Physiology & Behavior 169 (2017) 165–168

Contents lists available at ScienceDirect

Physiology & Behavior

journal homepage: www.elsevier.com/locate/phb

Colour preference between adults and children during a dental treatment session

Didem Oner Ozdas [a], Magrur Kazak [b,*]

[a] Paediatric Dentistry Department, Istanbul Aydin University, Faculty of Dentistry, Florya, Istanbul, 34295, Turkey
[b] Restorative Dentistry, Istanbul Aydin University, Faculty of Dentistry, Florya Kampusu, Beşyol Mah Inonu Cad, 34295 Istanbul, Turkey

HIGHLIGHTS

- Male adults were more curious about experimenting with colourful mouthrinses during a dental treatment session.
- Female adults and children did not want colourful mouthrinse solutions during a dental treatment session.
- A dentist who wants to work with child patients should follow all the cartoon's characters and the advertisements.
- Dentist may manage the child patients to a new treatment by using familiarity.

ARTICLE INFO

Article history:
Received 17 May 2016
Received in revised form 30 September 2016
Accepted 19 November 2016
Available online 21 November 2016

ABSTRACT

Background: It is evidently shown that colour has physical, psychological and sociological effects on human beings. There are many studies showing the effects of colours on brain activity. Colour preferences may change from childhood to adulthood and are significantly different in various age groups. The aim of this study was to evaluate the adults and children in their preference for mouthrinses in various colours under stress condition during a dental treatment session.

Methods: 240 adults and 263 children were included in the study. Three transparent cups were filled with water, two of which were coloured green/pink rinsing by dissolving a tablet in the water. Cups were placed near the dental unit. During dental treatment sessions, patients were told to rinse their mouth with whichever cup they preferred. Preferred colour of cup, gender and age of patient, number of sessions were recorded. Data were statistically analysed by SPSS 15.0 programme and chi-square tests.

Results: Half of all cases preferred water. In adults, while females statistically significantly preferred water, males chose cups with coloured contents ($p < 0.01$). Male adults preferred more than one rinsing solution in a dental treatment session. Children mostly preferred water. Even if adults preferred cups with coloured contents in multi-dental treatment sessions, children regularly preferred water ($p < 0.001$). Female and male children mostly preferred water as a rinsing solution. Water was the most often choice for all patients. Both patients' gender and colours of cups affected choices made by adults and children.

Conclusions: Female adults and children were not interested in trying colourful mouthrinses, while male adults were curious about trying colourful mouthrinses during dental treatment sessions under stress condition.

© 2016 Elsevier Inc. All rights reserved.

1. Introduction

Colour is described as the spread of energy from light [1]. Colour is everywhere in our lives; it evokes thoughts and feelings, it increases motivation and also wellness [2]. Modern science has shown the effects of colour on human beings. Therefore, it is necessary to use colour correctly cause it is a psychological factor [3,4]. Colour is also found to play an important role in the symbolisation of concepts and ideas by expressing imagination and requests, producing emotional and visual responses and attracting people in persuading them to purchase a product [5]. In today's markets that have competition in global dimensions, power of colours is used by corporations to reach target consumers in many ways. The brands meeting their consumers in their adulthood, could have been in an interaction with them since their childhood [6]. Nowadays, children are seen as pushing power of economy and number of corporations that accepting the children as target group for marketing are increasing day by day [7]. The growing use of visual presentation-pictures and illustrations- minimizes the need for translation [8]. Product ranges for children are miscellaneous. For instance, personal hygiene products such as tooth-pastes and tooth-brushes are produced

* Corresponding author.
E-mail address: magrur@hotmail.com (M. Kazak).

http://dx.doi.org/10.1016/j.physbeh.2016.11.023
0031-9384/© 2016 Elsevier Inc. All rights reserved.

in different colours or various animation characters on the packages according to gender [6]. Product preference has been shown to occur with only a single commercial exposure and to strengthen with repeated exposures. Product preferences affect children's request and consequently influence parent's purchasing decisions [9].

Not only purchasing decision, environmental stimuli may also affect on human social behavior. Colour and lighting are two elements that if used effectively, may become a strategic element to stimulate people. Otherwise people will easily feel unpleasant and avoid [10].

Each colour has different variances [2,4]. In nature, there are three primary colours: red, yellow and blue. There are also three intermediate colours: pink, grey and violet, which are obtained from the mixture of the primary colours [1,11]. Orange, green and purple are the complementary colours [11]. In terms of their effects on people, colours are classified as warm and cold colours. It was reported that warm colours such as red, orange, yellow and pink create liveliness, joy, action, excitement and are stimulating effects, whereas cold colours such as blue, green, purple and grey create relaxing, restful, tranquil and soothing effects [1,4,12,13]. It has been stated that, transparent colour symbolizes purity and cleanliness [14]. Knowing the effect of colours on human behavior can be used for environmental design at various setting such as home, healthcare center, learning center, nursery and hospice and dental office, to stimulate brain activity for psychology purposes and cognitive function [4].

Therefore; the aim of this study was to evaluate the preferences for mouthrinses in various colours for different genders of adults and children during a dental treatment session.

2. Method

503 patients: 263 children and 240 adults were included in this study. The patients were between the ages of 3–73. The patients were referred to Istanbul Aydın University Faculty of Dentistry Paediatrics and Restorative Dentistry Departments for dental treatments. Before any dental treatment, the patients were examined by dentists. After determining the treatment plan, it was explained in detail to the patient, and then a consent form was signed by the patient. Thereafter, the patient's treatment was started by using a rotary instrument. Three transparent cups filled with water, a green rinsing solution, or a pink rinsing solution were prepared by dissolving tablets in water that were aligned near the dental unit. During the dental treatment session, adults and children were separately told to rinse their mouths with the contents from whichever cup they preferred (Fig. 1). The preferred colour of a cup, gender and the age of the patient, and number of sessions were recorded.

2.1. Statistical analyses

Data were statistically analysed by the SPSS 15.0 programme for Windows (SPSS) Inc., v22.0, Chicago, IL, USA and chi-square tests.

3. Results

Five hundred and three patients were assessed in this study. The patients included 240 adults (age 15–73 years old; 161 female, 79 male) and 263 children (age 3–14 years old; 122 female, 141 male). Mean age of patients was 22.73 ± 16.98 years old. In the study, 43.7% (n:220) of the patients were male and 56.3% (n:283) were female. A statistically significant difference was found between adults and children when evaluated in terms of colour preferences for the contents of a rinse cup ($p < 0.01$). While the multiple coloured mouthrinse preference (84.2%) was high for the adults (n:82), the preference for water (62.7%) was high for the children (n:165) (Table 1). A statistically significant difference was found in male patients for colour preferences ($p < 0.01$). While the preference for multiple coloured mouthrinse (36.7%) was high for the male adults (n:29), the preference for water (63.1%) was high for the male children (n:89) (Table 2). A statistically significant difference was found in female patients for colour preferences ($p < 0.01$). The preference for water was high for both female adults (n:55) (34.2%) and female children (n:76) (62.3%) (Table 3). When the numbers for colour preference among groups in terms of gender were evaluated, a statistically significant difference was found ($p < 0.01$). The

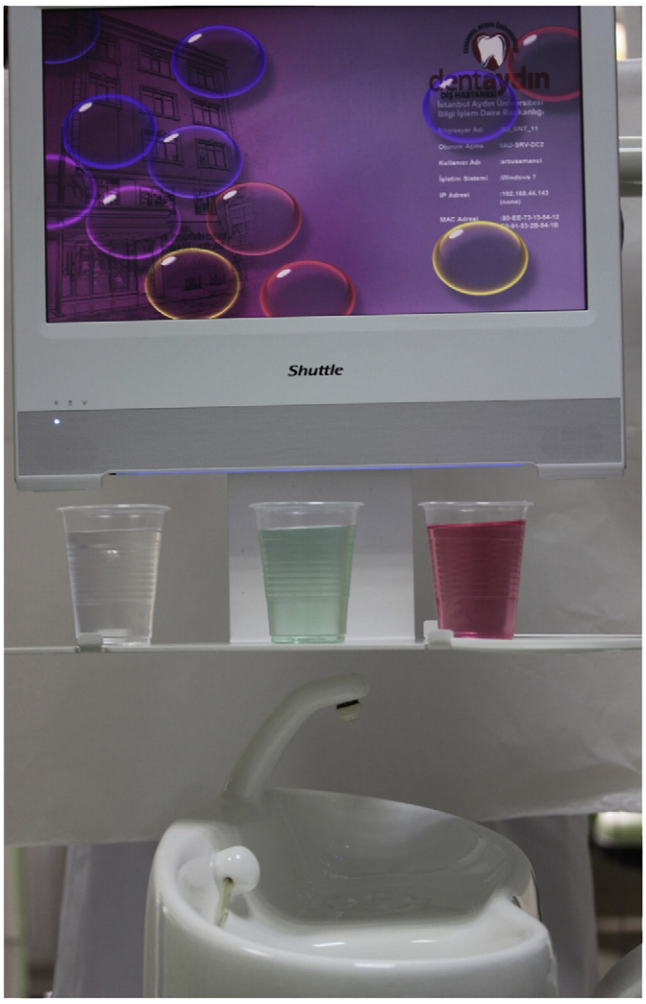
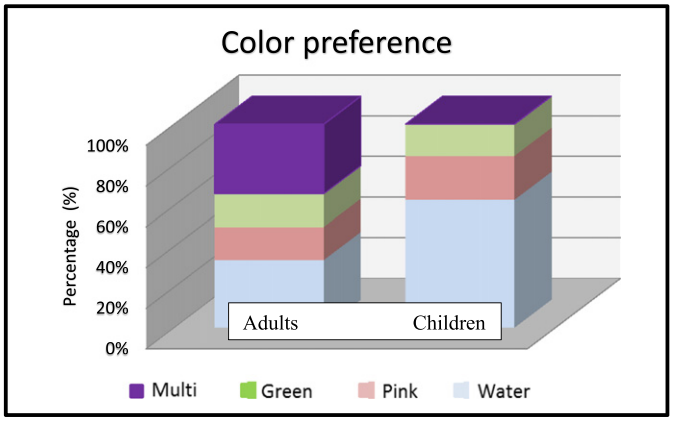


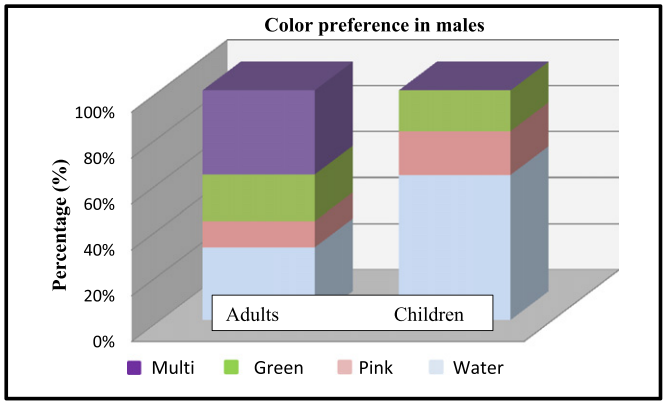
Fig. 1. Three transparent cups filled with rinsing solutions.

Table 1
Colour preference distribution of adults and children.



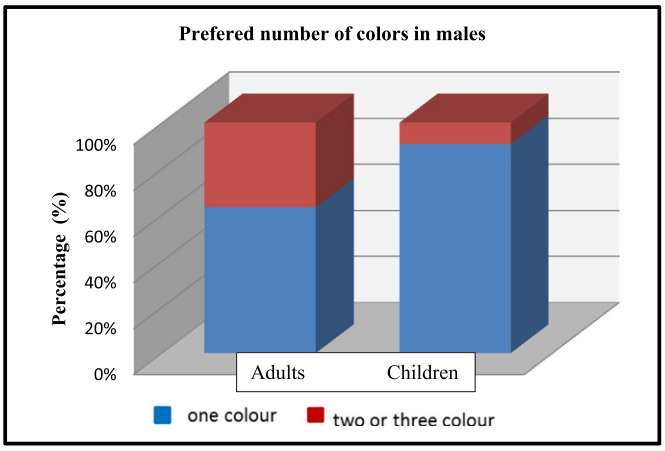
*$p < 0.01$

Table 2
Colour preference distribution of male adults and male children.



*p < 0.01

Table 4
Distribution of preferred number of colours in males according to groups.



*p < 0.01

preference for one colour was high for male adults, male children, female adults and female children (Tables 4 and 5).

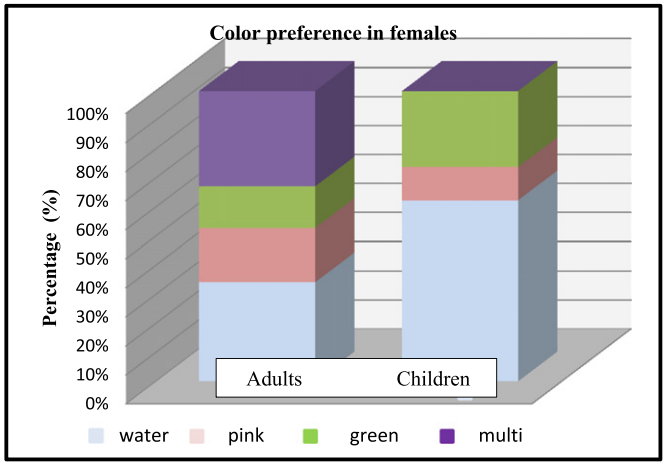
4. Discussion

Making choices enhance the quality of life for individuals through expressing their own preferences, desires, beliefs, and worth. They make their own decisions from the various options [15]. Preferencing colours are one of the main choices that we make. Due to the nature of colours, it is thought that colours produce psychological effects on people. Also, it is believed that preferred colours have a guiding effect on individuals [16]. Red, blue and green objects showed different effects on the brain activity [4]. It was reported that age has an important effect on colour preferences and also that colour preferences change with age and maturity. In the recognition of the environment by children, texture, form, and colour are the main variables. Children, especially between the ages of 3–6, prefer colours more than forms. It was determined that consistency in colour preference was seen in children before the age of 3. Also, no colour preference changes were detected for children between 3 and 15 years of age [3,17]. A statistically significant difference was found between adults and children, when evaluated in terms of colour preferences ($p < 0.01$). While multiple coloured mouthrinse preference (36.7%) was found high for the male adults, no multiple coloured mouthrinse preference was detected for the male children.

Male children preferred mostly water with an incidence of 63.1%. Likewise, both female adults and female children have preferred mostly water as a mouthrinse. In Pliner and Loewen study when the children were asked to rate the foods, it was found that children scored higher if they were familiar with the food [18]. When children were asked why they were unwilling to try novel foods, the typical response involved the expectation that the foods would not taste good or the foods could be dangerous for them. Lesser known food or tastes provides negative expectations that prevent people from trying them. While children are growing up, it was reported that food neophobia was the biggest strength protecting the children from hazardous environmental factors [19]. Thus, children, with developing cognitive abilities and increasing mobility after weaning, were prevented from putting in their mouths whatever they encounter [20]. In another word, if people were served different choices of drinks and knew only the taste of a Coke, they will always prefer Coke to drink [15]. In accordance with other studies, children chose the water as the most familiar mouthrinse instead of unfamiliar coloured mouthrinses in present study.

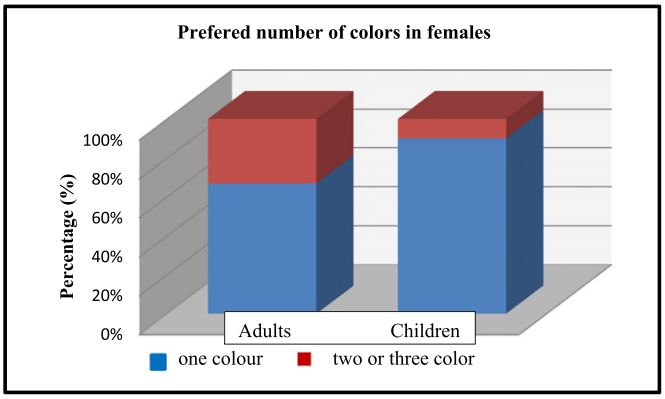
According to a study which was about colour preferences of German adults, it was found that age groups differences in colour preferences were highly significant. With advancing age, the preference for blue decreased steadily, whereas the popularity of green and red increased [17]. In another study the red colour is the most favorite colour for

Table 3
Colour preference distribution of female adults and female children.



*p < 0.01

Table 5
Distribution of preferred number of colours in females according to groups.



*p < 0.01

both genders and all ages [21]. The individuals who were familiar with the presented alternatives had diverse preferences [15]. The adults that chose multiple coloured mouthrinses in this study could be explained from this point of view. Also, this situation can be seen from the standpoint of male adults being open to the different experiences.

Several studies have reported that children were using colours to express themselves in their thoughts and feelings in the most appropriate manner. The children were expressing themselves by choosing the colour that best denoted their psychological state [22]. Children often choose lively colours to show that they exhibit a positive attitude towards life. It has been reported that children that prefer warm colours, such as pink, yellow and orange, are polite and reasonable. On the contrary, children who prefer dull colours, such as black, blue, green and dark brown, are nervous and suppress their emotions [23]. One of the reasons that male children preferred the green mouthrinse after the water option may be due to the high anxiety that develops during a dental treatment session. The other reason for preference in mouthrinse colour could be gender-based. In female children, pink mouthrinse was the second highest choice after water. This can be attributed to a Turkish saying: 'Pink is the colour of female children' [24]. Additionally, it is reported that pink is a warm colour that awakens the sense of optimism in children [11].

Male adults first preferred more than one coloured solution at the rate of 36.7%, and water was preferred second at the rate of 31.6%. The pink solution was preferred at the rate of 20.3%, and lastly, the green solution was preferred at the rate of 11.4%. The reason for the male adults testing all the solutions may be due to the different emotional connotations sourced from different colours of mouthrinses that were tried during the dental treatment session.

When the preferred number of colours for the groups in terms of gender were evaluated, all adults and children (girls and boys) were more likely to prefer a single colour rather than two or three coloured mouthrinses. Considering that dental treatment increased the anxiety of the patient, it was normal for the patients to prefer a single mouthrinse in order to feel safe. Colours play an important role in persuading and communicating with people as well as drawing attention to an object [5]. Furthermore, colours have an effect on human psychology. Perception is a psychological factor, and colours are related to perception [25]. For instance, it was reported that the colour stimuli have an important role in people's perceptions [26]. Colour is the most important factor affecting the selections made by individuals; furthermore, colour can be used as a visual communication tool. Therefore, in this study, various coloured mouthrinses were used for both adults and children. When assessing public perception of colours, it was reported that water was used in the marketing of mouthrinses due to the sense of cleanliness and the feeling of purity [14]. For these reasons, water is included in this study. Gender and preferred colours have been effective factors when the choice of adults and children were analysed. Most of the girls and boys preferred water as mouthrinses. Most of the female adults chose water as a mouthrinse solution. Female adults, female children and male children did not want colourful mouthrinse solutions during a dental treatment session. On the contrary, male adults were eager to try more than one colourful mouthrinse. In other words, it can be concluded that male adults were more curious about experimenting with colourful mouthrinses during a dental treatment session.

We can make some recommendations to dentist: colour of a dental office and waiting room is very important. According to Ryu and Jang study facility aesthetics, involving visual cues like; furniture, colour, lighting, decor and employees influence significantly on the level of customer pleasure and stress.

As a conclusion of this present study; a dentist who wants to work with child patients should follow all the cartoon's characters and almost the near all the advertisements generally on television to recognize and distinguish the popular characters. Dentist may manage the child patients to a new treatment by using familiarity.

Conflict of interest

The authors declare that they have no conflict of interest.

References

[1] K. Artut, Sanat Eğitimi Kuramları ve Yöntemleri, Anı Yayıncılık, Ankara, 2004.
[2] R.S. Ulrich, Effects of interior design on wellness: theory and recent scientific research, J. Health Care Inter. Des. 3 (1991) 97–109.
[3] E. Burdurlu, Y. Kılıç, A.C. İlçe, G.C. Elibol, G. Yener, Okul öncesi çocuk mobilyaları ile ilgili ebeveyn görüşleri ve öngörülen mobilya tasarım ölçütleri, Teknoloji. 1 (2007) 139–149.
[4] W. Sroykham, J. Wongsathikun, Y. Wongsawat, The effects of perceiving color in living enviroment on QEEG, oxygen saturation, pulse rate, and emotion regulation in humans, Conf. Proc. IEEE Eng. Med. Biol. Soc. 2014 (2014) 6226–6229.
[5] H.Y. Öztuna, Temel tasarım öğeleri: Renk, Grafik Tasarım-Görsel İletişim Kültürü Dergisi. 8 (2007) 88–91.
[6] O.E. Yıldız, C. Denecli, The effect of animation character usage in advertisements on nutritional routines of children, İletisim Kuram ve Araştırma Dergisi. 241-53 (2013).
[7] A. Gulerarslan, Children as consumer and effects for family purchase decisions, Selçuk İletişim. 6 (2011) 126–137.
[8] V. Terpstra, R. Sarathy, International marketing. In Chapter 12: International Promotion: Advertising, The Dryden Press, International 5th Ed., USA, 1991.
[9] D. Campos, J.J. Hernandez-Torres, A. Agil, M. Comino, J.C. Lopez, V. Macias, C. Campoy, Analysis of food advertising to children on Spanish television: probing exposure to television marketing, Arch. Med. Sci. 12 (2016) 799–807.
[10] P. Wardono, H. Hibino, S. Koyama, Effects of interior colors, lighting and decors on percieved sociability, emotion and behavior related to social dining, Procedia. Soc. Behav. Sci. 38 (2012) 362–372.
[11] S. Türkoğlu, Anlatım ve deyimlerde renklerin dili, Kazım Karabekir Eğitim Fakültesi Dergisi. 8 (2003) 277–290.
[12] E. Becer, İletişim ve grafik tasarım, Dost Kitabevi Yayınları, Ankara, 2005.
[13] A.B. Korkut, E.E. Şişman, M. Özyavuz, Peysaj Mimarlığı, Verda Yayıncılık, İstanbul, 2010.
[14] Y. Odabaşı, G. Barış, Tüketici davranışı, Kapital Medya Hizmetleri A.Ş., İstanbul, 2003.
[15] B. Ülke Kürkçüoğlu, Otistik özellik gösteren çocuklara sunulan seçim fırsatları ve etkileri, Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi. 8 (2007) 67–83.
[16] M. Kuloğlu, A. Çayköylü, E. Soydaş Akyol, A. İbiloğlu, E. Yılmaz, O. Ekinci, Bir grup hekimde renk ve sayı tercihi, Düsünen Adam Psikiyatri Nöroloji Bilim Derg 20 (2007) 179–185.
[17] M. Dittmar, Changing color preferences with ageing: a comperative study on younger and older native germans aged 19–90 years, Gerontology 47 (2001) 219–226.
[18] P. Pliner, R. Loewen, Effects of prior exposure to palatable and unpalatable novel foods on children's willingess to taste other novel foods, Appetite 23 (1999) 147–163.
[19] E. Cashdan, A sensitive period for learing about food, Hum. Nat. 5 (1994) 279–291.
[20] P. Pliner, Cognitive schemas: how can we use them to improve children's acceptance of diverse and unfamiliar foods? Br. J. Nutr. 99 (2008) 2–6.
[21] B. Özer, İnsan Psikolojisi ve Peysaj Tasarımı, Ankara Üniversitesi Fen Bilimleri Enstitisü Yüksek Lisans Tezi, 2005.
[22] A.S. Ece, A. Çelik, Öğretilebilir Zihinsel Engelli Öğrencilerin Renk Seçimleri, 5, UIBD, 2008 1–24.
[23] Ç. Köçkar, A. Gürol, Anxiety, agression and self-esteem analysis through pictures in children with cancer, Istanbul Univ Florence Nightingale Hemsire Yo Derg. 21 (2013) 33–39.
[24] M. Kuloğlu, M. Atmaca, Ö. Geçici, A. Ünal, A.E. Tezcan, Bir grup üniversite öğrencisinde renk ve sayı tercihi, Düsünen Adam Psikiyatri Nöroloji Bilim Derg. 15 (2002) 34–38.
[25] G.E. İçli, M.E. Çopur, Pazarlama iletişiminde renklerin rolü, Trakya Üniversitesi Sosyal Bilimler Dergisi. 10 (2008) 22–33.
[26] F.J. Engel, R.D. Blackwell, P.W. Miniard, Consumer Behavior, The Dryden Pres, Forth Worth, 1995.