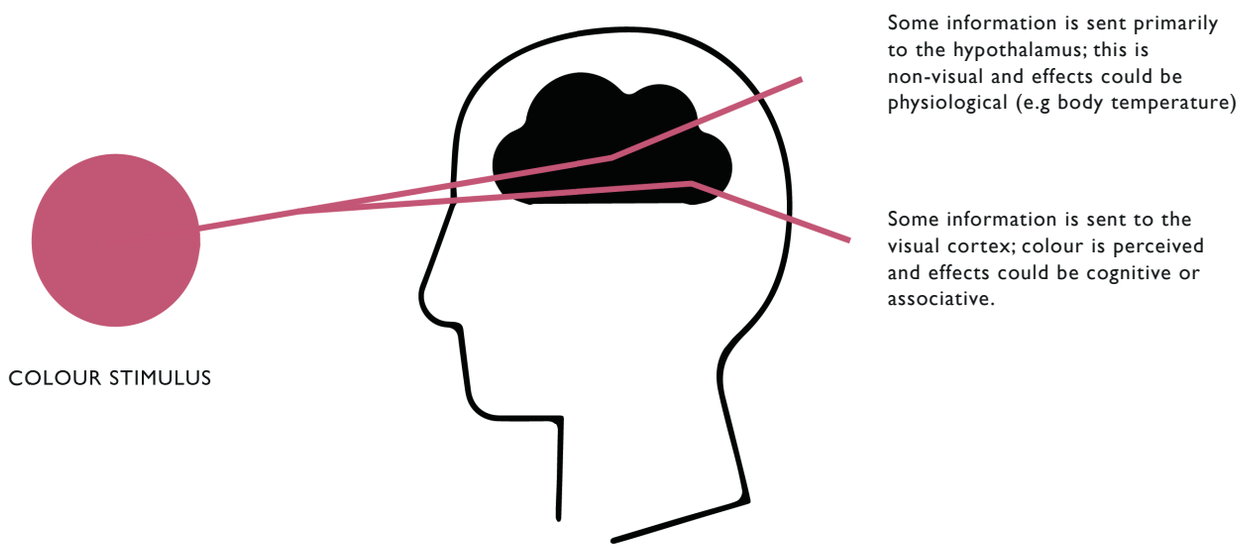


Figure 2: *The eye has two functions; one is image forming and one is not. We refer to effects that operate through the visual (or image-forming function) as being psychological (or physical) and the effects that operate through the hypothalamus as being physiological (or emotional).*

One could argue that any effect of light that is mediated by the eyes is physiological in the sense that light must activate light-sensitive cells in the eye if it is to have any effect at all and that is a physiological process. However, the physiological or physical effects of colour in this paper refer to non-visual processes. By contrast, the term psychological or emotional effect will be used to describe effects of colour and light that are mediated by visual processes (in short, these occur when we 'see' colour). To demonstrate this distinction consider the effect of blue light in the bedroom. On the one hand, we can read that blue is alerting; blue light, in particular, can delay the onset of sleep. On the other hand, there is evidence that blue is also calming and there is some evidence that blue light reduces heart rate and blood pressure compared with, for example, red light. Does this seem to be a contradiction? The contradiction can be resolved if we distinguish between physical and emotional effects. For example, blue light (for example, light emitted by a device such as a smart tablet) can be alerting and can delay sleep. This is a physical effect and is assumed to be mediated by the intrinsically photosensitive retinal ganglion cells and signals that they send to the centre of the brain, the hypothalamus. However, at low levels the amount of light may not reach the threshold to generate this physical effect. Thus, although blue-painted walls reflect blue light, this blue light will likely be insufficiently intense to have an alerting effect. The blue light reflected by the walls is perceived, however, as blue; in other words there is a visual effect. This blue could have a calming effect which is likely mediated by associations; blue is calming because we associate it with things such as the sky or blue sea. The idea that blue can be both alerting and calming is therefore quite logical and can be understood if we distinguish between physical and emotional effects. We suggest that some of the confusions that can be found in the literature may result from an inability to distinguish between these two mechanisms in some experiments. Emotional effects are more likely to vary between individuals whereas physical effects are more likely to be consistent between individuals. Colour preference, for example, Seems to be an emotional effect and many studies have established that colour preference varies significantly between individuals.

We suggest that the majority of studies that have been carried out and reported in the literature are concerned with emotional effects even if they modified the colour environment through lighting. A systematic review by Savavibool et al. of the effect of colour in the workplace analysed more than 80 sources and found that a colourful environment enhanced performance in the workplace more than an achromatic one. It was also found that most errors were made in a white environment implying that colour can enhance performance. It was also found that colour can affect creativity whereas white walls were found to be boring and uninteresting. An earlier review focussed on the effect of colour environment on human behaviour and this raised the issue of low and high screeners. A body of work over the last 30 years or so has established differences between individuals in that some are characterised as being high screeners (less aroused by their environment) and low screeners (more easily aroused by their environment). In simple English, this means that high screeners are less sensitive to their environment whereas low screeners are more easily influenced by it. For example, in one study, performance of office workers was tested in red, blue and green office environments; it was found that the performance of low-screeners was lower in the environment compared with the blue or green environment . The consequence of this study is that rather than concluding that blue environments have this effect and red environments have that effect, for example, it is likely that coloured environments will have different effects of different individuals. Whether they are low screeners or high screeners could well be an important factor in many cases and, especially, in an office environment. However, an individual's aesthetic preferences might also be important.

One recent study looked at colour preferences for an interior environment and related this to individual's general colour preferences . Generally, younger people were more likely to prefer warmer redder colours whereas older people were more likely to prefer cooler bluer colours. Interestingly, some effects of age and culture were found in terms of the most preferred environmental colour. In short, the colour environment that makes one person happy may be not so effective for someone else. Consumers may obtain most benefit from using more colour and should be encouraged to exercise their choice and allow their home environments to express their personality. A recent TED talk by Ingrid Lee lamented the limited use of colour in our built environment generally and noted that there would be more joy in our lives if we used more colour .

RENEW COLLECTION

CONCLUSION

A REVIEW OF THE LITERATURE ON THESE ISSUES LEADS TO THE FOLLOWING CONCLUSIONS:

- Use of colour in the home and workplace can have a positive effect on health and well-being.
- We process colour in two ways; emotional & physical.
- Most people and studies focus on the emotional effects of colour rather than the Physical.
- Designing your room, taking into account both emotional and physical effects may create a happier home.

SOURCES

Küller R, Ballal S, Laike T, Mikellides B, Tonello G. The impact of light and colour on psychological mood: a cross-cultural study of indoor work environments. Ergonomics. 2006 Nov 15;49(14):1496-507.

Savavibool N, Gatersleben B, Moorapun C. The effects of colour in work environment: A systematic review. Asian Journal of Behavioural Studies. 2018 Aug 25;3(13):149.

Salonen H, Lahtinen M, Lappalainen S, Nevala N, Knibbs LD, Morawska L, Reijula K. Physical characteristics of the indoor environment that affect health and wellbeing in healthcare facilities: A review. Intelligent Buildings International. 2013 Jan 1;5(1):3-25.

Czeisler CA. Perspective: casting light on sleep deficiency. Nature. 2013 May;497(7450):S13-.

Knez I. Effects of colour of light on nonvisual psychological processes. Journal of environmental psychology. 2001 Jun 1;21(2):201-8.

Yildirim K, Hidayetoglu ML, Capanoglu A. Effects of interior colors on mood and preference: comparisons of two living rooms. Perceptual and motor skills. 2011 Apr;112(2):509-24.

Lennon, R., 1997. Home Design from the Inside Out. Penguin Arkana, New York.

Haller K, 2017. Colour in Interior Design, in Colour Design (2nd edition), J Best (ed.), Woodhead Publishing.

Mikellides B, 2017. Colour psychology: the emotional effects of colour perception, in Colour Design (2nd edition), J Best (ed.), Woodhead Publishing.

Lin J, Westland S, Cheung V. Effect of intensity of short-wavelength light on electroencephalogram and subjective alertness. Lighting Research & Technology. 2020 May;52(3):413-22.

Rosenthal NE. Winter blues: Everything you need to know to beat seasonal affective disorder. Guilford Press; 2012.

Jacobsen FM, Wehr TA, Sack DA, James SP, Rosenthal NE. Seasonal affective disorder: a review of the syndrome and its public health implications. American Journal of Public Health. 1987 Jan;77(1):57-60.

Melrose S. Seasonal affective disorder: an overview of assessment and treatment approaches. Depression research and treatment. 2015 Oct;2015.

Provencio I, Rodriguez IR, Jiang G, Hayes WP, Moreira EF, Rollag MD. A novel human opsin in the inner retina. Journal of Neuroscience. 2000 Jan 15;20(2):600-5.

Westland S, Pan Q, Lee S. A review of the effects of colour and light on non□image function in humans. Coloration Technology. 2017 Oct;133(5):349-61.

Walker M. Why we sleep: Unlocking the power of sleep and dreams. Simon and Schuster; 2017 Oct 3.

Lin J, Westland S. Effect of long-wavelength light on electroencephalogram and subjective alertness. Lighting Research & Technology. 2020 Oct;52(6):763-74.

Savavibool N, Gatersleben B, Moorapun C. The effects of colour in work environment: A systematic review. Asian Journal of Behavioural Studies. 2018 Aug 25;3(13):149.

Jalil NA, Yunus RM, Said NS. Environmental colour impact upon human behaviour: A review. Procedia-Social and Behavioral Sciences. 2012 Jan 1;35:54-62.

Kwallek N, Soon K, Lewis CM. Work week productivity, visual complexity, and individual environmental sensitivity in three offices of different color interiors. Color Research & Application, 2007, 32 (2). 130-143.

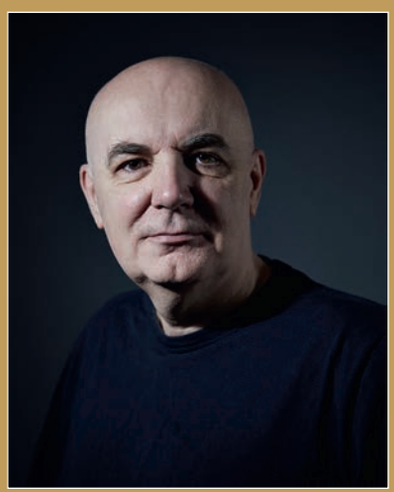
Lee S, PhD Thesis, 2021, University of Leeds.

Lee IF, TED talk, https://www.youtube.com/watch?v=A_u2WFTfbcg (last accessed 18th March 2021).

REFLECT COLLECTION

HARLEQUIN

This white paper has been produced in collaboration with



STEPHEN WESTLAND

A Professor of Colour Science and Technology at the University of Leeds. He has published over 200 peer-reviewed articles about colour, colour design and colour science and was President of the Society of Dyers and Colourists in 2019.

SOOJIN LEE

A Research Fellow in Colour Design at the University of Leeds. She obtained her PhD in Colour Science and previously worked as an Interior Desgner.

HARLEQUIN.SANDERSONDESIGNGROUP.COM

A PROUD MEMBER OF **SANDERSON DESIGN GROUP**