The relationship between consumer colour preferences and product-colour choices

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Colour is an important component of many corporate and brand-building cues and is an integral part of many design processes. A study has been carried out to explore consumer product colour choices and their relationship with consumer colour preferences in the context of personal-care products. Responses from 241 consumers from 17 countries were collected for 7 products and consumer product-colour choices were shown to be related to individual colour preferences. When presented with a choice, individuals tend to select products whose colour is similar to colours that they prefer. Some effects of gender, ethnicity and age were also explored. The authors discuss the implications for product and packaging colour design and exploitation of data mining.

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Introduction

Colour is an important component of many corporate and brand-building cues, such as names, symbols and logos [1]. It is an integral part of many design processes and can be an effective means of creating and sustaining brand images in customers' minds [2]. Colour may also play a role in imparting information, creating lasting identity and suggesting imagery and symbolic value [3]. The appropriate use of colour can impact greatly on the success of a design. There are many colour-design strategies but the meanings that colour impart to a consumer and, in particular, the coherence of these meanings with other brand and product messages is often an important consideration.

The meanings imparted by colour can depend upon culture and geography and can vary over time. The context in which a colour is used can also affect the meaning although the extent of this has not been widely studied. So, on the one hand the connection between meaning and colour seems obvious, natural nearly; but on the other hand it seems idiosyncratic, unpredictable and anarchic [4]. As Gage wrote, "To what extent different colours, such as red or black, have cross-cultural significance, is an altogether more difficult question." [5-6].

The role of consumer colour preferences on consumer purchase decisions may also be a factor in effective colour deign. Colour preferences have long been known to differ from one person to the next [7-9] but, unlike colour meanings, are much more consistent between cultures. Guildford and Smith asked observers to assess the pleasantness of various coloured samples and revealed a preference, on average, for cold colours (such as blue and green) and a dislike for warm colours (particularly yellow) [10]. This preference for cool colours over warm colours has subsequently been confirmed across all cultures [11-14]. Hue is only one of the three dimensions of perceptual colour, however, and colours having greater saturation and brightness have also been found to be preferred more than the same hues with lesser saturation and brightness [8, 15]. More recently, it was shown that females' hue preferences shifted to longer wavelengths (warmer colours) when compared with those of males [16]. The extent to which colour preferences reflect personal taste or are influenced by fashion trends remains unknown although recently Palmer and Schloss postulated a theory as to why individuals may differ in their colour preferences [17]. Rather little has been written about the relationship between consumers' colour preferences and their product-colour choices.

Nevertheless, it is known that colour preference can be an important factor in marketing and product design [14, 18] and has the potential to affect a consumer's overall perception of a product [19-21]. According to a study of colour on consumer choice for automobiles, colour preferences were significantly associated with product choice and the relationship between colour and product choice was gender specific [22]. In a cross-cultural study of colour meanings and preferences, there were different tendencies within respondents from eight different countries with regard to matching colours in a logo design [2]. A recent study indicated that product colour is more important among young adults than older age groups and it is more important to females than males [23].

Although these studies have produced some tentative insights, relatively few marketing-based investigations have bridged the gap between the sensory and cognitive aspects of colour perception and their impact on consumer decision-making processes and the associated implications for marketing strategy. Indeed, colour theory research is still in its infancy within the marketing domain [24, 25]. The research described in this paper aims to try to reduce that gap and tests the hypothesis of whether individual colour preferences can be correlated with consumer purchase decisions.

For example, if a consumer is presented with a colour choice for a product, is the consumer colour choice related to that consumer's individual colour preferences? Of course, it is unlikely that a consumer with red preference would necessarily (and consistently) buy red products. Nevertheless, for some product domains there may be a relationship between consumer colour preferences and their product-colour choices. This paper directly explores the possibility of a link between consumer colour preferences and consumer product-colour choices using an empirical study conducted on-line and in the domain of personal-care products. Personal-care products were chosen for the study because these products frequently appear in a wide range of different colour choices.

The main hypothesis for the study can therefore be stated thus: consumer colour preferences will affect their product-colour choices for personal-care products. In addition, the effect of age, gender and ethnicity on any potential relationship will also be explored. The study will also collect data on colour preferences per se which can then be compared and contrasted with existing studies.

Methodology

Digital images of seven personal-care products (denoted hereafter as body wash1, face cream, shampoo, hand soap, cosmetic, body wash2, and tooth brush) were obtained (see Figure 1) and were each digitally manipulated in Adobe Photoshop to generate two images where the product colour was of a warmer hue and two images that were of a colder hue. Colour is a three-dimensional phenomenon consisting of hue, lightness and chroma but in this study the effect of hue alone has been explored. The images were therefore manipulated to change the hue but to keep the other two dimensions (lightness and chroma) approximately constant. The effect of lightness and chroma may be explored in a later study. Figure 2 illustrates the five images thus generated for the body wash1 product as an example. Note that the starting point for each of the seven product types was an image of an actual product (though slightly blurred so that any brand information, other than colour, was unavailable) which resulted in the colours used for each of the seven products being different (see Figure 1).

Figure 1: The seven personal-care products (body wash1, face cream, shampoo, hand soap, cosmetic, body wash2 and tooth brush).

Figure 2: The five images generated for the body wash1 product. Note that the original image for this product was orange (see Figure 1) and four new coloured product images were created (two that were warmer in hue and two that were colder in hue).

An on-line questionnaire was constructed and made available consisting of four parts: (1) introduction to the survey and participant consent page; (2) pages to collect participant age, gender and ethnicity; (3) each of the seven sets of five images were presented and participants were asked to indicate (by clicking on a radio button) which of the five differently coloured products they would most prefer to purchase; (4) participants were presented with six different colours (each shown as a simple square) and asked to indicate which one was their favourite colour. The six hues used to collect information on colour preference (red, orange, yellow, green, blue and purple) correspond to the primary and secondary colours of a typical colour wheel.

A total of 241 participants (60 male and 181 female) from 17 countries completed the survey. Table 1 summarises the proportion of the participant groups by gender, age, and ethnicity. Obviously,

variability between participants' displays and viewing conditions would vary in an experiment of this type carried out over the internet. In addition, it is possible that observers with colour-defective vision may participate. These variances add noise to the experiment. Advantages and disadvantages of internet-based experiments have been described in the literature [26, 27]. However, as Moroney has noted [28], the advent of sRGB (and ICC colour-management workflows) has provided some degree of convergence in colour encoding and display for the internet. Furthermore, variability in colour appearance is likely to be significantly smaller than variability in colorimetric measurements. The choice was made to accept the limitations of colour variability in order to get responses from a diverse and large population of participants.

Gender	Male: 24.9%	Female: 75.1%	
Age	Young (<30): 58.1%	Old(>=30): 41.9%	
Ethnicity	British/European: 61%	Asian: 34%	Other: 5%

Table 1: The proportion of the participant groups by gender, age, and ethnicity (%).

Given that participants made discrete choices the chi-squared statistic is the appropriate method to test for significance.

Results

Analysis of colour preference

Before the product-colour choices were analysed to address the main hypothesis of the research the data on personal colour preferences were first analysed. The colour that was selected as most preferred was blue (31%) and the colour that was selected as least preferred was yellow (8%); this is consistent with other studies [14]. Figure 3 shows the breakdown of colour preferences by gender. There was a significant difference ($p < .05$) between the responses of the male and female participants; the preference for colder colours over warmer colours was much more pronounced in the male group; this finding is consistent with previous research [16]. However, there was no significant effect of age or ethnicity on personal colour preferences (see Table 2).

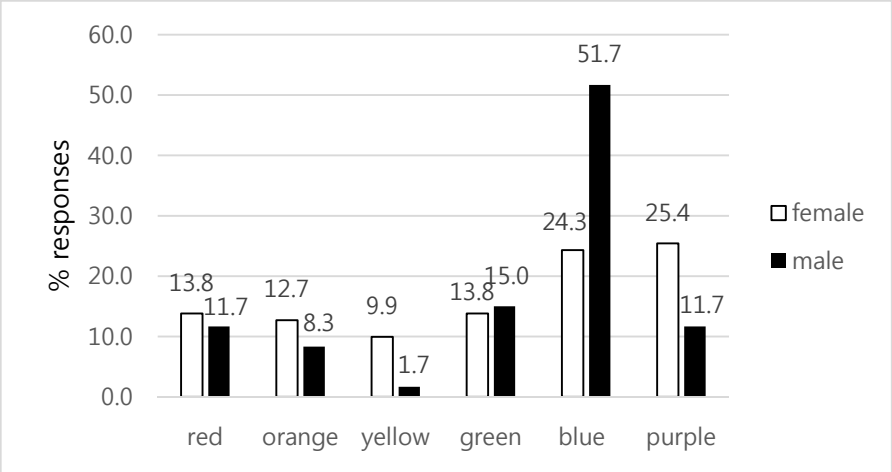

Figure 3: Effect of gender on colour preferences.

		Preference colour						Total	χ^2 (p)
		Blue	Green	Orange	Purple	Red	Yellow		
Gender	Female (%)	44(24.3)	25(13.8)	23(12.7)	46(25.4)	25(13.8)	18(9.9)	181	19.57* (11.07)
	Male (%)	31(51.7)	9(15.0)	5(8.3)	7(11.7)	7(11.7)	1(1.7)	60	
Ethnicity	British/European (%)	26(31.7)	11(13.4)	11(13.4)	13(15.9)	12(14.6)	9(11)	82	3.91 n.s (11.07)
	Asian (%)	43(29.3)	22(15.0)	15(10.2)	37(25.2)	20(13.6)	10(6.8)	147	
	Others (%)	6(50.0)	1(8.3)	2(16.7)	3(25.0)	0(0.0)	0(0.0)	12	
Age	Young (%) (<30)	39(27.9)	21(15.0)	15(10.7)	36(25.7)	18(12.9)	11(7.9)	140	3.72 n.s (11.07)
	Old (%) (>=30)	36(35.6)	13(12.9)	13(12.9)	17(16.8)	14(13.9)	8(7.9)	101	

Table 2: Effect of gender, ethnicity and age on colour preferences. The number of participants for each preference is given (with per cent figures in parentheses). In the right-most column the chi-squared statistic is given (if this exceeds the threshold in parentheses then there is an effect at the 5% level). Therefore we see a significant effect of gender (*) but no effect of ethnicity or age

Analysis of product-colour choices

Products							Total
Body wash1	Colours [RGB]	[249,88,252]	[253,71,122]	[248,139,82]	[252,249,92]	[118,253,72]	
	Consumer choice (%)	18 (7.5)	53 (22.0)	58 (24.1)	57 (23.7)	55 (22.8)	241
Face cream	Colours [RGB]	[179,147,220]	[230,151,170]	[226,183,151]	[221,220,137]	[166,222,147]	
	Consumer choice (%)	39 (16.2)	45 (18.7)	87 (36.1)	35 (14.5)	35 (14.5)	241
Shampoo	Colours [RGB]	[185,102,70]	[189,181,72]	[117,187,73]	[71,189,105]	[73,188,181]	
	Consumer choice (%)	51 (21.2)	28 (11.6)	46 (19.1)	34 (14.1)	82 (34.0)	241
Hand soap	Colours [RGB]	[203,66,60]	[206,167,66]	[147,204,61]	[48,194,57]	[65,203,167]	
	Consumer choice (%)	21 (8.7)	31 (12.9)	51 (21.2)	28 (11.6)	110 (45.6)	241
Cosmetic	Colours [RGB]	[78,166,105]	[77,166,162]	[82,115,169]	[105,81,169]	[168,84,172]	
	Consumer choice (%)	21 (8.7)	73 (30.3)	78 (32.4)	28 (11.6)	41 (17.0)	241
Body wash2	Colours [RGB]	[132,206,143]	[118,195,179]	[117,162,195]	[127,119,196]	[172,111,189]	
	Consumer choice (%)	46 (19.1)	66 (27.4)	66 (27.4)	28 (11.6)	35 (14.5)	241
Tooth brush	Colours [RGB]	[146,34,204]	[212,38,161]	[206,42,43]	[213,149,39]	[158,211,38]	
	Consumer choice (%)	64 (26.6)	65 (27.0)	55 (22.8)	7 (2.9)	50 (20.7)	241

Table 3: The frequency of consumer choice by colour for each of the seven products. The number of participants for each preference is given (with per cent figures in parentheses). In each case the null hypothesis that participants responded randomly without regard to colour can be rejected ($p < .05$). RGB values of the colours are shown in brackets.

Table 3 shows the number of participants that selected each colour for each of the seven products considered in this study. Two notable colour observations are that (1) yellow-orange colour is seldom chosen (< 3% of participants chose this) for the *toothbrush* and (2) blue-green colours are chosen more than warmer colours for *hand soap*.

		Face cream colours [RGB]					Total	χ^2 (p)
		(a) [179,147,220]	(b) [230,151,170]	(c) [226,183,151]	(d) [221,220,137]	(e) [166,222,147]		
Gender	Female (%)	25 (13.8)	42 (23.2)	71 (39.2)	25 (13.8)	18 (9.9)	181	23.24** (9.49)
	Male (%)	14 (23.3)	3 (5.0)	16 (26.7)	10 (16.7)	17 (28.3)	60	

Table 4: Per cent responses for male and female colour choices for face cream. The effect of gender (**) is highly significant ($p < .01$). RGB values of the colours are shown in brackets.

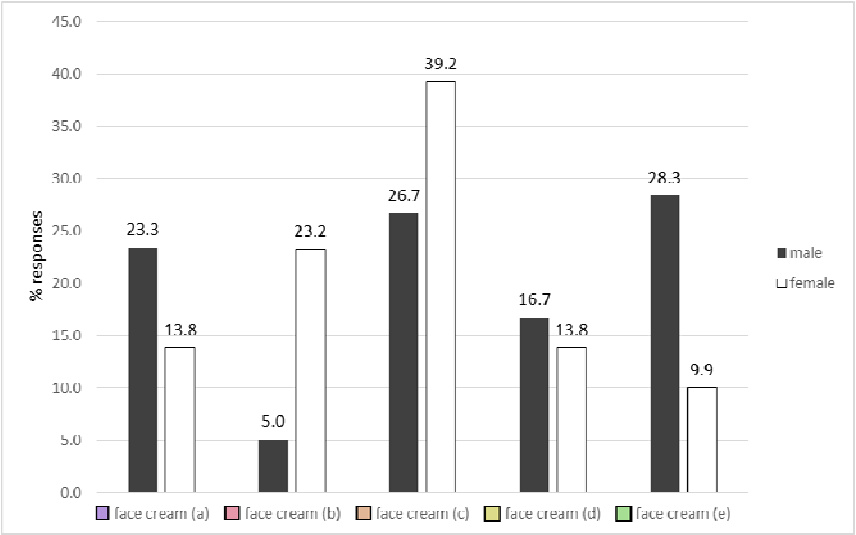

Figure 4: The effect of gender on colour choices for face cream. Females preferred warmer colours (red and orange) and males preferred colder colours (green and purple).

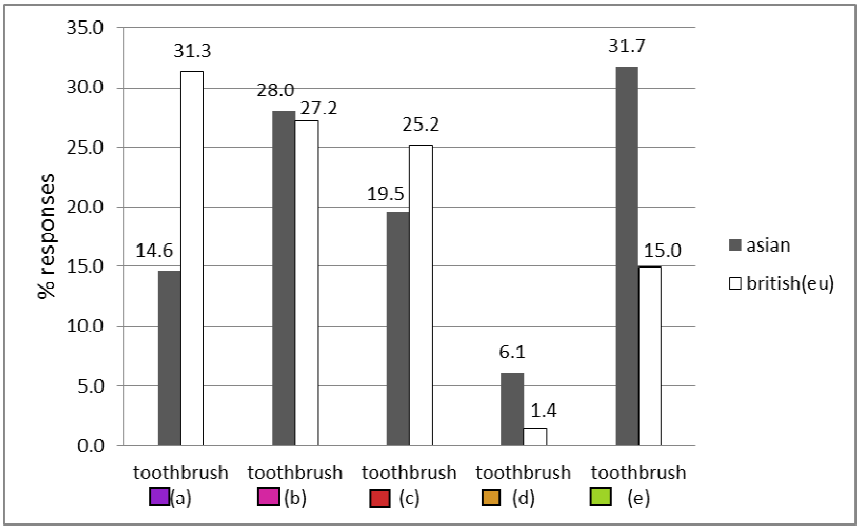

Figure 5: The effect of ethnicity on colour choices for tooth brush. Asian participants tend to chose colder colours than British/European participants.

In four out of seven cases (*body wash1*, *face cream*, *cosmetic* and *tooth brush*) a significant effect ($p < .05$) of gender was found. The largest gender effect was found for *body wash1* and *face cream* (in both cases $p < .01$) where females chose warmer colours (red and orange) and males chose colder colours (green and purple). An example, for *face cream*, is shown in Figure 4.

There was also an effect of ethnicity on colour choices. For example, Asian participants tend to choose colder colours than British/European participants (see Figure 5).

Effect of colour preference on product-colour choices

The main purpose of the study was to explore the hypothesis that consumer colour preferences affect consumer product-colour choices in personal-care products and this is addressed in this section.

The effect of colour preference on product-colour choices was significant ($p < .01$) in four of the seven product cases (*body wash1*, *cosmetic*, *body wash2* and *tooth brush*). In each of the other three cases (*face cream*, *shampoo* and *hand soap*) the effect was marginally significant ($p < .10$).

The chi-squared analysis shows that there is an effect of personal colour preference on consumer product-colour choice. Figure 6 shows the qualitative relationship between personal colour preferences (plotted along the horizontal axes) and consumer product colour choices (denoted by the coloured bars) for three of the products used in this study. For example, over 45% of participants who stated a preference for green and orange chose green or orange *body wash1* product colour respectively. Over 40% of participants who stated a preference for yellow chose a yellow *body wash1* product colour. For the *toothbrush* product yellow was seldom chosen as a product colour. However, note that 50% of participants who stated a preference for red chose a red *toothbrush* product colour and over 40% of participants who stated a preference for green chose a green *toothbrush* product colour. For the hand soap product blue was chosen very frequently irrespectively of consumer colour preferences.

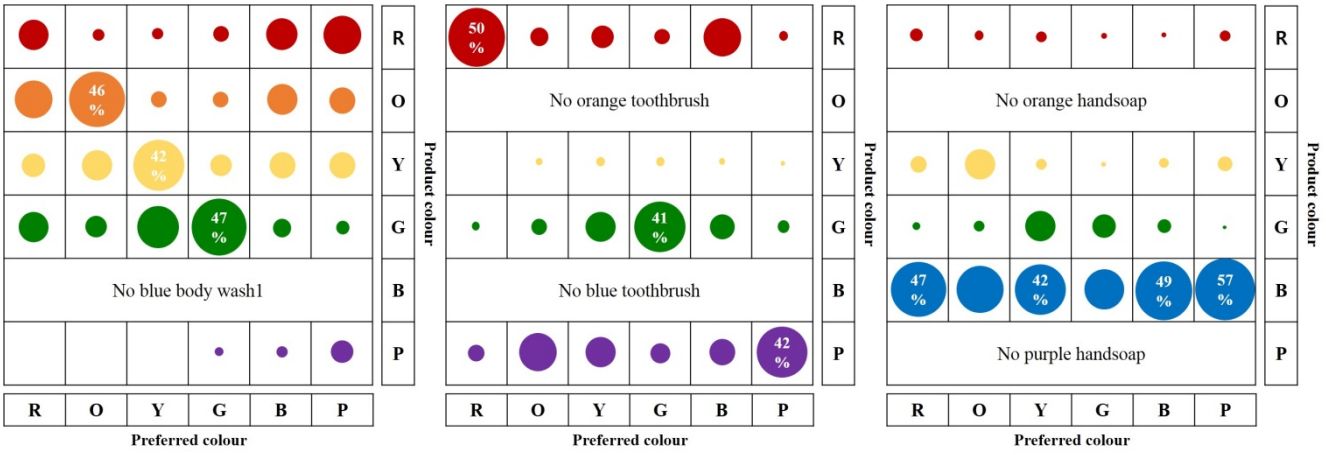

Figure 6: The table shows correlations between colour preference and product colour choice for body wash1 (upper), toothbrush (middle) and handsoap (lower). The size of the circles in each cell is related to the number of observers who chose the product colour and preferred colour designated by the row and column of the cell respectively. For clarity, the colours of the circles designates (approximately) the colours of the products for each row. Where more than 40% of observers with a particular colour preference chose a product colour, the per cent is indicated with white text. For example, the upper image row indicates that 42% of the respondents who selected yellow as their favourite colour also selected the yellow product colour for body wash1.

Discussion

A number of factors have been shown to be correlated with consumer product-colour choices. An effect of gender was found with four products. Most significantly, for *face cream* and *body wash1*, females chose warmer colours and males chose colder colours. There was some effect of ethnicity, most notably for the *toothbrush* where Asians preferred green and British/European preferred bluish purple. Little effect of age was noted. A recent study [23] did conclude that product colour is more important among young adults than older age groups. However, in this study, age was only a factor for one of the products (*body wash1*) where red was strongly preferred by young respondents.

The main focus of this study was to investigate a possible relationship between a consumer's favourite or preferred colour (in an abstract sense) with a colour choice they might make for a specific product. Some correlations were found between colour preference and product-colour choice. For example, 41.2% of respondents for whom green was their favourite colour selected a green *toothbrush* whereas 50% of respondents for whom red was their favourite colour selected a red *toothbrush*. There were similar correlations for several other products. In some cases, for example *hand soap*, no such correlations were observed but in this case one colour was universally preferred irrespective of colour preference, age or gender. In two other product cases the range of colours available to the respondents was limited but, arguably, respondents still chose the product colour closest to their colour preference (for example, respondents who preferred yellow chose the warmest colour available for the *cosmetic* product). The analysis was on individual choices and not the choices of the general population of the study. The relationship between colour preferences and consumer product-colour choices is complex but this study, whilst only focussing on hue and on a selection of personal healthcare products, provides some evidence that consumers do make product colour choices that can be predicted based on knowledge of their personal colour preferences. The effect was significant or marginally significant in each of the seven products that we tested. There is also some evidence that consumer product-colour choices differ between males and females and between different cultural groups. This raises the possibility that a more detailed and systematic study of consumer colour preferences and their relationship to product-colour choices, in particular, could provide invaluable information that could lead to more effective use of colour in the design of products and product packaging.

The study suggests that providing consumers with a choice of product colours may be advantageous in the personal-care domain although the extent to which this is true for different product and markets is still to be determined. In addition, the study suggests that, as companies evolve effective methods for collecting big data, information about a consumer's personal colour preferences could enable a bespoke offering that could enhance the possibility of leading to a sale.

This study has suggested that the relationship between colour preference and consumer product-colour choice may be worth further investigation. However, it is recognised that the success of colour in a design or packaging can be affected by numerous other factors (such as shape, texture, gloss and product names) that have not been part of this study. Cultural boundaries become blurred, and consumer preferences appear to be driven less by long-standing local and regional traditions, and more by perceived desirability of global products and brand identities [29]. The consequence is not only a progressive globalisation in markets but a reduction in the differences of consumer product selection, and therefore a growing similarity of preference [30].

One weakness of the study is that the same five colours were not used throughout for the different products. This was done so that in each product there was at least one colour that was commercially successful and the other colours were made to be warmer and colder than this starting point. However, in retrospect, it may have been better to use the same colours throughout and it may have

made the analysis easier and led to stronger conclusions. This work should therefore not be seen as definitive but a starting point. It suggests that colour preference is important, for some products at least. Identifying which products colour preference is critical for and which products colour preference tends to have little effect, and understanding the reasons for this, should be the focus of future study in this area.

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