Color Association to Emotions of Chinese and Thai University Students

Noppon Choosri*, Nilawan Laolee, Nitchanun Wannayot and Pathomsakul Supamanee

College of Arts, Media, and Technology, Chiang Mai University, Chiang Mai, 50200, Thailand

***Corresponding author's e-mail: noppon.c@cmu.ac.th**

Received: *July 9, 2022* ***Revised:*** *December 14, 2022* ***Accepted:*** *January 11, 2023*

Abstract

Color association with emotions is culturally universal. The primary objective of this study is to identify cultural differences in color-emotion associations in two study groups that have received limited research attention: Thai and Chinese university students. The study used a questionnaire to collect data, then applied quantitative data analysis to address how colors are used to represent specific emotions in each respondent group. The study also investigated whether color association with emotions in those two study groups is significantly different. The findings suggest that some colors have a very strong association to one culture such as 100% of Thai respondents used red to represent anger. The chi square test revealed a cross-cultural effect in color association. The color association in emotions that the two cultures studied differ significantly is red for anger. Purple for fear, green and white for happiness and black for sadness.

Keywords: Color association, Color- emotion, Color stereotypes, Cross- culture, Color in culture

Introduction

Color is perceived, because the human eye can detect visible light and the eye de-codes different wavelengths of light to different colors (Grzybowski & Kupidura-Majewski, 2019). The significant impact of color to human perceptions is seen by the fact that color exposure is used in medical therapies known as chromotherapy (Jonauskaite et al., 2020). Also, color can play a stimuli role to trigger other perceptual experiences (Eagleman & Goodale, 2009), which is known as the synesthesia phenomenon. This phenomenon interestingly reminds one of a place, a time of year, or a favorite tradition (Grzybowski & Kupidura-Majewski, 2019). Visual aesthetics is considered to be one of the most important factors of user satisfaction in website design (Seckler et al., 2015).

Color conveys meaning and communicates human perception, so one of the most common functionalities of color is to symbolize or embed the meanings in a visual communication design. However, several studies from literature reviews indicate that there is no unified global color association, and one of the factors that affects how people give the meaning of colors is a cultural factor. The unique feature of how a specific culture has a sense of a specific color has been reported. For example, in British folklore, green can signify bad luck (Hutchings, 2004), while in traditional Chinese life, yellow was considered to be a social symbol for rich and majestic, with red being symbolic of blood and worship to the sun and fire of the ancients (Fang & Tong, 2015). In contrast, red is associated with perceptions of higher social status in both the United Kingdom and China (Wu et al., 2018).

In the food business, Jantathai et al. (2014) evaluated the impact of color expectation of Thai desserts between Australian and Thai respondents. It was found that Australians generally expect dessert to be in yellow color, but Thais preferred the same dessert in green and pink. Also, the impact of color on product image has been investigated. For example, Wang et al. (2020) found color imagery generates more effective customer satisfaction in taste-focused products, while black and white imagery generates more effective outcomes in health-focused products. In a fashion store, a combination intervention of color and light had significant impacts on price fairness to customers' perception (Babin et al., 2003). Jacquot et al. (2016) focused on a study of color-odor association in British and French cultures on how each culture symbolize color to specific different odors such as caramel, peppermint, and mint chlorophyll.

In the domain of UX/UI design, it has been discovered that users only spend their first 50 milliseconds to decide the first impression of the web design (Lindgaard et al., 2006). Color obviously plays an important role for that verdict. Some research found that preference of color in digital interfaces is also associated with the culture of users. Multicultural analysis from a large user dataset by the researcher of this study focuses on colorfulness and visual complexity. It was discovered that the level of colorfulness and visual complexity at which visual appeal is greatest varies greatly (Reinecke & Gajos, 2014). Ruse et al. (2019) conducted an in-depth analysis of web design in local Swedish and Thai websites and found many differences in designs such as common hue combination, hue contrast combination and dominant hue in monochromatic color combination. In the industrial symbolic domain, the study of Chan and Courtney, (2001) also illustrated the difference of color association to several common industrial terminology among Hong Kong, Yunnan Chinese, and US subjects.

The aforementioned empirical research gives evidence of variances in color association across domains. Cultural variables are among the most important factors that contribute significantly to this. In this research, two study groups that have received limited research attention namely Thai and Chinese university students are focused. The goal of this study is to examine how two distinct cultures, Thai and Chinese, correlate colors with various emotions. Therefore, designers who must deal with multicultural design or who are designing products/interfaces for Thai and Chinese users should have additional information to select a color that conveys the intended message, mood, and tone more effectively.

The contribution of this research is twofold. First of all, the research initially gave survey evidence of color association to basic emotion in Thai and Chinese university students. Second, the research provides a cross culture analysis to identify which color and emotional association differ significantly between these two cultures.

Literature review

For this research, a literature survey was conducted to identify current knowledge and evidence of how both Thai and Chinese cultures associate color to particular emotions.

Association in Chinese culture

In Jacob et al. (1991) A color association in a set of marketing domain terms from various countries was investigated. Chinese was one of the focused research populations alongside the other country populations including: Korea, Japan, and the US. The study found Chinese has a stronger association (more than 30% of population) with some marketing terms which are: grey for government buildings, green for school and brown for restaurant.

The associations of color stereotypes of Chinese to some industrial concepts were studied in Courtney (1986); Chan and Courtney (2001). The former focused the study on Yunnan Chinese and the latter repeated a similar re-search procedure to the Hong Kong Chinese population. It was found that both Chinese groups share a similar color association notion for the words "stop" and "danger" when it comes to the color red. Green signifies "go," "safe," and "on". However, there is less consensus of color representation in many concepts. Yellow represents caution for Yunnan Chinese , but red for Hong Kong Chinese. 'Hot' is represented by "red" in Yunnan, but orange in Hong Kong Chinese. Cold is represented by white for Yunnan Chinese, but blue for Hong Kong Chinese, and finally off is represented by black for Yunnan Chinese, but white for Hong Kong Chinese.

Ng and Chan (2018) investigated color associations to determine if there are differences in designers' and non-designers' perceptions of common warnings and industrial activities that are normally communicated using abstract language. The study found that the abstractions of "red-danger," "red-fire," and "red-hot" were strikingly similar. In contrast, "escape," "increase," "potential hazard," "fatal," and "normal" are examples of abstraction terms that were color-coded differently by both groups in that study.

Color association in Thai culture

One of the most common color associations in Thailand is for different colors to represent each day of the week, as follows Sunday is red, Monday is yellow, Tuesday is pink, Wednesday is green, Thursday is orange, Friday is blue, and Saturday is purple. It has been suggested that the association is rooted from the colors of the clothing of one of the Hindu gods who protects the day (Tien-Rein Lee, 2013).

It has been noticed that the majority of studies relating to color association in Thai subjects usually focus on understanding and seeking out design solutions for specific purposes. For example, Leekitvatana (2017) evaluated the effects of workplace interior color on the

moods of Thai workers and discovered that red, orange, and yellow rooms were associated with negative emotions, including anger, confusion, and tension. In the meanwhile, Thai workers favor working in beige rooms. A similar study conducted by Savavibool (2020) found that a purple-blue space working environment creates a feeling of calmness, while red can incur the feeling of stimulation to Thai participants in that study

In restaurant and hotel coloring, relaxing emotions is the primary expectation for Thai guests, and white the most preferable color to induce those feelings (Amorntatkul & Pahome, 2011) With the attention seeking design color encouraging more food order in food delivery Apps, Satcharoen (2017) revealed that orange, red, yellow, and blue were connected with food appetite. Orange, red, and yellow, and blue were also shown to be associated with food cravings

On a note of clarification with regard to color association for Thai people. In Obeng et al., (2018) purple is a color of mourning in Thailand. The Thai authors of this paper can affirm that black is the traditional dress code at a Thai funeral.

Methodology

An online survey was sent to participants. The questionnaires were distributed to two groups: one group was Chinese students; the other group was Thai student. There were 30 participants in each group generating a total of 60 responses. Participants' ages ranged from 20 to 25, and gender information was optional.

The main section of the questionnaire contains two sets of information: the first is a ribbon of eight colors for the selection reference, as illustrated in Fig. 1: red, yellow, blue, orange, green, purple, and black and white. The respondents were requested to identify a color that might be associated to their feelings, namely anger, disgust, fear, happiness, sad-ness, and surprise into a matrix of association. The mapping is open-ended so that participants can assign multiple colors to a single emotion. This is done with the goal of obtaining feedback that most accurately describes user opinion without requiring a selection of color that is "closest" to the emotion association. Similarly, the same color can represent more than one emotion. If respondents do not have any associations with the specified colors or feelings, they can select nothing.

The collected data is statistically analyzed using the SPSS version 22.0. The Chi-square test is the primary method for determining whether or not there is a relationship between categorical variables, such as cultural factor and color and emotion pair.

Results

The color- emotion association for Thai and Chinese of 8 colors and 6 emotions including the choice of 'no selection' is shown in Table 1. Respondents were free to select multiple colors that they associated from the given list of emotions. In addition, they could skip assigning color to an emotion, especially where they think that the weight of association is not very strong. We normalized the selection to the percentage scale (100 scale). However, a response of 'no association' is defined as a kind of association; so, it is counted as an option "no association". The bold indicates the highest color-association by participants.

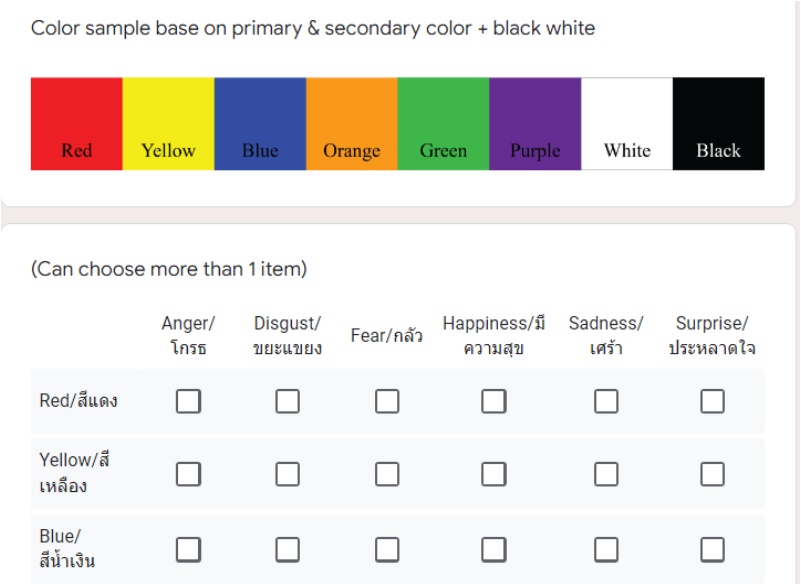

Figure 1 A snippet of the online form of this research

Table 1 the color association for all options available

Emotion: Color	**Red**	**Yellow**	**Blue**	**Orange**	**Green**	**Purple**	**White**	**Black**	**N/A**
Anger (TH)	**30(70%)**	1(2%)	0(0%)	9(21%)	0(0%)	1(2%)	0(0%)	2(5%)	0(0%)
Anger (CH)	**20(57%)**	0(0%)	2(6%)	2(6%)	0(0%)	1(3%)	2(6%)	4(11%)	4(11%)
Disgusted (TH)	0(0%)	7(18%)	1(3%)	2(5%)	8(21%)	7(18%)	0(0%)	4(10%)	**10(26%)**
Disgusted (CH)	2(5%)	6(15%)	2(5%)	1(2%)	6(15%)	7(17%)	2(5%)	7(17%)	**8(20%)**
Fear (TH)	2(4%)	2(4%)	7(13%)	2(4%)	0(0%)	**19(34%)**	2(4%)	**19(34%)**	3(5%)
Fear (CH)	5(8%)	6(10%)	8(13%)	1(2%)	2(3%)	**10(16%)**	9(14%)	15(2%)	7(11%)
Happiness (TH)	2(3%)	14(18%)	7(9%)	10(13%)	22**(29%)**	0(0%)	20(26%)	(3%)	0(0%)
Happiness (CH)	6(8%)	14(19%)	6 (8%)	17**(23%)**	14(19%)	5(7%)	8(11%)	2(3%)	3(4%)
Sadness (TH)	0(0%)	0(0%)	14(24%)	2(3%)	1(2%)	13(22%)	2(3%)	**20(34%)**	6(10%)
Sadness (CH)	0(0%)	0(0%)	**13(25%)**	1(2%)	3(6%)	7(14%)	9(18%)	7(14%)	11(22%)
Surprise (TH)	4(8%)	**12(24%)**	5(10%)	10(20%)	2(4%)	8(16%)	2(4%)	3(6 %)	5(10%)
Surprise (CH)	8(19%)	7(17%)	1(2%)	**13(31%)**	2(5%)	5(12%)	2(5%)	2(5%)	2(5%)

In Table 1, red shows the strongest association with anger for both Chinese and Thai respondents. ‘Disgust’ is not associated with any color by both groups. Purple and black have a stronger association with fear than other colors for Thais, whereas Chinese only associate

fear with purple. Happiness for Thai respondents is green, and orange for Chinese. Sadness is best visualized in black for the Thai group, but it is best visualized in blue for the Chinese group. Respondent. Finally, 'surprise' is most frequently associated with yellow among the Thai respondents but orange among the Chinese respondents.

When excluding cases in which respondents did not justify any association between color and emotion from the analysis, the results indicate which color a respondent considers to be the best option to associate with a particular emotion. In this aspect, the applied analyses reveal the proportion of individuals who associate a particular color with a particular emotion in a binary fashion (Yes or No association). The visual representation of the research is useful for designers who use a design approach that focuses on the user, such as User Centered Design (UCD).In this research, if the weight of the association is greater than 20% (one-fifth) of the group, the association using the results from Table 1 is counted. The colors that are best associated with a specific emotion for Thai and Chinese respondents are shown in Table 2.

Table 2 The best choice of color association for Thai and Chinese

Emotion	Thai	Chinese
Anger	Red (100%) Orange (30%)	Red (66.67%)
Disgusted	Green (26.67 %), Yellow (23.33%), Purple (23.33%)	Purple (23.33 %), Black (23.33%)
Fear	Purple (63.33%), Black (63.33%)	Black (33.33%)
Happiness	Green (73.33%), white (66.67%)	Orange (56.67%)
Sadness	Black (66.67%), Blue (46.67%)	Blue (43.33%)
Surprised	Yellow (40%), Orange (33.33%)	Orange (43.33%)

All Thai respondents associated 'anger' with red, with a high percentage of association for Chinese. For disgust' green, yellow, and purple can be stereotyped in this feeling in Thai, but purple and black are the two closest colors for Chinese. Purple and Black, on the other hand, share quite a strong association of fear for Thais, while black is the only color that is closely related to this feeling to Chinese. 'Happiness' is relatively strongly associated to green and white for Thais, but it is orange for Chinese. 'Sadness' has a strong association to black, while blue is the second most frequently chosen color for this feeling. Blue is the only color associated with sadness for Chinese. Lastly, 'surprise' is associated with yellow and orange by Thais, but for the Chinese, it is only associated with orange.

The findings of Table 2 are analyzed further to determine if there is a significant difference between two cultural groups in the representation of color to emotions. Table 3 dis-plays the results of applying the Chi-square test to the top percentage of color association among Thai and Chinese respondents. Red is the color association for 'anger', where the two groups differ significantly. The colors that demonstrate the greatest effect of cultural fac-tors are purple for 'fear,' green and white for 'happiness,' and black for 'sadness.'

Table 3 The significance of difference in color association

Emotion	Color	Proportion (selection: non selection)		P-value
		Thai	**Chinese**	
Anger	Red	30:0	20:10	0.001
Disgusted	No significance	-	-	-
Fear	Purple	19:11	10:20	0.020
Happiness	Green	22:8	14:16	0.350
	White	20:10	8:22	0.020
Sadness	black	20:10	7:23	0.001
Surprised	No significance	-	-	-

Discussion

From table 1, it can be seen that the strengths of color association of many colors are not very strong in both cultures. The distribution of the percentage to several colors to the same emotion indicates that participants have a variation of stereotypes. The N/A column indicated that some participants feel that there is no relationship between specific color to specific emotion. The result also shows that a disgusted feeling is less obvious for the association. However, disgust has shown stronger association with yellow-green or green color in US colleges from the previous study as it may be reminiscent of vomit color (Naz & Epps, 2004).

Examining Table 2 reveals that two cultures have some color-emotion connections. With the exception of happiness, two civilizations have at least one color associated with the same emotion in almost all instances. However, if a strong color association is defined as more than fifty percent (50%) of the population associating a color with an emotion, then Thai participants appear to be more prejudiced in their color associations with emotions, as they exhibit a greater number of color associations. Red is strongly associated with anger in the Thai group, while purple and black are strongly associated with fear, green and white with happiness, and black with melancholy. In contrast, only two colors have strong associations in Chinese group: red for anger and orange for happiness.

Despite the fact that the statistical analysis revealed a cross-cultural difference between Thai and Chinese participants, some parts of the results suggested that both cultural groups share a particular association pattern with or connection to other cultures in previous studies.. For example, happiness for Thai university students is green, similar to the findings of a study in a comparable age group in the United States, which discovered that green is related with relaxation because it invokes the idea of being in nature (Naz & Epps, 2004). Meanwhile, happiness in the Chinese group is orange, which is closely related to a similar sensation of enthusiasm and fun discovered in the Turkish group in Demir's (2020) study. In addition. Thai people, like many Westerners, traditionally wear black to funerals, but the Chinese, like those in Korea and Japan, follow the custom of wearing white (Casas & Chinoperekweyi, 2019).

Conclusions and future work

Color association is culturally dependent. Although there has been extensive research into how different cultures associate color in different cultures, little is known about Chinese and Thai perceptions in this regard. While existing research in these two groups has focused on color association in a specific application, this research explores general perceptions of each color stereotype for both target groups. It was found that there are only three patterns that Chinese and Thai students concur, which are red for 'anger', and purple for 'fear' and 'disgust'. The results from the cross-cultural analysis of Chinese and Thai students, also indicate that there are several pairs of color association, which show a significant difference. These are red for 'anger', purple for fear, happiness for green, happiness for white, and sadness for black.

There are many potential research directions that could strengthen the findings of this research. For example, research examines color association in a wider range of ages in these two populations. Research could also increase the number of participants. Future research can facilitate the shedding of light on why people from these two cultures associate their feelings to certain colors. This would also require more qualitative data collection and analysis methods to address these in-depth questions.

References

Amorntatkul, N., & Pahome, T. (2011). How sensory marketing applies to the hotel and restaurant industry in order to influence customer's behaviour in Thailand (Master Thesis). Sweden: Maladalens University.

Babin, B. J., Hardesty, D. M., & Suter, T. A. (2003). Color and shopping intentions: The intervening effect of price fairness and perceived affect. *Journal of Business Research, 56*(7), 541-55.

Casas, M. C., & Chinoperekweyi, J. (2019). Color Psychology and Its Influence on Consumer Buying Behavior: A Case of Apparel Products. *Saudi Journal of Business and Management Studies, 4*(5), 441-456.

Chan, A. H. S., & Courtney, A. J. (2001). Color associations for Hong Kong Chinese. *International Journal of Industrial Ergonomics, 28*(3-4), 165-170.

Courtney, A. J. (1986). Chinese population stereotypes: Color associations. *Human Factors, 28*(1), 97-99.

Demir, Ü. (2020). Investigation of color-emotion associations of the university students. *Color Research and Application, 45*(5), 871-884.

Eagleman, D. M., & Goodale, M. A. (2009). Why color synesthesia involves more than color. *Trends in Cognitive Sciences, 13*(7), 1-5.

Fang, W., & Tong, Y. (2015). A Study on Symbol of Color Cultural in Web Page Design. *Journal of Simulation, 3*(4), 37.

Grzybowski, A., & Kupidura-Majewski, K. (2019). What is color and how it is perceived? *Clinics in Dermatology, 37*(5), 392-401.

Hutchings, J. (2004). Colour in folklore and tradition - the principles. *Color Research and Application, 29*(1), 57-66.

Jacob, L., Keown, C., Worthley, R., & Ghymn, K. (1991). Cross-cultural colour comparisons: Global marketers beware! *International Marketing Review, 8*(3), 21-30.

Jacquot, M., Noel, F., Velasco, C., & Spence, C. (2016). On the colours of odours. Chemosensory Perception, 9(2), 79-93.

Jantathai, S., Sungsri-in, M., Mukprasirt, A., & Duerrschmid, K. (2014). Sensory expectations and perceptions of Austrian and Thai consumers: A case study with six colored Thai desserts. Food Research International, 64(1), 65-73.

Jonauskaite, D., Tremea, I., Bürki, L., Diouf, C. N., & Mohr, C. (2020). To see or not to see: Importance of color perception to color therapy. *Color Research and Application, 45*(3), 450-464.

Leekitvatana, P. (2017). *Effects of nine workplace interior colors on Thai worker mood and color preferences* (Thematic paper). Bangkok, Thailand: Mahidol University.

Lindgaard, G., Fernandes, G., Dudek, C., & Browñ, J. (2006). Attention web designers: You have 50 milliseconds to make a good first impression! *Behaviour and Information Technology, 25*(2), 115-126

Naz, K., & Epps, H. (2004). Relationship between color and emotion: A study of college students. *College Student Journal, 38*(3), 396-409.

Ng, A. W. Y., & Chan, A. H. S. (2018). Color associations among designers and non-designers for common warning and operation concepts. *Applied Ergonomics, 70*, 18-25.

Obeng, S. L., Kwabena Danso, D., Omari, J. A., Kuwornu-Adjaottor, J. E. T., & Danso, D. K. (2018). Colour In Fashion: Effects On Personality. *Journal of Education Studies, 4*(6), 353-376.

Reinecke, K., & Gajos, K. Z. (2014). *Quantifying visual preferences around the world* (pp. 11-20). In Proceedings of the Conference on Human Factors in Computing Systems. New York, United States: The ACM Digital Library is published by the Association for Computing Machinery.

Ruse, V., Faraon, M., & Wetterstrand, M. (2019). *Hue combinations for the web: Towards a repertoire of design guidelines for combining color hues based on cultural background*. (pp. 63-70). In Proceedings of the 5th International Conference on Computer and Technology Applications (ICCTA 2019). Istanbul, Turkey. The ACM Digital Library is published by the Association for Computing Machinery.

Satcharoen, K. (2017). *The influence of colour on intention to adopt food delivery service mobile app* (pp. 87-91). In Proceedings of the 3rd International Conference on Communication and Information Processing. Tokyo, Japan: The ACM Digital Library is published by the Association for Computing Machinery.

Savavibool, N. (2020). Effects of color schemes on aesthetic response of the work environment. *Kasetsart Journal of Social Sciences, 41*(3), 581-586.

Seckler, M., Opwis, K., & Tuch, A. N. (2015). Linking objective design factors with subjective aesthetics: An experimental study on how structure and color of websites affect the facets of users' visual aesthetic perception. *Computers in Human Behavior, 49*,375-389.

Tien-Rein, L. (2013). *The color we use in our daily life-communicating with color* (pp. 22-27). In Proceedings of the 1st Asia Color Association Conference. Pathum Thani, Thailand: Rajamangala University of Technology Thanyaburi.

Wang, B., Liu, S. Q., Kandampully, J., & Bujisic, M. (2020). How color affects the effectiveness of taste- versus health-focused restaurant advertising messages. *Journal of Advertising, 49*(5), 557-574.

Wu, Y., Lu, J., van Dijk, E., Li, H., & Schnall, S. (2018). The color red is implicitly associated with social status in the United Kingdom and China. *Frontiers in Psychology, 9,* 1-8.