Journal of Sensory Studies

Journal of Sensory Studies ISSN 0887-8250

THE INFLUENCE OF THE COLOR OF THE CUP ON CONSUMERS' PERCEPTION OF A HOT BEVERAGE

BETINA PIQUERAS-FISZMAN[1,2,3] and CHARLES SPENCE[2]

[1]Department of Engineering Projects, Universitat Politècnica de València, Camino de Vera s/n. Valencia 46022, Spain
[2]Department of Experimental Psychology, University of Oxford, South Parks Road, Oxford, OX1 3UD, UK

[3]Corresponding author.
TEL: +34-669274990;
FAX: +34-963636301;
EMAIL: bepifis@upvnet.upv.es

Accepted for Publication July 20, 2012

doi:10.1111/j.1745-459X.2012.00397.x

ABSTRACT

Research has demonstrated that the physical attributes of the containers from which we eat and drink can influence our perception of various foods and beverages and the overall consumption experience. In the present study, we extended this line of research in order to investigate whether the consumer's perception of a hot beverage (namely hot chocolate) would be influenced by the color of the plastic vending cup from which it was served. To this end, 57 participants tasted four samples of hot chocolate from four cups of the same size but different color (red, orange, white and dark cream). The participants had to rate each sample of hot chocolate (two of which had been sweetened) on a number of sensory scales. The results revealed that orange (with a white interior) and dark-cream colored cups enhanced the chocolate flavor of the drink and consequently improved people's acceptance of the beverage. By contrast, sweetness and chocolate aroma were less influenced by the color of the cup, but the results still showed that the hot chocolate, when consumed from the dark-cream cup, was rated as sweeter and its aroma more intense.

PRACTICAL APPLICATIONS

These results are relevant to sensory scientists interested in how the brain integrates visual input (such as color), not only from the food itself, but also from the container, packaging or plateware from which it is being consumed. In addition, these results should hopefully help stimulate chefs, restaurateurs and those working in the food and beverage packaging sectors to think more carefully about the color of their plateware/packaging and its potential effects on their customers' perception of the taste/flavor of the products that they happen to be serving/delivering to market.

INTRODUCTION

The containers from which we eat and drink influence our perception of food and beverages and the overall consumption experience to a greater extent than most of us are consciously aware of (e.g., Lyman 1989; see Spence *et al.* 2012, for a recent review). Apart from functional reasons (e.g., the necessity of having a deep enough bowl to contain the soup that we happen to be eating, say), in many cases we prefer one container over the other, simply because the sensory attributes of the container somehow seem to enhance the consumption experience (see also Piqueras-Fiszman and Spence 2011, for a similar example from the world of cutlery). An anecdotal example of this can be the favorite mug from which so many of us prefer to drink our tea or coffee. Perhaps that drink, which is always prepared in more or less the same manner, does not *really* taste better from our preferred mug, but the mug itself simply improves our overall multisensory experience.

Relevant here is research from Krishna and Morrin (2008). They demonstrated that participants rated water samples as being significantly lower in quality when they

were allowed to touch or hold the flimsy plastic cup in which the water sample was served than when they were not. Such results highlight the impact that the haptic qualities of a container for drinking can exert on a consumer's quality appraisal and overall experience. In another recent study, this time reported by Schifferstein (2009), participants either had to evaluate empty cups made from different materials (all of them pinkish except for one which was transparent), or the experience of drinking hot tea or a chilled soft drink from these cups. For many of the attributes that were assessed, the results suggested that the drinking experience was related to the participants' experience of the cups. Interestingly, one of the attributes was sweetness; specifically, the drinks consumed from the pinkish cups were rated as tasting significantly sweeter than when exactly the same drink was evaluated from a transparent cup instead. Such results suggest that Schifferstein's participants may unconsciously have transferred the experience of the pinkness of the cups (or rather, their intuitions about pink foodstuffs being sweet) to their judgments of the drinks themselves. Note that Cheskin (1957) long ago observed that adding 15% more yellow color to the outside of a can of 7 Up resulted in consumers' becoming more aware of the lemony flavor of the drink. Meanwhile, Guéguen (2003) reported that people rated beverages served in blue-tinted glasses as significantly more thirst-quenching than when exactly the same drinks were presented in red, green or yellow glasses instead. Such findings have recently been extended by other researchers demonstrating that the color of the plate or bowl can also influence a consumer's perception of the food (from popcorn to strawberry mousse; see Harrar *et al.* 2011; Piqueras-Fiszman *et al.* 2012a; though see Yenket *et al.* 2007, for a null effect of color on the tactile perception of different fabrics).

However, in spite of the evidence concerning the effect of the color of the cups or containers on people's perception of foods and beverages, there is only limited research to date, most of which has been conducted in the domain of wine (see Spence 2011, for a review). This means that there are still a number of important questions that remain to be answered, such as, would a similar effect (of the color of the container) be observed for hot beverages? It could be argued that something hot in the mouth is simply more attention-capturing (cf. Zampini and Spence 2005), as there is a potential danger of burning/oral damage. As such, if the food itself (a hot beverage) is more demanding of a consumer's attention than a food served at room-temperature, it may be less likely that the color of the container will impact on their perception. However, on the other hand, there are also reasons to believe that the effect of the color of a vending cup (and perhaps specifically the color of the inside of the cup) will have more of an impact than the color of a plate, say, since one normally sees the inside surface of the cup up close when bringing the drink to one's mouth.

In the domain of hot beverages, suggestive evidence comes from Favre and November (1979). They offered 200 people a single type of coffee in four different jars (brown, red, blue and yellow). Seventy-three percent of the participants reported that the coffee served from the brown container was too strong, whereas 80% of women felt that the coffee served from the red receptacle had a richer, fuller aroma. The blue jar suggested to most a milder aroma and the coffee in the yellow container seemed to come from a weaker blend. The concept of sensation transference can be used to try and account for such effects (Spence and Piqueras-Fiszman 2012); be it the "cold" from the color of the cup or the "cheap" from the material properties of the cup (Spence and Piqueras-Fiszman 2011). Each time, the attribute – be it sensory, emotional or evaluative – appears to have been transferred from the cup to the consumer's evaluation of the drink itself (see Table 1 for a summary of findings published to date in this area).

It is certainly true that many brands use specific colors in order to symbolize the cacao concentration, or the milk content (e.g., red tends to be associated with sweetness, purple with softness, yellow/white with milk and black with a high concentration of cacao; see also Wheatley 1973; Garber *et al.* 2008). That said, the effect of these colors, present in packaging or on cups, on the flavor of the product has not been explored to date. Given the wide range of colors that are potentially available for disposable cups for hot drinks, such as chocolate, tea or coffee, the aim of the present study was therefore to investigate whether the color of plastic cups would influence the consumers' rating of the sweetness, bitterness, creaminess, flavor and aroma intensities, and/or liking of hot chocolate beverages.

MATERIALS AND METHODS

Participants

Fifty-seven volunteers took part in this study. The participants were attending a day-long sensory event, in which this tasting activity was included as a small part of the day's activities. No information about the specific aim of the study was provided to the participants prior to their activity. The volunteers ranged in age between 21 and 61 years ($M = 25.4$ years, $SD = 8.8$), and 31 were male. The procedures were explained to all participants in detail.

Stimuli

The stimuli consisted of plastic cups of the following colors: white, dark cream, reddish orange-and-white (with

TABLE 1. SUMMARY OF RESEARCH THAT HAS INVESTIGATED THE EFFECT OF THE RECEPTACLE OF A DRINK/FOOD IN THE PERCEPTION OF THE SENSORY CHARACTERISTICS OF THE DRINK/FOOD

Author(s) (year)	Receptacle	Product	Characteristics studied	Main findings
Cheskin (1957)	Can	7 Up	Color	Adding 15% more yellow to the outside of a green increased the perceived lemony flavor
Dichter (1964)	Packaging	Coffee	Color	The majority of respondents associated the brown packet with a strong flavored coffee, red with richness, blue with mildness/smoothness and yellow with an excessively mild flavor.
Favre and November (1979)	Jars	Coffee	Color	The coffee from the brown jar was rated as too strong, that from the red jar had a richer, fuller aroma, that from the blue jar a milder aroma and that from the yellow jar appeared to have come from a weaker blend.
Guéguen (2003)	Cups	Soft drink	Color	Drinks from "colder-colored" cups were judged as more thirst-quenching than those from warm colors
Krishna and Morrin (2008)	Cups	Water	Flimsiness (touch – not touch)	Touching the flimsy cup decreased the perceived quality of the water.
Schifferstein (2009)	Cups	Soft drink and tea	Materials (and color)	Drinks from cups were perceived similarly as the cups were perceived when empty.
Harrar *et al*. (2011)	Bowls	Popcorn	Color	The sweet popcorn, in addition to being sweet, was perceived as saltier when eaten out of a colored (as compared with a white) bowl, and vice versa for the salty popcorn.
Piqueras-Fiszman *et al*. (2012a)	Plates	Sweet strawberry mousse	Color (black and white)	When the mousse was served from a white plate, it was perceived as significantly more intense and sweeter. It was also liked more than when served from a black plate.

the outside orange and the interior white, though it will be referred as orange henceforth to simplify the description) and red, since those are among the most common colors found among cups available for dispensed (or vended) hot beverages (see Fig. 1). The different cups (different in terms of their inner color) were used to explore whether the inner or outer color would dominate in terms of any effects that could be observed. The cups were filled with 50 mL of either a sweetened or unsweetened chocolate drink. The chocolate drink was prepared according to the specifications of the brewing system used and insulated flasks were filled just prior to the experiment in order to maintain the drinks at the appropriate temperature. For the sweet condition, 50 g of sugar was added per 1.5 L of chocolate solution.

Procedure

Prior to the start of testing, the participants were given an information pack for the event, which included the relevant questionnaire for this study. The participants approached two tables in groups of 10–15, where 10–15 cups of each color were laid out, each containing approximately 50 mL of chocolate drink. The four stimulus samples were coded with a number for identification purposes. To avoid a possible sweetness–color bias in the responses, the tasting procedure followed a complete blocked experimental design, as shown in Fig. 2, in monadic sequence. The instructions were given to participants at the start of the experiment, as follows: "Please taste each of the drinks, in any order, and rate each one according to your own perception on the

FIG. 1. THE FOUR CUPS THAT WERE PRESENTED TO THE PARTICIPANTS IN THE PRESENT STUDY

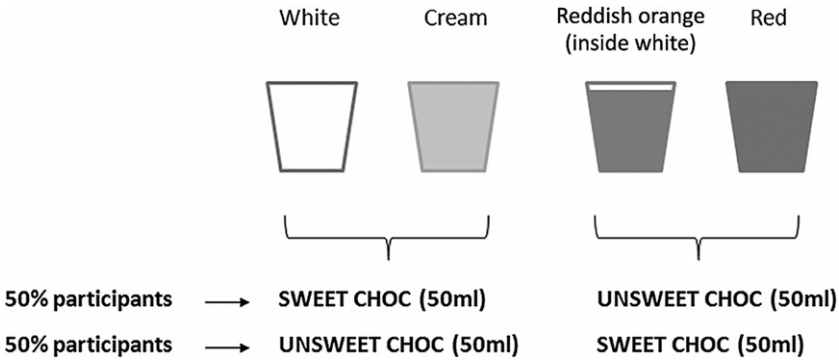

FIG. 2. DIAGRAM OF THE EXPERIMENTAL PROCEDURE FOLLOWED

following scales." The questionnaire included these written instructions as well. Ten-centimeter-long scales were used to rate the drink samples in terms of their sweetness, bitterness, chocolate flavor, chocolate aroma and creaminess (which were labeled at their anchors with "Extremely" and "Not at all"). To rate acceptability, the consumers had to score their overall liking using a 10-cm labeled affective magnitude scale (LAM; Schutz and Cardello 2001). The LAM scale ranged from "greatest imaginable dislike" to "greatest imaginable like," and had incremental units of appropriate distances and labels as described by Cardello and Schutz (2004).

The participants were also instructed to rinse their mouth out with filtered natural water between tastings. Once a participant had finished tasting each sample, she or he was instructed to empty the leftovers into a basin and deposit the cups in a recycling bin. Prior to the arrival of a group of participants at the testing table, new cups were prepared with chocolate drinks from four different flasks (two pairs containing the same) previously stirred. Although the participants did not appear to be paying any attention to the serving process, this procedure was designed to avoid the "curious" participant from gaining the impression that certain of the contents of the vending cups may have been the same.

Data Analysis

A repeated measures analysis of variance (ANOVA) was performed on the data in order to determine the effect of the color of the cup, if any, on the participants' perception of the various attributes that were being assessed. The color of the cups and the type of drink, together with their interaction, and the participant effect were considered as explanatory variables. Significant differences were calculated using Tukey's test. Differences were considered significant when $P \leq 0.05$. All statistical analyses were performed using XLStat 2010 (Addinsoft, NY, USA).

RESULTS

Liking

The color of the cup exerted a significant impact on participants' liking of the hot beverage ($P < 0.01$). The fact that there was no interaction with drink type implies that the effect was similar for both the sweetened and unsweetened beverages (see Fig. 3A). The chocolate drink served in the red cup was significantly more liked ($P < 0.01$) than when the hot beverage was served in the white cup (M = 4.6 versus 3.3, respectively).

Chocolate Flavor

The color of the cup also exerted a significant effect on participants' ratings of the chocolate flavor of the hot beverage ($P < 0.05$). There was, however, no interaction with the type of drink. This means that the effect of cup color was similar regardless of whether the participants were drinking the sweetened or unsweetened hot chocolate samples. The intensity of the chocolate flavor was rated as being significantly ($P < 0.05$) more intense when the hot beverage was served from the orange cup than when it was served from the red cup and white cup (M = 5.4 versus 4.6 and 4.6, respectively; see Fig. 3B).

Chocolate Aroma

As for the chocolate aroma ratings, the color of the cup did not exert a significant effect on the perception of sweetness ($P = 0.118$), nor was there any interaction with drink type. Nevertheless, it is still interesting to note that a similar pattern of results to those obtained for the perception of sweetness was observed. The chocolate aroma from the cream-colored cups was perceived as being more intense than from the red cups (at marginal levels, $P = 0.07$, M = 4.6 versus 3.7; see Fig. 3C).

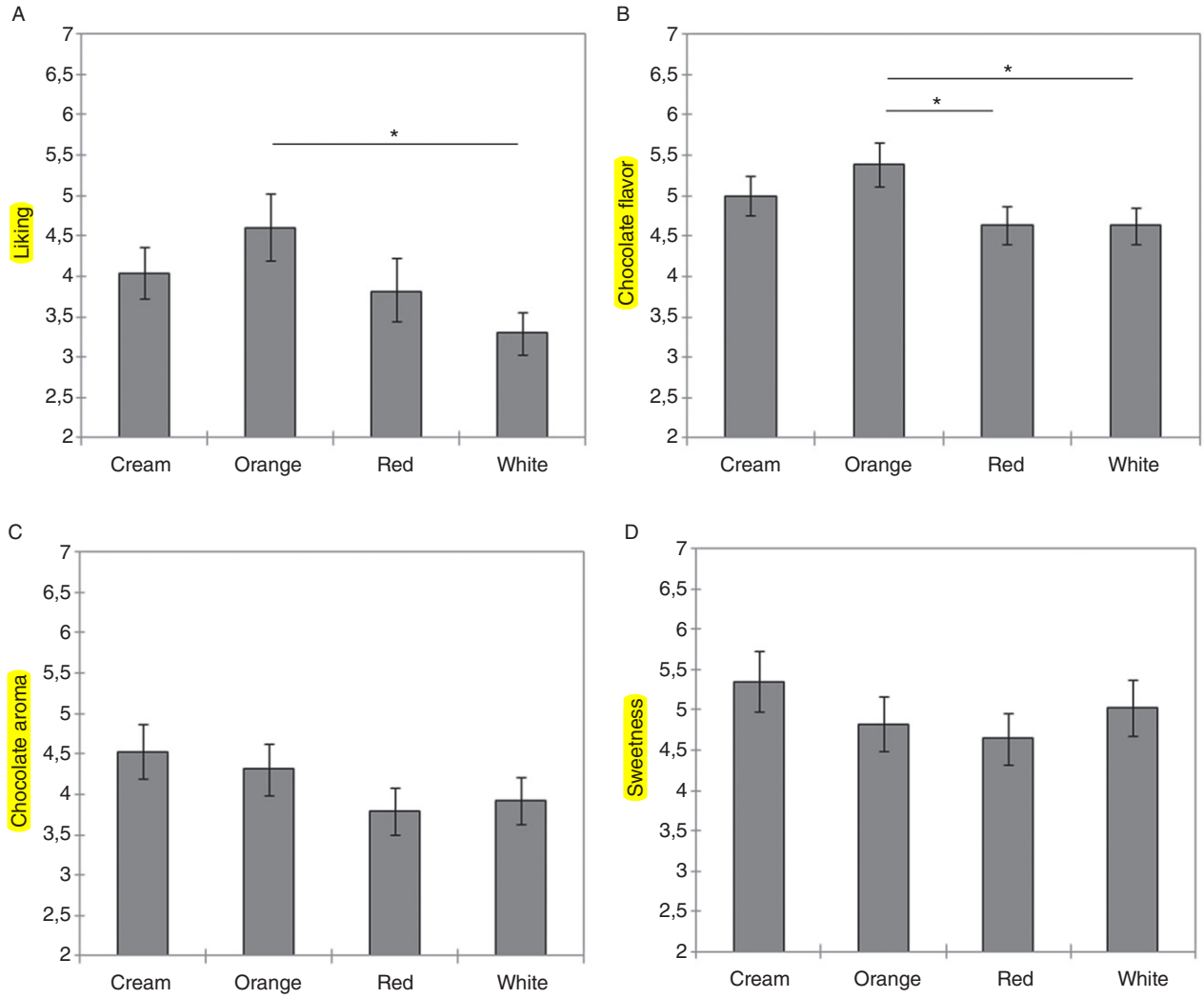

FIG. 3. MEAN RATINGS IN A 10-CM SCALE, AS A FUNCTION OF THE COLOR OF THE CUP AND THE TYPE OF DRINK. (A) LIKING (ON A LAMS); (B) CHOCOLATE FLAVOR; (C) CHOCOLATE AROMA; AND (D) SWEETNESS. ERROR BARS REPRESENT STANDARD ERRORS. *TUKEY'S SIGNIFICANT DIFFERENCES AT $P < 0.05$

Sweetness

The ANOVA revealed that the color of the cup did not exert either a significant effect on participants' perception of the sweetness of the hot beverage ($P = 0.176$), nor did the color of the cup interact with the type of drink that was being tasted. However, when consumed from the dark-cream cup, the drinks were rated as tasting slightly sweeter, followed closely by the white cup, with the lowest sweetness ratings being observed when the hot chocolate was served from the cups that were red (Fig. 3D). This subtle pattern was observed for both levels of sweetness (no interaction effects were observed).

No significant effects were found for either creaminess, or bitterness ratings, and hence these will not be discussed further here.

DISCUSSION

Crossmodal associations between colors and tastes (and flavors), particularly the associations between redness and sweetness and greenness and sourness appear to be well-established (Maga 1974; Johnson and Clydesdale 1982; Roth *et al.* 1988; Clydesdale *et al.* 1992; Wei *et al.* 2012; see Spence *et al.* 2010, for a review). However, many of the crossmodal associations that we have internalized can perhaps be linked to the natural ripening process of certain fruits, and the simultaneous correlated change in taste (from sour to sweet) and color (often from green to red; Maga 1974). On the other hand, other color–flavor associations we likely pick up from the supermarket (e.g., see Garber *et al.* 2008; Shankar *et al.* 2010). However, even when any one of these colors is applied to nonfruit-related products (e.g., to the

packaging of a food product), consumers possibly recall that learned association and tend to apply it (as in Schifferstein's 2009 study; see also Cheskin 1957; Garber *et al.* 2008).

Of course, regarding chocolate, the darker the brown of the packaging, the higher the cocoa content ("stronger") we expect the product to be; and the lighter the brown, the higher the milk content or the creamier (cf. Duncker 1939; Tom *et al.* 1987). Given these reasonably well-established associations, one might have thought that the chocolate drinks would be rated as tasting sweeter from the red cups, but instead, the cream-colored cup, rather than the red ones, enhanced the sweetness of the drinks. In fact, contrary to our expectations, the red-orange cups actually gave rise to the lowest sweetness ratings. Another unexpected result to emerge from the present study was that the cream-colored cup did not enhance ratings of the creaminess of the hot beverage.

Where the orange cup (with the white interior) did give rise to higher ratings was in terms of the chocolate flavor and liking ratings, the dark-cream cup came a close second. Possible reasons for the variations between the ratings of the completely red cup and the completely white one remain unclear. What is evident, though, is that the participants liked the contents more when consumed from the orange (with white interior) cup and from the dark-cream one than from the other two cups, with the white one being liked least. This latter result could perhaps be explained in terms of the fact that white cups are more common, hence the experience is not in any sense unusual.

A possible explanation for the observed results, that did not meet our expectations, is that despite the fact that certain colors are associated with specific sensory product characteristics due to the consumer's previous knowledge (i.e., redness being paired with sweetness), when it comes to consuming a product from another category (not fruit, but a hot chocolate beverage) from a colored container, those associations do not necessarily hold true. Based on the results reported here, it might be the case that for chocolate drinks, a dark-cream colored cup/mug would enhance the perception of sweetness, while an orange one would intensify its flavor, consequently being more liked. Of course, one must also allow for the possibility that any effects of color might be driven by a consumer's familiarity with a certain brand, should it be associated with a particular color (cup), say. Relevant here is the fact that different vending companies tend to use different colored cups/sachets for their chocolate range. Unfortunately, brown or black cups were not available in the same shape for possible evaluation in the present study; it would certainly be of interest to explore their influence on the perception of chocolate flavor/aroma in future research. That said, and with particular reference to the perception of hot chocolate beverages, it is worth noting that people rate chocolate products as tasting "more chocolatey" when they are colored brown rather than another color (see Duncker 1939; Tom *et al.* 1987; Shankar *et al.* 2009).

Would the same hold true if the coloring of the chocolate/coffee sachet were to be manipulated in a similar manner (cf. Garber *et al.* 2008)? Only future research will tell. Of course, one needs to be careful here, given that while some color associations stay constant over the years (not to mention decades), others may be much more short-lived, and change in accordance with changes in fashion and the marketplace (e.g., Walford 1980; Downham and Collins 2000). Hence, it is important to be clear that the crossmodal color conclusions drawn by researchers in previous years/decades need not necessarily hold true of today's marketplace. What is more, there are also likely to be a number of important cross-cultural variations that need to be borne in mind (e.g., see Wheatley 1973; Jacobs *et al.* 1991; Piqueras-Fiszman *et al.* 2012b).

CONCLUSIONS

The results of the present study demonstrate for the first time that the color of the cup can influence sensory-discriminative and hedonic (liking) evaluations of a familiar hot drink, namely hot chocolate. As such, these results back up previous results in this area that have demonstrated such effects with a variety of food and beverage items (see Table 1 for a summary of findings). However, now that such crossmodal effects of plateware/packaging color on the sensory-discriminative and hedonic responses to the taste/flavor of food and beverage products have been robustly shown (i.e., demonstrated across a number of studies, by a number of labs, using a number of different foodstuffs), the more challenging theoretical question becomes one of explaining why such crossmodal effects occur. Furthermore, if, as seems increasingly likely, the effect of a given plate/bowl/cup color depends, at least to some degree, on the particular foodstuff that happens to be under experimental consideration, then, one might wonder whether that constrains the explanation of the underlying crossmodal effect. It certainly means that any producer will probably need to conduct the colored cup, plate, bowl experiment with their own product rather that necessarily relying on the results of prior research with other participants of another age group. It would be interesting in future research to conduct a study in which multiple different food/drink products (e.g., having different colors) are served off of same range of containers in order to see how generalizable the effects are (and to more fully evaluate what role color contrast may play in any effects observed).

In addition, the influence of the presence of certain colors on consumers' judgments of food or drinks is apparently

not applicable to all cases, since, Beckman *et al*. (1984) demonstrated, for instance, that color as a means for product coding produced little or no bias when used in paired preference tests. Although theoretical explanations for the fact that the color of the plate/bowl/cup can sometimes impact on taste/flavor perception have not been fully developed yet (see Spence *et al*. 2012), the present results will nevertheless hopefully stimulate not only sensory scientists, but also innovative chefs and restaurateurs (and those working in the packaging sector) to think a little more carefully about the color of their plateware/packaging and its potential effects on their consumers' perception of the taste/flavor of the dishes that they happen to be serving.

ACKNOWLEDGMENT

Thanks to the Ministerio de Educación (Spain) for the FPU scholarship awarded to B. P-F.

REFERENCES

BECKMAN, K.J., IV, E.C. and GNAGI, M.M. 1984. Color codes for paired preference and hedonic testing. J. Food Sci. *49*, 1115–1116.

CARDELLO, A.V. and SCHUTZ, H.G. 2004. Research note. Numerical scale-point locations for constructing the LAM (labeled affective magnitude) scale. J. Sensory Studies *19*, 341–346.

CHESKIN, L. 1957. *How to Predict What People Will Buy*, Liveright, New York, NY.

CLYDESDALE, F.M., GOVER, R., PHILIPSEN, D.H. and FUGARDI, C. 1992. The effect of color on thirst quenching, sweetness, acceptability and flavor intensity in fruit punch flavored beverages. J. Food Qual. *15*, 19–38.

DICHTER, E. 1964. *Handbook of Consumer Motivation*, McGraw-Hill, New York, NY.

DOWNHAM, A. and COLLINS, P. 2000. Coloring our foods in the last and next millennium. Int. J. Food Sci. Technol. *35*, 5–22.

DUNCKER, K. 1939. The influence of past experience upon perceptual properties. Am. J. Psychol. *52*, 255–265.

FAVRE, J.P. and NOVEMBER, A. 1979. *Color and Communication*, ABC-Verlag, Zurich.

GARBER, L.L. Jr., HYATT, E.M. and BOYA, Ü.Ö. 2008. The mediating effects of the appearance of nondurable consumer goods and their packaging on consumer behavior. In *Product Experience* (H.N.J. Schifferstein and P. Hekkert, eds.) pp. 581–602, Elsevier, London.

GUÉGUEN, N. 2003. The effect of glass color on the evaluation of a beverage's thirst-quenching quality. Current Psychol. Lett. Brain Behav. Cogn. *11*(2), 1–6.

HARRAR, V., PIQUERAS-FISZMAN, B. and SPENCE, C. 2011. There's no taste in a white bowl. Perception *40*, 880–892.

JACOBS, L., KEOWN, C., WORTHLEY, R. and GHYMN, K.I. 1991. Cross-cultural color comparisons: Global marketers beware! Int. Market. Rev. *8*(3), 21–31.

JOHNSON, J. and CLYDESDALE, F.M. 1982. Perceived sweetness and redness in colored sucrose solutions. J. Food Sci. *47*, 747–752.

KRISHNA, A. and MORRIN, M. 2008. Does touch affect taste? The perceptual transfer of product container haptic cues. J. Consumer Res. *34*, 807–818.

LYMAN, B. 1989. *A Psychology of Food, More Than a Matter of Taste*, Avi, van Nostrand Reinhold, New York, NY.

MAGA, J.A. 1974. Influence of color on taste thresholds. Chem. Senses *1*, 115–119.

PIQUERAS-FISZMAN, B., HARRAR, V., ALCAIDE, J. and SPENCE, C. 2012a. Is it the plate or is it the food? Assessing the influence of the color (black or white) and shape of the plate on the perception of the food placed on it. Food Qual. Prefer. *24*, 205–208.

PIQUERAS-FISZMAN, B., VELASCO, C. and SPENCE, C. 2012b. Exploring implicit and explicit crossmodal color-flavor correspondences in product packaging. Food Qual. Prefer. *25*, 148–155.

PIQUERAS-FISZMAN, B. and SPENCE, C. 2011. Do the material properties of cutlery affect the perception of the food you eat? An exploratory study. J. Sensory Studies *26*, 358–362.

ROTH, H.A., RADLE, L.J., GIFFORD, S.R. and CLYDESDALE, F.M. 1988. Psychophysical relationships between perceived sweetness and color in lemon- and lime flavored drinks. J. Food Sci. *53*, 1116–1119.

SCHIFFERSTEIN, H.N.J. 2009. The drinking experience: Cup or content? Food Qual. Prefer. *20*, 268–276.

SCHUTZ, H.G. and CARDELLO, A.V. 2001. A labeled affective magnitude (LAM) scale for assessing food liking/disliking. J. Sensory Studies *16*, 117–159.

SHANKAR, M., LEVITAN, C., PRESCOTT, J. and SPENCE, C. 2009. The influence of color and label on the perceptions of flavor. Chemosens. Percept. *2*, 53–58.

SHANKAR, M.U., LEVITAN, C.A. and SPENCE, C. 2010. Grape expectations: The role of cognitive influences in color–flavor interactions. Conscious. Cogn. *19*, 380–390.

SPENCE, C. 2011. Crystal clear or gobbletigook? World Fine Wine *33*, 96–101.

SPENCE, C. and PIQUERAS-FISZMAN, B. 2011. Multisensory design: Weight and multisensory product perception. *Proceedings of RightWeight 2* (pp. 8–18).

SPENCE, C. and PIQUERAS-FISZMAN, B. 2012. The multisensory packaging of beverages. In *Food Packaging: Procedures, Management and Trends* (M.G. Kontominas, ed.) (in press), Nova Publishers, Hauppauge, NY.

SPENCE, C., LEVITAN, C., SHANKAR, M.U. and ZAMPINI, M. 2010. Does food color influence taste and flavor perception in humans? Chemosens. Percept. *3*, 68–84.

SPENCE, C., HARRAR, V. and PIQUERAS-FISZMAN, B. 2012. Assessing the impact of the tableware and other contextual variables on multisensory flavor perception. Flavour *1*, 7.

TOM, G., BARNETT, T., LEW, W. and SELMANTS, J. 1987. Cueing the consumer: The role of salient cues in consumer perception. J. Consum. Market. *4*(2), 23–27.

WALFORD, J. 1980. Historical development of food coloration. In *Developments in Food Colors* (J. Walford, ed.) pp. 1–26, Applied Science, London.

WEI, S.-T., OU, L.-C., LUO, M.R. and HUTCHINGS, J.B. 2012. Optimisation of food expectations using product color and appearance. Food Qual. Prefer. *23*, 49–62.

WHEATLEY, J. 1973. Putting color into marketing. Marketing *October*, 24–29, 67.

YENKET, R., CHAMBERS, E. and GATEWOOD, B.M. 2007. Color has little effect on perception of fabric handfeel tactile properties in cotton fabrics. J. Sensory Studies *22*, 336–352.

ZAMPINI, M. and SPENCE, C. 2005. Modifying the multisensory perception of a carbonated beverage using auditory cues. Food Qual. Prefer. *16*, 632–641.