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Colour associations and consumer product-colour purchase decisions

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Abstract:
This article describes a conceptual framework for understanding consumer product-colour purchase decisions. Building on previous work, a new primary factor, colour association, is introduced. The purpose of this study is to test whether consumers' colour-associations connect with their product-colour association, and whether colour-association affects consumers' intended product-colour purchase decisions. The study used two research activities (a laboratory experiment and an interview) and two research methods (multiple choice for 6-alternative-forced-choice and multiple choice for rank-order) to investigate which colour a participant would choose if asked to select a product to purchase when there is a range of colours available. Participants were also asked to provide a reason for their decisions. The study finds that the stronger a participant's preference for a colour, the more likely they are to purchase a product in that colour. The data from interviews suggests that, for some of the products tested, participants are highly influenced by the colour association that they would purchase a product-colour on their one of the colour association than other colours. The updated conceptual framework suggests that the colour association factor could be one of the product-colour decision primary factors that influence consumer product-purchase intentions in the absence of consumer personal colour preferences.

Keywords: colour association; colour preference; packaging design; purchase decisions

INTRODUCTION

'Where the eye stops, the sales begin'. [23] One of the first and most immediate ways capturing consumers' attention (and influencing their purchase decisions) is through the use of visual elements, especially packaging.[6] Up to 90% of consumers make their purchase decisions based on visual examination of the packages.[4] This places enormous importance on packaging as a powerful visual element.[1, 13] Moreover, colour has been suggested as one of the most powerful visual elements of packaging.[12] Packaging colour may invoke a person's imagination of a product.[19] Thus, choosing an appropriate colour for the packaging of a product (or, even, in some cases, of the product itself) is tremendously important, in that it may affect consumer decision-making. It establishes a link between product colour (or product-packaging colour) and marketing. An underlying understanding of colour psychology is very important to ensure that the product/packaging uses colour in an attractive and eye-catching manner (with the aim of either boosting sales or reducing product overproduction).[12]

Studies have suggested that, for food-packaging, red colours are associated with hot flavours[19] and that natural and gardening products are often green to relate to nature and environmental friendliness[21]. However, colour is an interdisciplinary discipline that spans science[29], design[18], art[15] etc. and the multifarious nature and multiple functions of product colour (or product-packaging colour) have been highlighted.[11, 7] It is not clear whether colour associations have been sufficiently utilised in product-colour or product packaging design.

Colour associations *per se* have been studied by many researchers. Most previous colour association research has worked with simple colour patches including colour-association human-emotion research[19, 24] and colour-association object research[23]. In some cases, it is surprising, for example, that seemingly desirable and positive emotions (such as happy) are associated with less preferred hues (such as yellow), whereas less desirable emotions (such as sad) are associated with more preferred hues (such as blue)[26]. Palmer and Schloss[20] suggested that colour associations are due to the affective response to individual colour preference. However, very little work has been carried out to explore whether consumers' colour associations might affect product-colour association (that is, whether the personal colour association affects product-colour association), and how it affects consumers' product-colour decisions.

For colour association *per se*, some studies asked participants to list objects that they associated with a colour (finding that, for example light-blue is associated with 'sky') or asked participants to list colours that they associated with words.[20, 25, 3] Some research found an interesting relationship between coloured-object association and individual colour preference. Taylor and Franklin[25] found there is a negative relationship between the number of objects and colour preference. For example, in the chromatic environment, a colour associated with few objects could have a stronger object/colour identity; and therefore, might elicit a clearer internal image than colour associated with multiple objects (such as light-blue being associated with 'sky'; however, dark-yellow being associated with 'a lot of stuff'). However, it is hard to find the connection between colour-association with product-colour-association (or we say item-colour association), also the effects on consumers' product-colour purchase decision specific products and product categories.

A previous study[31] considered the role of colour in product and product-packaging on intended consumer purchase decisions. Data confirmed that personal colour preference affected intended product-colour purchase decisions but that the extent varies for different product categories. It was suggested that the role of individual colour preference (that is, which colours consumers prefer in general without regard to any specific product category) is secondary to other factors, which can be defined as primary factors. Fig. 1 lists and describes these primary factors. Consumers are more likely to select a product in their favourite colour when the colour does not infer any functional or performance attributes. For example, a consumer would most likely not expect one coloured toothbrush to perform better than a toothbrush of a different colour and therefore for a product like this it might make sense to offer the consumer a range of colours.

The motivation of this new study is to provide new data for more product categories and to build upon the previous study[31] to develop new insights on the effect of colour on consumers' intended product-purchase decisions. This study differs from the earlier study in that it explores the reasons why participants choose products in certain colours when given the opportunity. This type of research requires qualitative methods and in this study this is achieved using interviews.

FRAMEWORK FOR COLOUR ASSOCIATION AND CONSUMER DECISIONS

An earlier conceptual framework was presented[31] to show the effect of *colour functionality* and *colour preference* on consumers' product colour preferences even though they have strong personal preferences for other colours in an abstract sense. The original conceptual framework found that personal colour preference affects intended product-colour purchase decisions but that the extent varies between product categories and that personal colour preferences are more likely to influence consumer product-purchase intentions in the absence of these primary colour factors (*colour functionality* and *colour preference*).

However, some products are not particularly related to any of these existing factors and therefore a new primary factor, the *colour association factor,* has been introduced in an updated conceptual framework.

The updated hypothesis is that a *colour association factor* is one of the primary factors that could drive consumer purchase decisions in some circumstances (details see Fig.1). The *colour association factor* relates to whether a colour is appropriate (in terms of association/information/meaning) for a product. The difference between the colour association factor and the previous factors (colour functionality and colour performance) is that in this case, it is about the associations that the colours have; whereas the colour functionality factor is about the function of the object or product. In some cases, such consumer inference may not be correct but nevertheless, such colour associations may drive consumer purchases. This study captures both qualitative and quantitative data for 51 products and explicitly tests the hypothesis that colour association might be an important primary factor.

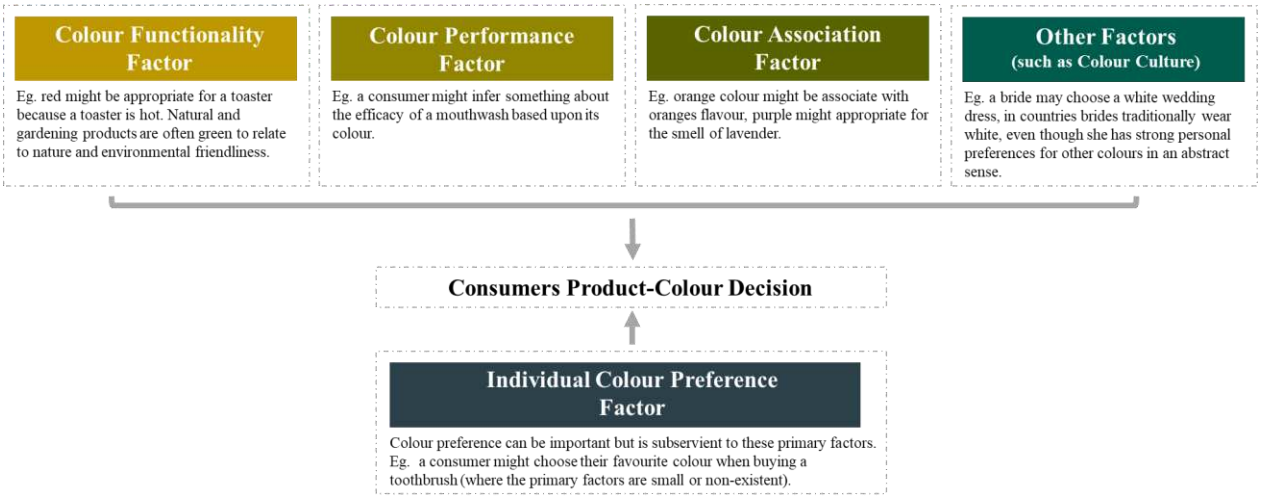

Fig. 1. Updated conceptual framework for this study: colour association factor joins in as one of the primary factors for consumers' product-colour decision. Colour preference is only important in the absence of any of primary colour factors.

EXPERIMENTAL DESIGN AND METHODS

In this study, six colours (red, orange, yellow, green, blue and purple) were selected from an Adobe HSB colour system.[8, 2, 31] The display was colour calibrated; however, coloured patches were defined by sRGB values and the actual colours that were displayed on the monitor were measured using a Minolta CS100A colorimeter and these are reported in TABLE I for the colour squares as CIE L*a*b* and CIE L*C*h values.

TABLE I. The sRGB, CIE L*a*b* and CIE L*C*h colour coordinates of the six basic colour squares.

Colour coordinates of the six basic colour squares						
Coloured Squares	Red	Orange	Yellow	Green	Blue	Purple
sRGB	255, 0, 0	255, 127, 0	255, 255, 0	0, 255, 0	0, 0, 255	127, 0, 255
CIE L*a*b*	40.01, 55.08, 58.27	49.84, 28.88, 64.20	72.35, -17.18, 80.75	63.85, -68.14, 69.37	17.65, 75.93, -89.76	29.46, 61.16, -63.54
CIE L*C*h	40.01, 80.19, 46.61	49.84, 70.39, 65.77	72.35, 82.56, 102.20	63.85, 97.24, 134.49	17.65, 117.57, 301.23	29.46, 88.19, 313.91

Totally, 51 products were selected (see TABLE II) and product categories were expanded from those used in a previous study[31]. All of the 51 products - household kitchen/ bathroom products, clothes and food products - were digitally manipulated in Adobe Photoshop to create images in each of six target colours

(red, orange, yellow, green, blue and purple). The colours of the products were modified in Adobe Photoshop to be a visual match to the intended colours. However, this visual-matching process introduced a small amount of error. For the purposes of this work very high colour fidelity of the colours on the display was not necessary but it was important that observers would recognise the products as being categorically either red, yellow, or green etc. Fig. 2 reports the actual measured (using a Minolta CS100A colorimeter) colours from ten of objects for illustration that were displayed on the monitor and represents visually the extent of the variability that occurred between the products. The ΔE is the average ΔE between the product colour and the appropriate squares colour. Furthermore, variability in colour appearance is likely to be significantly smaller than variability in colorimetric measurements.

TABLE II. The 51 products that were used in this study

Name list of the 51 products					
Alarm Clock	Cream	Hand Wash	Milk	Shoe	Tie
Back Cushion	Dental Floss	Hat	Mouse	Shower Gel	Toner
Bag	Deodorant	Headphone	Notebook	Smart Phone	Tool Kit
Bike	Condoms	Ice Cream	Pan	Soap Bar	Toothpaste
Calculator	Makeup-Remover	Laptop	Pant	Sock	Trousers
Candy	Washing Up Liquid	Laundry Detergent	Pen	Sofa	T-Shirt
Cheese	Floor Lamp	Lighter	Photo frame	Suitcase	USB
Chocolate	Gloves	Shave Splash	PlayStation	Table Cleaner	Vase
Coffee maker	Hand Cream	Yogurt			

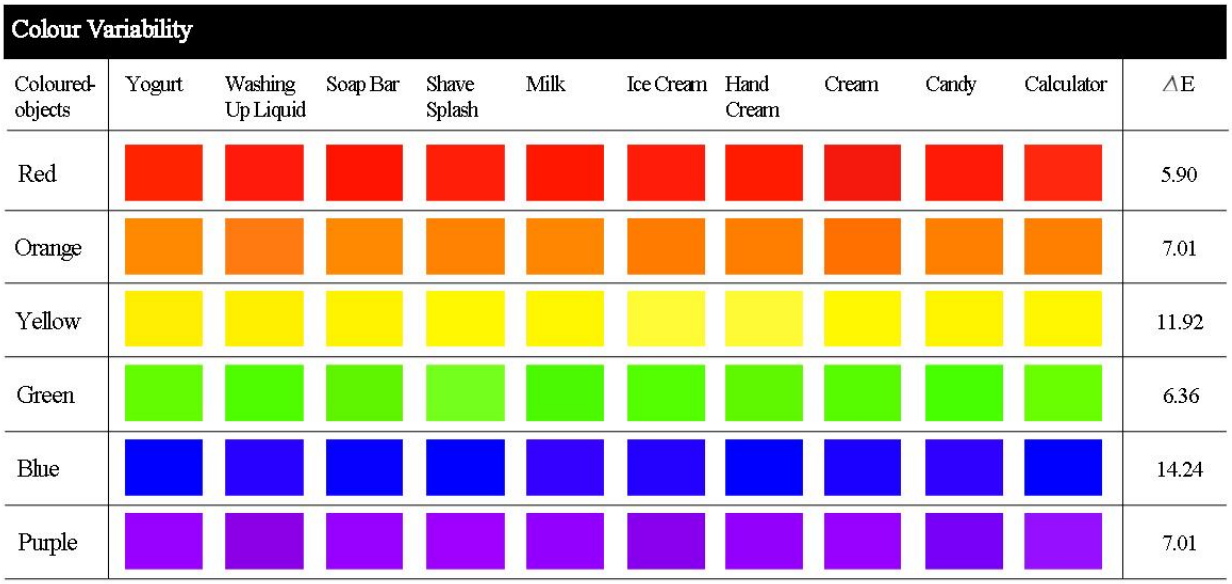

Fig. 2 The coloured images for ten products in each of the six colour options and the six colour squares that were used to determine colour preference. The CIELAB colour coordinates for 10 of the products in each of the six basic colours in order to demonstrate the extent of the variability, E is the average colour difference between these ten product colours and the colour squares TABLE II.

In this study, two research activities (a laboratory experiment and an interview) have been used to test the effect for colour-association on consumer product-colour purchase decisions. The activities were carried out in a laboratory with controlled viewing conditions, and lighting conditions and controlled display technology. The laboratory experiment was to (i) ascertain the colour that participants would prefer to buy for each product and (ii) participants' colour preference. The interview, on the other hand, aimed to collect

in-depth data on characteristic or to produce a description and also to explain further observations. The purpose of employing two data collection activities was to obtain complementarity to elaborate more fully on the results gathered from one activity with those from another.[5]

The survey was made and coded using MATLAB (see Fig. 3), and the 6-alternative-forced-choice (6-AFC, for product-colour choice part) and the rank-order (for colour preference part) research methods were employed. Each participant was presented with the six coloured images for each product in turn (the order in which the products were presented varied randomly for each participant) and asked to indicate (by clicking with the mouse) which of the coloured products they would like to buy. At the end of the experiment (after which all 51 products had been evaluated), the six coloured squares were displayed, and the participants were asked to indicate a colour preference order for these six colours (see Fig. 3) using the rank-order method. In addition, each survey was combined with an interview (both one-to-one and face-to-face). Participants were additionally asked to indicate, for each product, why they choose this colour; and also, to provide for each colour square, what do they associate. The qualitative data from the interviews were recorded using a voice recorder.

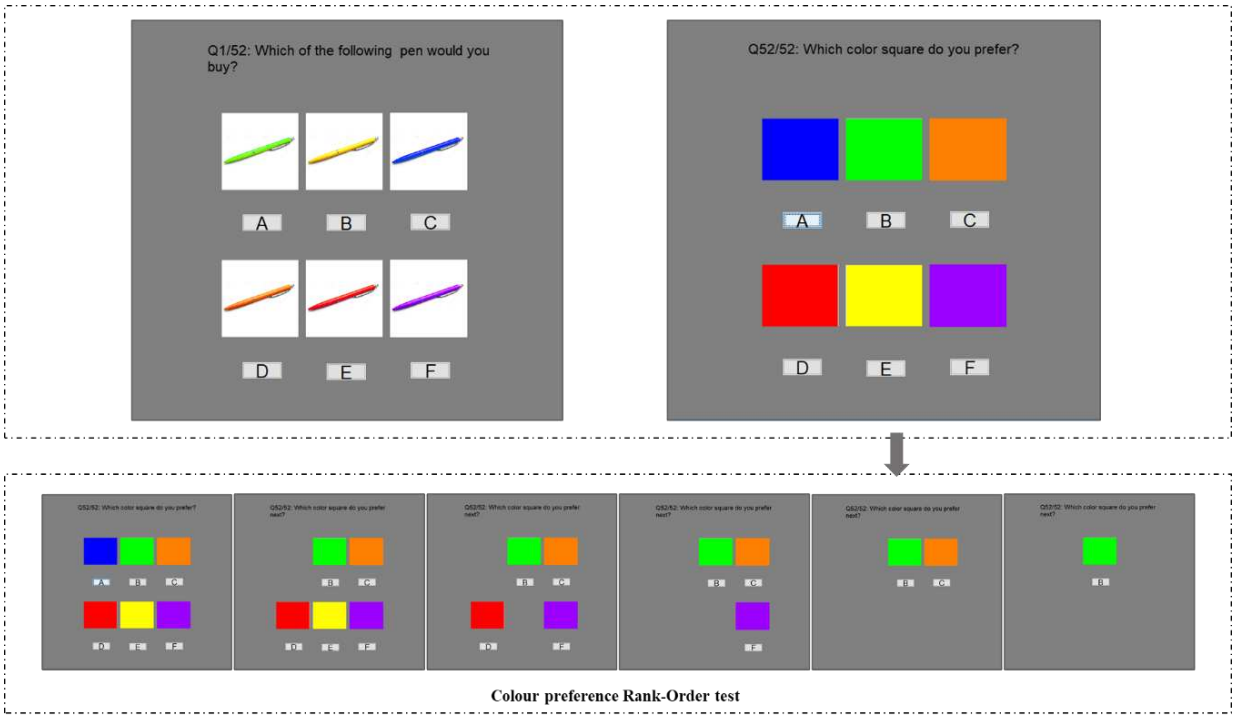

Fig. 3 Graphical user interface for laboratory experiment. The order of in which the products were presented was random for each participant.

The laboratory experiment took place in a dark room in the Experience Design Laboratory at University of Leeds. Stimuli were displayed on an HP DreamColor LP2480zx Professional Display (24-inch Diagonal LCD Backlit Monitor, the luminance of the display white was 218 cd/m^2). The size of each image was 50 × 40 mm displayed on a uniform grey background (CIE L^* = 50) and participants viewed the screen from about 60 cm. A total of 37 participants (18 males and 19 females) were recruited to take part in the Interview and Laboratory Experiment II.

RESULTS

For the data analysis, the colour that each participant selects for each product is compared with the participant's own individual colour preference rank-order result (for each colour-patch). The extent to which the chosen product-colour matches the individual colour preference order is calculated as a per cent figure and this will be referred to as the colour consistency rate. This is done for each product (also for each colour-patch); that is, the per cent of participants that indicate they would buy that product in their individual colour preference. Fig. 4 shows the distribution of the colour consistency rate for the laboratory experiment for the rank-order method were 33.7% for first preferred-colour, 22.6% for second preferred-colour, 15.4% for third preferred-colour, 9.4% for fourth preferred-colour, 12.7% for fifth preferred-colour and 6.4% for sixth preferred-colour. This suggests that consumers are more likely to prefer a product in a particular colour, the more they like that colour generally. In other words, individual colour preferences do affect participants' purchase decisions[10, 28, 31].

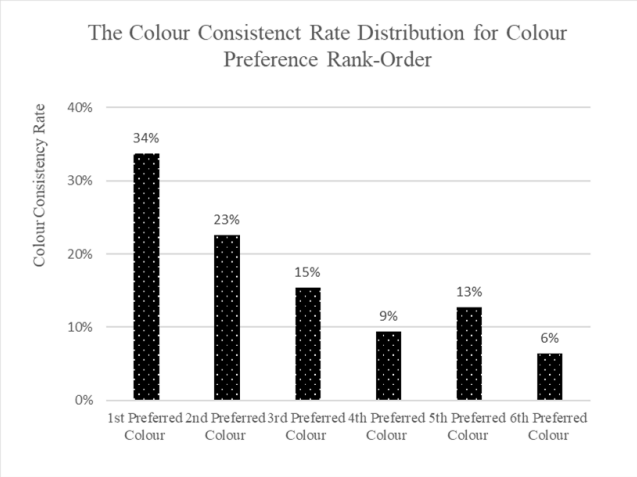

Fig. 4 The distribution of the product-colour consistency rates for Laboratory Experiment threated as Rank-Order method. The 1st preferred colour, 2nd preferred colour and 3rd preferred colour etc. are referred to as the first/second/third etc. colours participant chose when they did the individual colour preference rank-order test.

To explore the connection between colour-association and product-colour-association, the 'template approach' analysis method[14] was used (NVivo software) to code and organise qualitative data from interviews. The three sequential steps for the template approach were as follows: 1) creating a coding scheme for each colour name; 2) coding the data to each colour; 3) gathering similar data in one place. The transcribed data from each interview was first coded based on the words/phrases related to colour patches. The descriptive themes that are close to the data were narrowed down to the interpretive theme. Finally, the data was clustered in one place. For colour-patch-association, there were 48 associations for the red-colour, the highest colour association for red was Culture that the weighted percentage was 17.12%, followed by Passion (9.01%) etc.; 27 from orange-colour, the highest association for orange was Oranges (30.51%), flowed by Warm (13.56%) etc.; 35 associations from yellow, the highest was Lemon (15.71%), flowed by Bright (10.00%) etc.; 36 associations from green, the highest was Fresh (12.90%), flowed by Grass (12.90%) etc.; 28 associations from blue, the highest was Calm (13.92%), flowed by Fresh (13.92%) etc.; and 30 associations from purple, the highest was Lavender (16.33%), flowed by Luxury (8.16%) etc.

For analysing product-colour association, the three sequential steps for coding were: 1) creating a master node named by the products' name and producing six sub-schemes under each product's name by colour-name; 2) coding words/phrase related to each product-colour; 3) gathering similar data in each colour. The

list of choosing reason keyword, including counts and weighted percentages for each reason, were generated for each product. Interestingly some of the product-colour decision reasons are connected with colour-square associations (for example, for Coffee Maker, the reasons of bright and warm from red-colour and orange-colour are found from red-colour and orange-colour associations). This suggests colour association may influence participant purchase behaviour of that product to support the updated framework.

The qualitative result from product-colour decision reasons for each product is compared with the colour-patch association result to explore the relationship between them. In this study, totally, 1922 product-colour decision reasons were received from 51 products (including colour preference reasons), more than one third of them (667 reasons) could be found from colour-patch associations. For data analysis, *the product-colour association score* has been introduced (the extent to which the product-colour decision reason matches the colour squares associations is calculate as a weight percentage figure). Fig. 5 shows a *product-colour association score* example for Alarm Clock. Figure lists all of the reasons for which participants say they chose a particular product colour (in this case, Alarm Clock). Those reasons that are underlined are those for which there is a colour-association connection. The product-colour association score is the sum of percentages of each of the underlined reasons.

The example shown in Fig. 5, for the alarm clock, 46 reasons for why the participants selected a colour has been collected (note that some participants gave more than one reason). Fig. 5 shows the counts for each colour-reason pair. So, for example, for blue there were two reasons (an association with calm and an association with cool-down). The blue-calm association was mentioned twice so it has a count of two and the blue-cool-down association was also mentioned twice so it also has a count of two. In Fig. 5 the total number of counts is 46. For red-alarm there were three times mentions and so the count for the red-alarm association is 3. We obtain 6.52% as 100*3/46; in other words, it is the percentage of reasons that were given that were the pair red-alarm. Of course, the total of the percentages in Fig. 5 is 100%.

Product Name	Colour Name	Word (Association)	Count	Weighted (%)	Word (Association)	Count	Weighted (%)
Alarm Colck	Colour Preference		11	23.91			
	Red	Alarm	3	6.52	Cheerful	1	2.17
		Refresh	3	6.52	Colour Combination	1	2.17
		Tense	3	6.52	Decoration	1	2.17
		Noticeable	2	4.35	Morning	1	2.17
		Bright	1	2.17	Passion	1	2.17
	Orange	Active	1	2.17	Warm	1	2.17
		Cute	1	2.17			
	Yellow	Bright	1	2.17	Refresh	1	2.17
		Morning	1	2.17	Sun	1	2.17
	Green	Fresh	1	2.17			
	Blue	Calm	2	4.35	Cool-Down	2	4.35
	Purple	Colour Combination	2	4.35	Clam	1	2.17
		Decoration	2	4.35	Cool-Down	1	2.17

The Product-Colour Association Score = **6.52% (Alarm) + 2.17 % (Bright) + 2.17 % (Cheerful) +2.17 % (Passion) +2.17 % (Warm) + 2.17 % (Bright) + 2.17 % (Refresh) +2.17 % (Morning) +2.17 % (Sun) + 2.17 % (Fresh) + 4.35 % (Calm) + 2.17 % (Cool-down)** = **37%**

Fig.5 The illustration for the product-colour association score (example for Alarm Clock). The connected reasons with colour square associations were noted with bold and underline (coloured only in this illustration).

The responses for product-colour association score were averaged across all participants to produce a number (between 0 and 100%) for each product. The average score was 34.56%. For some products, participants judged colour to be a strong influence on colour-patch association such as Deodorant (83%), Shave Splash (82%) and Cheese (76%); however, for other products, colour only weakly influenced colour-patch association such as Shoe (3%), Headphone (5%) and PlayStation (9%) (see Fig. 6). It is clear that, for a product such as Shave Splash and Deodorant, participants indicated that the product colours associate with colour association; products such as Shoe and Trousers have no connection with these attributes.

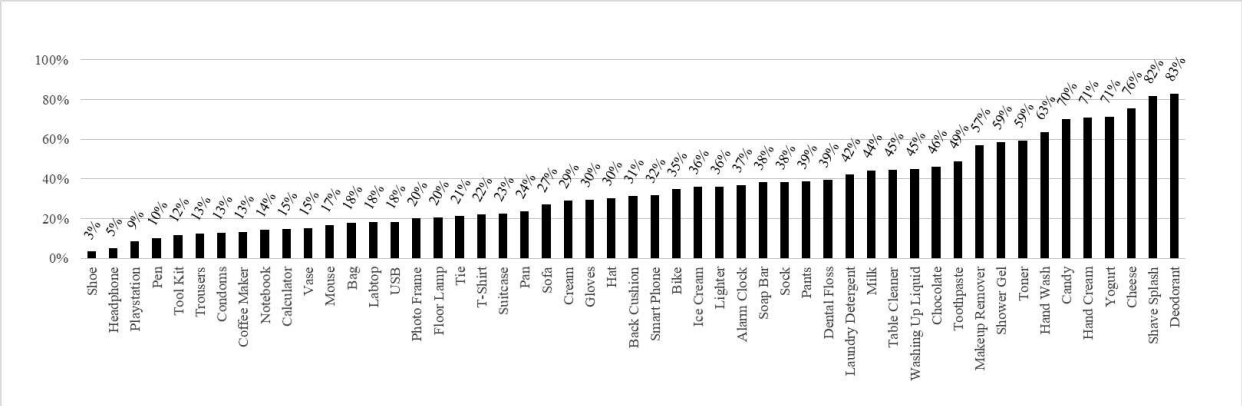

Fig.6 Product-colour association scores for the 51 products.

The critical question, however, is whether that product-colour association scores correlate with the product colour consistency rate for the product. If the conceptual framework is supported, the expectation that high product-colour association scores to be an association with low product colour consistency rate and vice versa. Fig. 7 shows the correlation of product-colour association scores with product colour consistency rate, (each filled diamond symbol represents one product). The coefficient of deamination (r^2) between product-colour association scores and product-colour consistency rate is 0.32.

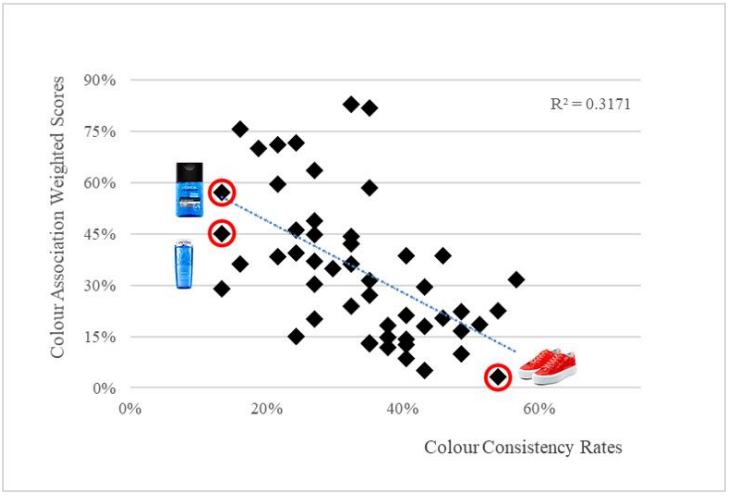

Fig. 7 The correlation of the colour association scores with the colour consistency rate. Each filled diamond symbol represents one product (selected products are identified using an icon).

DISCUSSION AND CONCLUSION

Colour is an important marketing tool for many products as consumers will often chose to purchase a product when it is presented with expected or preferential colours or colour schemes. From the authors' previous research, consumers' product-colour decisions are often connected with consumers' individual colour preference,[28, 31,10] expected function or performance depending on the type of products. Consumers' personal colour preference may be important but only in the absence of primary factors that will otherwise drive a product-colour purchase behaviour. However, for some products, neither colour preference or existing primary colour factors drives consumer product-colour decisions. Further work towards understanding the primary factors could be valuable information for professionals working in product design and/or marketing. One potential practical application of this work would be to use information about a general colour-association scheme or individual colour preference to make a tailored proposition; for example, to present a special advertisement for a toothbrush using the colour that is known to be a specific consumer's favourite colour, or a special offer for a green fence paint that is known to be associated with nature because this could increase the likelihood that the consumer would make a purchase (this might be especially true, given consumers are changing their shopping behaviours from in-store to online because of social media or even coronavirus).[9] On the other hand, this work would be used as a 'work to forecast' guidance for manufactures that 'product-colour prediction' forecasts efficiently the consumer demand which are the levels of consumption, if effective demand is achieved then there is no overproduction because all inventories are sold (also to reduce out-of-stocks delivery times and the waste of resources).[27]

In this study, the colour association factor has been introduced as a new primary factor to investigates whether consumers' colour association affects their purchase-decision intentions and to build the framework further. The data from the laboratory experiment suggests that participants are more likely to purchase a product-colour in their first favourite colour than their second to last favourite colour (see Fig. 4). However, the effect is much stronger for some products than for others and this was also found in previous studies.[28, 30, 31] The data from interviews shows that that for some of the products tested, participants are highly influenced by the colour association that they would purchase a product-colour on their one of the colour association than other colours. On average, about 35% of reasons from product-colour purchase decisions were connected with colour-patch associations. The updated conceptual framework suggests that colour association factor could be one of the product-colour decision primary factor that influence consumer product-purchase intentions in the absence of consumer personal colour preferences (see Fig. 1). It suggests a process by which it would be possible to predict in advance the products for understanding colour association/information might be important. The updated framework could be used as a predictor as well, especially when looking a multi-colour options product which the colour repents special associations/meanings, such as the flavoured-yoghurt. It is noted that this work was concerned with that aspect of colour known as hue. However, it is acknowledged that lightness and chroma may also be important for consumer purchase decisions. The work in this study is also limited in its selection of product categories and it is yet to be determined whether our conceptual framework can be applied more broadly. There is limited understanding how to predict a consumer's product-colour decision (in other words, the work is limited to understanding when primary colour factors drive consumers' product-colour decisions). It is clear that much more work is required in this field.

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