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Joanna Koszela-Kulińska,
Rafał Michalski

Wrocław University of Science and Technology, Poland

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Wyb. Wyspiańskiego 27, 50-370 Wrocław, Poland

The effects of the anthropological race, gender and location of verbal-pictorial stimuli on the usability of visual information conveyance

Joanna Koszela-Kulińska^{1,*}, Rafał Michalski¹

¹ Wrocław University of Technology, Wrocław, Poland

{joanna.koszela, rafal.michalski}@pwr.edu.pl
RafalMichalski.com

Abstract. The usability of information conveyance is influenced by various factors. It has already been confirmed that verbal stimuli to be more effective should be presented on the right-hand side while non-verbal stimuli on the left-hand side. The aim of this paper is to analyze the impact of three factors: the race, gender and location of the human model picture in relation to a text on people's perception of visual information promoting social campaign for tolerance. A total of 31 students from the Wrocław Academy of Art and Design took part in this study. Participants were shown a series of visual banners containing a picture of a human along with the campaign slogan. The subjective evaluation of experimental conditions was conducted by the AHP method involving pair-wise comparisons. The obtained results revealed significant effects of the race, gender and the interaction between them.

Keywords: display design · brain lateralization · digital signage · ergonomics · subjective preferences · AHP

1 Introduction

Since many years practitioners and researchers have developed and introduced techniques focused on attracting people's attention. A significant number of research works indicates that primary elements of graphical design, e.g. colors, shapes or layout may significantly impact the person's attitude towards visual information. The combination of words, symbols, and images creates a visual representation of ideas or messages and, thus, affects the comprehension and judgment of visual information conveyance.

The major objective of this investigation was to examine the influence of three factors on consumers' preferences towards graphical panels containing social message, namely: the model's race, gender and the verbal-pictorial layout. The organization of the paper is as follows. At the beginning a relevant literature review is presented. Later, the experimental design and procedure are given followed by presentation of results and their discussion.

2 Related literature

2.1 Anthropological race issues

Since early 1960's marketers have become more interested in defining a relation between consumers' behaviors and models' race in commercial advertising. Commonly raised issues concern how people of a different race/ethnicity respond to visual stimuli containing various racial cues. Past investigations were mostly focused on the anthropological race. The traditional definition refers to a person's physical appearance such as the skin, eye, and hair color, bone/jaw structure etc. Research conducted in the 1960's and 1970's on the effects of black models used in promotion materials has shown mixed findings. For example, white consumers have reacted to black models positively (Plummer and Schlinger, 1972), neutrally (Bush et al., 1974), and even negatively (Muse, 1971). Dimeo and Whittler (1991) also shown that white consumers had less favorable attitudes toward the visual stimuli when they included black rather than white models. These outcomes were opposite to those obtained by Whittler (1989) where white participants responded similarly to a picture of a white and black actor. Authors suggested that such different findings may probably depend on the social structure, customs and prejudices of the population sample.

The concept of ethnicity was incorporated in visual research in the mid-1980's. Ethnicity has a broader definition than a race and relates to such cultural factors as nationality, ancestry, language, customs and beliefs. It appeared for the first time in the investigation conducted by Deshpande et al. (1986) and concerned attitudes formation towards products in a population of Hispanic consumers with a strong ethnic identity. Numerous research revealed that visual stimuli including ethnics cues such as cultural symbols, ethnic characters, values held by a target population may positively influence on feelings and, thus, enhance for instance a purchase intention (Appiah and Yung, 2009; Deshpandé and Forehand, 2001). Some scholars use the term of race and ethnicity interchangeably e.g. Sierra et al. (2009); Fernandez et al. (2002). Butt and Run (2012) indicate that ethnicity, as a multidimensional construct, comprises the conception of race but cannot be used as a synonym.

Many recent studies take advantage of different theoretical concepts that try to explain viewers' responses to visual stimuli with racial cues. Among these, the following psychological theories may be mentioned: Distinctiveness, Identification, Social Identity Theory (SIT). Distinctiveness theory generally states that a person's distinguishing characteristics are more salient to him/her than traits that are more common in the environment. Identification theory, by contrast describes how persuasion is connected to perceptions of similarity. When people perceived a message source to be similar to them, then this source has a greater persuasive influence. Social Identity Theory provides the concept of a social identity as a way in which people assign themselves to social categories. The membership to a social group enhances the so-called self-concept which is commonly referred to as an individual's sense of self.

The abovementioned theories were applied in many studies on race/ethnicity e.g. Identification theory in Appiah (2001); Distinctiveness theory in Deshpandé and Stayman (1994), Social Identity Theory in Sierra et al. (2009).

In this study, the human typology introduced by a Polish anthropologist Jan Czekanowski was adopted. He assumes that a mankind is divided into three major varieties (commonly known as races) - white (Caucasian), black (Negroid) and yellow (Mongoloid). He distinguished them on the basis of physical characteristics concerning mainly the skin and eye color, shape and color of hair, shapes and sizes of different body regions, particularly the skull (Malinowski and Strzałko, 1985).

2.2 Gender issues

Most of gender-related research indicates that consistently across time and countries portrayals of men and women are assigned to specific roles. According to Higgs and Milner (2004) males are perceived as voiceovers, authorities, and frequently shown as knowledgeable professionals. By contrast, females are depicted in dependent roles such as a parent, spouse, and sex object. Furthermore, research on gender imagery in television programs and advertisements suggest that female characters are more likely to be shown in home, with males rather to appear in non-domestic settings or occupational roles (Coltrane and Messineo, 2000).

Much research concerning gender issues is focused on how the content and imagery affect viewers' responses, the brand perception and hence the purchase intention or attitudes towards products. It is undoubtedly true that there are sex differences in responding to various message cues incorporated in visual information. For example, there are differences in self-confidence demonstrated by males and females. In contrary to men, women tend to perform a given task with low estimates of their ability and low expectations for achieving success (Nigro and Sleeper, 1987). According to Kempf et al. (1997) such gender-based differences in a self-confidence level may be reflected in confidence of visual information processing. The confidence is considered to be a variable on the basis of which consumers' attitudes and behaviors may be predicted. It should be understood as "the certainty with which an evaluative judgment is held". Outcomes revealed that males performed a higher confidence level depicting fictitious soft drink, than females. In practice this may signify, that females require higher advertising exposure to persuade them to purchase the product (Kempf et al., 1997).

The literature also suggests that females tend to exhibit more adverse feelings toward stereotypical role portrayal than males. According to Courtney and Whipple (1985) females generally demonstrated more favorable attitudes toward brands and products when the visual information depicted modern, liberated. The investigation conducted by Dwivedy et al. (2009) also confirmed these observations. There are, naturally many more examples of gender-based differences in responses to various visual cues. A comprehensive overview of this issue may be found in Wolin (2003).

2.3 The role of image-text layout

There is a plentiful of evidence that the organization of visual information may significantly influence the subjective evaluation of the graphical material. In the investigation which concerned magazine ads, Ellis and Miller (1981) proved that right-handers

preferred the “words right – pictures left” configuration while left-handers had no overall preferences. Similar outcomes were obtained by Rettie and Brewer (2000) in the examination concerning a layout of verbal and pictorial elements of the package design. They focused only on right-handers that represent 89% of a human population. Findings derived from both experiments are consistent with the human brain lateralization theory which states that left and right hemispheres differ in psychological functions they subserve. Right-handed people have left-hemisphere dominance for analyzing verbal information and language skills while right-hemisphere dominance for processing pictorial information. In the case of left-handed people the brain lateralization is not so obvious and, for example, language-related functions are often right-lateralized or processed bilaterally. The possibility that the stimulus placement influences the evaluation and perception of a given visual stimulus clearly derives from the neurological connection between brain’s hemispheres and a human visual system. When stimulus is presented to the left side of visual field, it is sent to the right hemisphere and conversely, stimulus from the right side is sent to the left hemisphere.

According to Janiszewski (1988) the placement effect described above is considered to be a function of preattentive processing of stimuli located outside the point of focus. Therefore such stimuli are assessed at a subconscious level. In his subsequent investigation, besides the relation between the organization of the advertisement and lateralization of hemispheres processing, the influence of subconscious processing of a stimulus was additionally examined (Janiszewski, 1990). The experiment concerned the evaluation of preferences towards a brand name. The researcher pointed out that through increasing the subconscious analysis of a given stimulus also preferences towards this stimulus may be enhanced. These findings are consistent with the Matching Activation Hypothesis which states that, when hemispheres are activated differently, the less activated one processes secondary material more efficiently (Friedman and Polson, 1981). Although the lateralization of brain functions occurs in all normal human brains there is some evidence that, for instance, language differences may affect on how consumers process information about the organization of the advertising environment. In the investigation concerning consumers preferences towards packages of grocery products Hanzaee (2009) showed that in the case of right-to-left languages, verbal right - pictorial left stimulus layout may not be as effective as in the case of left-to-right languages consumers.

3 Method

3.1 Participants

A total of 34 (11 males and 23 females) white students from the Wrocław Academy of Art and Design took part in the experiment. All participants reported to be right-handed. Age of students ranged from 19 to 42 years.

3.2 Apparatus

Custom-made software was employed to conduct the experiment according to the AHP based methodology (Saaty 1980) which involves pairwise comparisons of presented stimuli. The software displayed randomly generated pairs of visual stimuli, collected the results and retrieved the subjects' hierarchy preferences. The experiments were carried out in teaching laboratories in the same lighting conditions by means of identical personal computers and monitors. Visual panels of all considered conditions were prepared by GIMP image manipulation software, version 2.8.10.

3.3 Variables and experimental design

The influence of three independent variables on subjects preferences were examined in this study: model's race, model's gender, and the location of verbal and non-verbal stimuli. According to the aforementioned classification of the human species, the first factor was specified at three categorical levels: black, yellow and white race. The second variable was defined at two levels: male and female. In the third one, two different types of verbal/non-verbal locations were used: the campaign slogan on the left side of model's photograph and conversely, the campaign slogan on the right side of the picture. All of the variables produced 12 variants for the AHP analysis (three races \times two genders \times two locations of picture vs. text). The number of pairwise comparisons amounted to 66.

A stimulus material was designed as visual panels containing a picture of a human model and the following campaign slogan ("Racism? No, thanks."). Models' photographs were taken in dormitories belonging to Wrocław University of Technology. Five unpaid volunteers agreed to use their image for the research purposes – a black male, a yellow male and female, and a white male and female. A picture of a black female was purchased and downloaded from a website <http://www.shutterstock.com>. Models were asked to stand upright with hands along a trunk and with a neutral facial expression. All of them were dressed in casual jeans, blouses or t-shirts. Models were photographed on a plain, neutral background. Exemplary conditions are demonstrated in Figure 1.

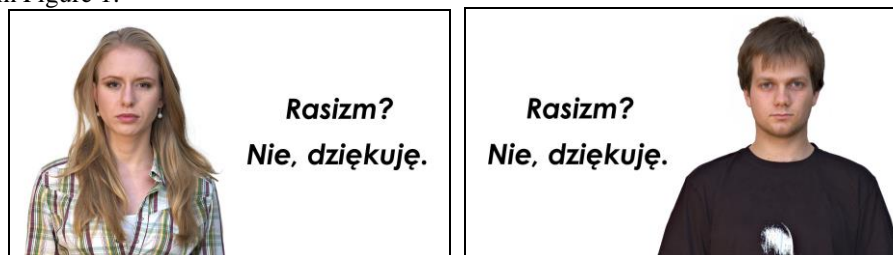


Fig. 1. Two exemplary experimental conditions. (1) left image: a female with a verbal-right – pictorial-left stimulus, and (2) right image: male with a verbal-left – pictorial-right layout.

The within subjects design was applied in this research, thus each subject examined all of the experimental conditions. The participants' perceptions were computed by

the AHP procedure (Saaty, 1980) which produced preference weights. We also computed consistency ratios for every subject to assess the degree of comparisons validity. Specifics regarding computations of preferences' weights and consistency ratios may be found, for instance, in the paper of Grobelny and Michalski (2011) or Michalski (2011).

4 Results

In the presented research the Consistency Ratios ranged from 0.012 to 0.361 with the overall mean and standard deviation of 0.111 and 0.084 respectively. Three subjects with the consistency ratio exceeding 0.2 were excluded from the further examination. Thus, priorities vectors only from 31 participants (21 females and 10 males) were taken into consideration.

Condition	Mean	*MSE	**CI -95%	**CI +95%
L_White_F	0.0657	0.0055	0.055	0.077
L_White_M	0.0692	0.0043	0.060	0.078
L_Black_F	0.0698	0.0072	0.055	0.085
L_Black_M	0.0543	0.0045	0.045	0.064
L_Yellow_F	0.1339	0.0089	0.116	0.152
L_Yellow_M	0.1006	0.0074	0.086	0.116
R_White_F	0.0678	0.0058	0.056	0.080
R_White_M	0.0685	0.0038	0.061	0.076
R_Black_F	0.0700	0.0063	0.057	0.083
R_Black_M	0.0582	0.0057	0.047	0.070
R_Yellow_F	0.1358	0.0087	0.118	0.154
R_Yellow_M	0.1062	0.0077	0.090	0.122

* MSE – Mean Standard Error, ** CI – Confidence Intervals,
L – picture on the left, R – picture on the right, F – female, M – male.

Table 1. Basic descriptive statistics for all conditions.

The basic descriptive results obtained for these participants are given in Table 1 and illustrated in Figure 2. One may easily notice that the highest mean preference weights have been assigned to conditions where black females were used while the smallest average values were obtained for white males.

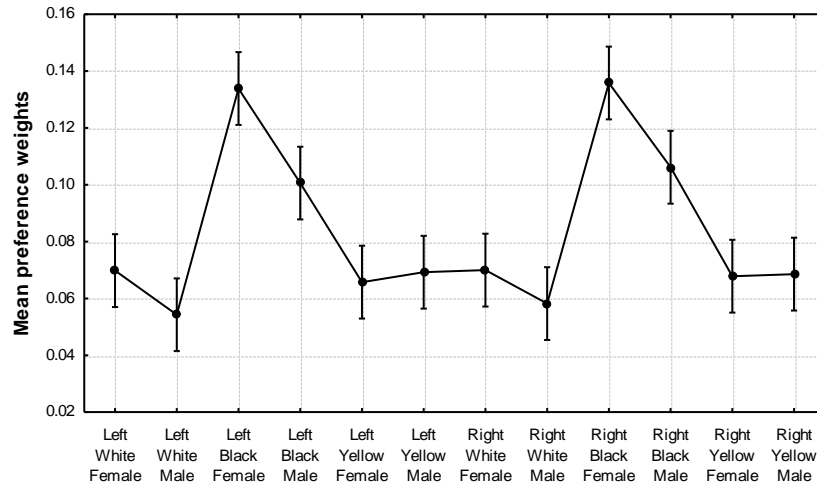


Fig. 2. Average preference weights for all experimental conditions. Vertical bars denote 0.95 confidence intervals.

In order to determine whether studied factors (race, gender and stimulus layout) demonstrates statistically significant influence on subjects' preferences, a three way ANOVA was applied. These results are presented in Table 2.

Effect	SS	df	MS	F	p
Layout	0.0004	1	0.0004	0.33	0.56
Race	0.239	2	0.119	91	< 0.0001
Gender	0.019	1	0.019	14.5	< 0.0002
Layout × Race	0.000147	2	0.000074	0.056	0.95
Layout × Gender	0.000055	1	0.0000055	0.042	0.84
Race × Gender	0.0174	2	0.0087	6.6	0.0014
Layout × Race × Gender	0.00021	2	0.0001	0.081	0.92

*p<0.05; df–degrees of freedom; SS–sum of squares; MS–mean sum of squares

Table 2. Three-way analysis of variance results.

Among three considered factors, race and gender showed statistically meaningful influence on subjects' preferences ($p < 0.0001$ and $p = 0.000163$ respectively) while the layout was insignificant. Figure 3 suggests that advertisements with black models were the most convincing ones. The mean weight for black race, in conjunction with confidence intervals, indicates that black race may probably differ significantly from the remaining two. From the gender perspective, the discrepancy between subjects' preferences was also demonstrated. Figure 4 provides a graphical illustration of AHP weights for both sexes. Although mean weights along with confidence intervals indi-

cates a clear trend towards female models, the difference is not as obvious as in the case of the black race.

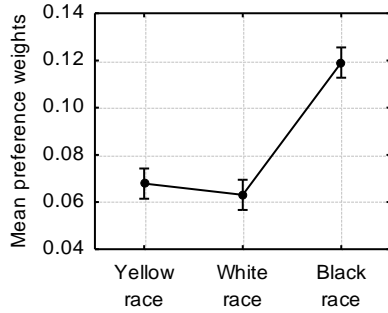


Fig. 3. Average preference weights for the race factor. $F(2, 360) = 91,042$, $p < 0.0001$. Vertical bars denote 0.95 confidence intervals.

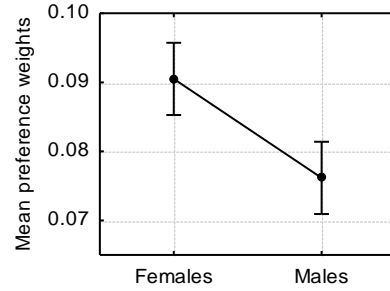


Fig. 4. Average preference weights for the gender factor. $F(1, 360) = 14,5$, $p = 0.000163$. Vertical bars denote 0.95 confidence intervals.

The ANOVA analysis showed also that only race \times gender interaction was statistically meaningful ($p = 0.00147$). The interaction is illustrated in Figure 5. The data show that for white race females the preferences were much bigger than for white race males. Similar phenomenon was observed for the black race: females were better perceived than males. However, when the yellow race is concerned, the difference between males and females does not exist.

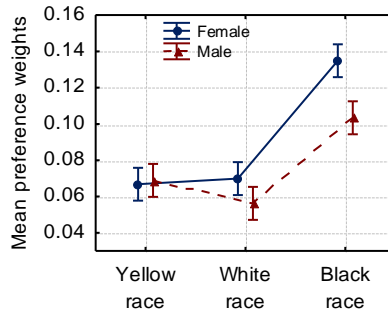


Fig. 5. Average preference weights for race and gender interaction. $F(2, 360) = 6.64$, $p = 0,00147$ Vertical bars denote 0.95 confidence intervals.

5 Discussion and conclusions

Scholars assume that consumers' preferences are one of the critical factors in the domain of designing efficient, effective and satisfying visual information conveyance. Many different strategies are introduced in order to attract consumers' attention and

shape their behavior. Relevant literature suggests that basic elements of graphical design may influence consumers' attitudes and behaviors in a positive manner.

The aim of the current investigation was to check whether three factors, namely: model's race, model's gender and verbal-pictorial layout, affect the subjects' preferences towards social advertisement. The findings revealed that, indeed, the model's race and gender showed statistically meaningful influence. Simultaneously, subjects seemed to have no overall preferences towards visual information layout. In relation to race issues, the brief literature review showed that consumers reaction on various racial/ethnic cues differ greatly and may depend on the prejudice, education level, social structure of the population sample etc. Using different psychological theories scholars attempt to explain such a discrepancy in people's reactions. However, in this particular experiment, using one of these theories as the theoretical foundation is probably pointless. Experimental stimuli were designed as a social advertisement concerned with promoting anti-racism behaviors and the highest AHP weights were obtained for black models. This may indicate that among Polish young adults that took part in this research, the idea of racism is associated with people of the black race. Such a connection may probably results from historical conditions like: the system of racial segregation in South Africa (apartheid) or slavery.

Outcomes obtained for gender, revealed a statistically significant trend towards female models. According to research conducted by Courtney and Whipple (1985) and Dwivedy et al. (2009) females tend to exhibit more positive attitudes towards ads depicting liberated female role portrayals. Almost 70% of participants in this experiment were females. Moreover, female banners contained a picture of young, self-confident, open-minded women, who expressed their views about an obvious social problem. Therefore, it is possible that under such circumstances female participants exhibited more favorable attitudes towards visual panels depicting female models, as they may reflect transition from a stereotyped gender role. However, it cannot be ruled out that also factors of beauty and aesthetics influenced participants' subjective evaluations. Thus, further examinations should be conducted to check whether this assumption may be correct.

There was also an interesting interaction effect observed between gender and race. Gender seemed to have an additive effect only in the case of a black race. The existing literature is insufficient to fully understand this phenomenon. Therefore, the additional research and analysis should be performed, for instance, to verify whether these outcomes may be repeated.

A further opportunity for future research involves expanding the knowledge about the impact of the constrained processing condition on consumers' attitudes and behaviors. The assumption that some conditions may temporarily inhibit cognitive capacity and thus significantly enhanced consumers' preferences is of great importance for marketing researchers and practitioners and can't be omitted in further examinations.

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