

ISSN: 1889-1861

***THE EUROPEAN JOURNAL
OF
PSYCHOLOGY APPLIED
TO
LEGAL CONTEXT***



Volume 4, Number 1, January 2012

The official Journal of the
SOCIEDAD ESPAÑOLA DE PSICOLOGÍA JURÍDICA Y FORENSE
Website: <http://www.usc.es/sepjf>

The European Journal of Psychology Applied to Legal Context, 2012, 4(1)
Eur. j. psychol. appl. legal context, 2012, 4(1), 1-98, ISSN: 1889-1861
www.usc.es/sepjf

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Official Journal of the *Sociedad Española de Psicología Jurídica y Forense* (www.usc.es/sepjf)

Published By: SEPJF.

Published in: Santiago de Compostela (Spain)

Volume 4, Number 1.

Order Form: see www.usc.es/sepjf

Frequency: 2 issues per year (January, July).

E-mail address: ejpalc@usc.es

Postal address: The European Journal of Psychology Applied to Legal Context, Facultad de Psicología, Universidad de Santiago de Compostela, E-15782 Santiago de Compostela (Spain).

ISSN: 1889-1861.

D.L.: C-4376-2008

THE EFFECTS OF PRESENTATION METHODS AND SEMANTIC INFORMATION ON MULTI-ETHNICITY FACE RECOGNITION

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(Received 10 March 2011; revised 20 September 2011; accepted 26 September 2011)

Abstract

Studies have shown that own-race faces are more accurately recognised than other-race faces. The present study examined the effects of own- and other-race face recognition when different ethnicity targets are presented to the participants together. Also the effect of semantic information on the recognition of different race faces was examined. The participants ($N = 234$) were presented with photos of own-race and other-race faces. For some participants the faces were presented with stereotypical names and for some not. As hypothesized, own-race faces were better recognised in target-present lineup and more correctly rejected in target-absent lineup than other-race faces. Concerning presentation method, both own-race and other-race faces were more correctly identified in target-present simultaneous than in target-present sequential lineups. No effects of stereotypical names on face recognition were found. The findings suggest that identifying multi-ethnicity perpetrators is a problematic and difficult task.

Keywords: eyewitness identification; cross-race effect; lineups; stereotypes; semantic information.

Resumen

La literatura ha demostrado que caras de la raza propia son reconocidas con mayor exactitud que las de otras razas. El presente estudio examinó los efectos del reconocimiento de caras en condiciones de presentación conjunta de personas de diferentes etnias. Asimismo, también se estudió el efecto de la información semántica en el reconocimiento de caras de razas distintas. Para ello, se le presentaron a los participantes ($N = 234$) fotografías de caras de su propia y de otras razas. Para unos participantes, las fotografías de las caras fueron presentadas con nombres estereotipados y para otros no. Como se había hipotetizado, las caras de la raza propia, en comparación con caras de otras razas, fueron reconocidas mejor en ruedas de identificación con el sospechoso presente a la vez que se registraron mayores rechazos correctos en ruedas con el sospechoso ausente. En lo concerniente al método de presentación, tanto las caras de la misma raza como de otra raza fueron identificadas más correctamente en ruedas con el sospechoso presente simultáneas que secuencializadas. No se encontró un efecto de los nombres estereotípicos en el reconocimiento de caras. Los hallazgos sugieren que la identificación multiétnica de agresores es una tarea difícil y problemática.

Palabras clave: identificación de testigos presenciales; efecto inter-racial; ruedas de identificación; estereotipos; información semántica.

Introduction

Research has shown that people are better able to recognize and discriminate own-race faces, relative to someone of another, less familiar race (Slone, Brigham, & Meissner, 2000; Meissner & Brigham, 2001; Sporer, 2001; Wright, Boyd, & Tredoux, 2001; Brigham, Bennett, Meissner, & Mitchell, 2007; Horry, Wright, & Tredoux, 2010; DeGutis, DeNicola, Zink, McGlinchey, & Milberg, 2011). This cross-race recognition effect has been found in both field settings (Brigham, Maass, Snyder, & Spaulding, 1982; Platz & Hosch, 1988) as well as in numerous laboratory-based studies (for reviews, see Meissner & Brigham, 2001; Sporer, 2001). These studies have often suggested that people devote more processing to features which are relevant to own-race faces.

It has been found that the cross-race effect among Caucasian participants is stronger than among Afro-Americans (Anthony, Copper, & Mullen, 1992; Meissner & Brigham, 2001). Further research has demonstrated the cross-race effect across a wide variety of racial and ethnic groups, including Caucasian and Afro-Americans in the United States (Malpass & Kravitz, 1969), British and South African Whites and Blacks (Chiroro, Tredoux, Radaelli, & Meissner, 2008; Wright, Boyd, & Tredoux, 2001, 2003), Asian participants (Chance, Turner, & Goldstein, 1982; Ferguson, Rhodes, & Lee, 2001; Sangrigoli, Pallier, Argenti, Ventureyra, & de Schonen, 2005; Hayward, Rhodes, & Schwaninger, 2008), German and Turkish groups (Sporer, 1999), Canadian First Nations (Jackiw, Arbuthnott, Pfeifer, Marcon, & Meissner, 2008) and Hispanics (MacLin, MacLin, & Malpass, 2001; Platz & Hosch, 1988). More lately, there is also evidence of own-nationality effects concerning face recognition (Doty, 1998) where within ethnicity, people recognise more accurately persons from their nationality than from other nationalities.

Multiple different race targets

The situation concerning identifying different race faces is even more complicated when several perpetrators are involved in a single crime. Research on multiple perpetrators indicates that when the number of culprits increases, accurate eyewitness identification rates decrease (Shapiro & Penrod, 1986). Wells et al. (1998) examined forty cases where DNA exonerated wrongfully convicted people and in 90%

of these cases, mistaken eyewitness identification played a major role. Another study revealed that when examining 500 wrongful convictions, mistaken eyewitness identification occurred in 60% of those analyzed (Huff, 1987).

Recently, Kask and Bull (2009) examined how accurately multiple targets of different race faces were recognised. They found using sequential six-person lineups that other-race faces were less correctly rejected than own-race faces. However, it is unknown how multiple targets from different ethnicities would be recognised in a simultaneous lineup. Therefore, in this study both simultaneous and sequential lineups are used to examine whether the lineup presentation method has an effect on recognition accuracy. It is hypothesized that own-race faces will be more correctly rejected than other-race faces in sequential compared to simultaneous lineups as it is previously found that in sequential lineups less false identifications are made than in simultaneous lineups (Lindsay & Wells, 1985; Sporer, 1993, 1994; Steblay, Dysart, Fulero, & Lindsay, 2001).

The effect of semantic information on the cross-race effect

There are several studies which have examined the effect of semantic information (i.e., stereotypical names) on participants' perceptions of the appearance of multiracial faces. Levin and Banaji (2006) found that multiracial (half African-American, half European-American) morphed faces that were simply labeled "White" were judged to have a lighter skin tone than multiracial faces labeled "Black". Hilliar and Kemp (2008) in their study asked Asian-Australian and European-Australian participants to rate the appearance of Asian-Australian faces given typically Asian names, European-Australian faces given typically European names, multiracial faces given Asian names, and multiracial faces given European names. Participants rated the multiracial faces given European names as looking significantly "more European" than the same multiracial faces given Asian names.

These results suggest that our perception of the appearance can be influenced by the non-physical racial cue like for example a person's name. According to Levin's (2000) "feature-selection" hypothesis, once people categorize a face as "other-race", they look for facial features which are consistent with that categorization but

consequently will not help individuate the faces. Therefore, if people categorize a face as “own-race”, their attention is focused towards individuating features of that face.

Based on these studies (Hilliari & Kemp, 2008; Levin & Banaji, 2006), it is examined in the present study whether the presence of semantic information (i.e. ethnically suggestive names) have an effect on the participants’ perception of multiracial faces. It is hypothesized that the presence of semantic information increase the accurate identification rate among own-race compared to other-race faces. Also, as there could be several nationalities within one country from one race, it is examined whether these stereotypical names have an effect on own-race face recognition. Namely, participants from the major nationality group will recognise better faces presented with stereotypical name from their own nationality compared to a minority living in the same country.

Method

Participants

The participants were young adults ($N = 234$) in a large city in Estonia. The total sample consisted of 103 male (44%) and 131 female (56%), age range from 16 to 19 years ($M = 17.44$, $SD = 1.02$). All participants spoke Estonian and were Caucasian; the nationality of the participants (Estonian or Russian) was not asked.

Materials

The non-target faces in the test set of faces were selected on the basis of “ratings of similarity of foils to the perpetrator” procedure used by Pigott and Brigham (1985). A pool of 32 photographs (16 own-race and 16 other-race faces) judged by the experimenter to be similar to the targets were rated by 46 mock witnesses whose task was to randomly choose someone out from the sixteen presented photographs. Own- and other-race faces which were very often or very rarely chosen were eliminated and not used. From both set of faces, own- and other-race, seven faces were chosen to the experiment, one as target, one as target replacement (for target-absent lineups), and five foils.

The original photographs including only the individual's head and shoulders were converted to grayscale and had a gray background. The first photo depicted the target person in a 3/4 profile pose and later in the lineups the second photo depicted the same person in a full-frontal pose (to avoid the situation where participants would recognise the same photo). All the people on the photos were dressed in black and had no facial hair, glasses, piercing or jewellery on them.

Procedure

The experiment was conducted as a part of their psychology lessons. The male experimenter entered a classroom where participants were together with their teacher and introduced himself. The participants were told that the experiment they are taking part in is about face recognition. First of all, participants were presented two photos on the same sheet of paper, one with Afro-American and the other with Caucasian stimulus face. The photos were shown for about 30 seconds.

For half of the participants, Caucasian face was presented on the left side and Afro-American face on the right side of the paper; and for the other half the Caucasian face on the right side and the Afro-American face on the left side of the paper. For some groups there were no stereotypical names for faces as for other groups there were either Estonian (i.e. Vahur) or Russian (i.e. Ilya) names on the Caucasian stimulus face and a foreign (i.e. Omar) name on the Afro-American stimulus face.

Then, the participants were handed a questionnaire which they had to fill out between the presentation of the "target" faces and the recognition test. Finally, participants were presented with two lineups (one concerning Afro-American and another concerning Caucasian faces) containing six stimuli faces for each set. The participants were told to identify the faces they saw earlier and that for each lineup the face may be or not be there. The lineups were constructed in a way that they had either target present or target absent condition among each set of the six faces (concerning target-present lineup the perpetrator and five foils or concerning target-absent lineups six foils). For some groups, simultaneous lineup and, for others, sequential lineup was used.

The faces were shown for 15 seconds each in the sequential lineup and for 15 seconds all the faces together in the simultaneous lineup. For each lineup, the participants had to write the number of the face they thought they saw or to indicate “not there” if none of the six faces look like the one of the targets. Also, confidence ratings on a ten point Likert scale with response options from not confident at all (one point) to very confident (ten points) were obtained.

Results

The proportions of correct identifications, false alarms and incorrect rejections in the target-present (TP) lineups and the proportions of correct rejections and false alarms in the target-absent (TA) lineups were computed. The analysis is focused mainly on differences concerning correct identifications and correct rejections with some references to the false alarm rates. First, information concerning the correct recognition of different race faces will be presented. Next, will be examined the effects of the different presentation methods (i.e. simultaneous or sequential) on accurate face recognition. Then, the effects of confidence on the face recognition will be presented. Finally, the effects of semantic information and different presentation methods are covered.

The effect of stimulus position

First of all, the effect of own- and other-race face identification accuracy concerning the position of the stimuli faces was analysed using the chi-square analysis (see Table 1). Results showed that the position of the stimuli (own-race faces right and other-race faces left or vice versa) had no effects on the recognition accuracy on own-race TP lineups, $\chi^2(2) = 1.74$, *ns*, $\phi = .10$, on own-race TA lineups $\chi^2(1) = .39$, *ns*, $\phi = .07$, on other-race TP lineups, $\chi^2(2) = .79$, *ns*, $\phi = .06$, and on other-race TA lineups, $\chi^2(1) = 1.92$, *ns*, $\phi = .13$.

Table 1. The effects of stimuli presentation method on own- and other-race face recognition in percentages.

			ID	FA	REJ
Own-race faces	TP	OWNL	62.9 (<i>n</i> = 39)	11.3 (<i>n</i> = 7)	25.8 (<i>n</i> = 16)
		OTHL	61.5 (<i>n</i> = 32)	19.2 (<i>n</i> = 10)	19.2 (<i>n</i> = 10)
	TA	OWNL	70.8 (<i>n</i> = 45)	29.2 (<i>n</i> = 19)	
		OTHL	65.5 (<i>n</i> = 36)	34.5 (<i>n</i> = 19)	
Other-race faces	TP	OWNL	32.8 (<i>n</i> = 21)	46.9 (<i>n</i> = 30)	20.3 (<i>n</i> = 13)
		OTHL	38.9 (<i>n</i> = 21)	38.9 (<i>n</i> = 21)	22.2 (<i>n</i> = 12)
	TA	OWNL	37.1 (<i>n</i> = 23)	62.9 (<i>n</i> = 39)	
		OTHL	50 (<i>n</i> = 26)	50 (<i>n</i> = 26)	

Note. TP – target-present lineup; TA – target-absent lineup; ID – correct identification in TP lineup or correct rejection in TA lineup; FA – false alarm; REJ – rejecting lineup; OWNL - own-race face presented left and other-race face right; OTHL - other-race face presented left and own-race face right.

Recognition of different race faces

Own- and other-race face recognition accuracy concerning TP and TA lineups is now analysed using chi-square analysis (see Table 2). For TP lineups own-race faces were more correctly identified than other-races faces (62.3% vs. 35.6%), $\chi^2(2) = 16.53$, $p < .001$, $\phi = .27$ and for TA lineups own-race faces were more correctly rejected than other-race faces (68.9% vs. 43%), $\chi^2(1) = 15.90$, $p < .001$, $\phi = .26$. It is worthwhile to note that the proportion of incorrect rejections in TP lineup was similar between own- and other-race faces; however, there were large differences in false alarm rates (14% vs. 43.2%). Interestingly, there were no differences in accurate recognition for own-race faces between TP and TA lineups, $\chi^2(2) = 1.13$, *ns*, $\phi = .07$, and for other-race faces, $\chi^2(1) = 1.33$, *ns*, $\phi = .08$, (i.e. persons in TP lineup were not recognised better than in TA lineup).

Table 2. The effects of target-present and target-absent lineups on own- and other-race face recognition in percentages.

		Lineup format	ID	FA	REJ
Own-race faces	TP		62.3 (<i>n</i> = 71)	14.0 (<i>n</i> = 16)	23.7 (<i>n</i> = 27)
	TA		68.9 (<i>n</i> = 82)	31.1 (<i>n</i> = 37)	
Other-race faces	TP		35.6 (<i>n</i> = 42)	43.2 (<i>n</i> = 51)	21.2 (<i>n</i> = 25)
	TA		43 (<i>n</i> = 49)	57 (<i>n</i> = 65)	

Note. TP – target-present lineup; TA – target-absent lineup; ID – correct identification in TP lineup or correct rejection in TA lineup; FA – false alarm; REJ – rejecting lineup.

Effect of different presentation methods on face recognition

Next, own- and other-race face recognition accuracy concerning the simultaneous and sequential presentation methods is analysed using chi-square analysis (see Table 3). Concerning own-race faces, there was a significant effect for TP lineup, namely own-race faces were more correctly identified in simultaneous compared to sequential presentation method, $\chi^2(2) = 6.72, p < .05, \phi = .20$. Remarkably, false alarm rates between simultaneous and sequential presentation method were similar but incorrect rejection rates were larger for sequential presentation method (33.3% vs. 15%). However, significant effect did not occur for the TA lineup, $\chi^2(1) = .37, ns, \phi = .07$.

For recognition of other race-faces chi-square analysis indicated statistical difference for TP lineup, namely other-race faces were significantly less correctly identified with sequential than with simultaneous presentation method, $\chi^2(2) = 15.95, p < .001, \phi = .36$. The incorrect rejection rates were identical (21.2%), whereas with sequential presentation method more false alarms were made than by using simultaneous presentation method (61.5% vs. 28.8%). For TA lineup, there were no differences in correct rejections between sequential and simultaneous presentation method, $\chi^2(1) = 1.48, ns, \phi = .11$.

Table 3. The effects of simultaneous and sequential presentation method on own- and other-race face recognition in percentages.

			ID	FA	REJ
			%	%	%
Own-race faces	TP	SIM	68.3 ($n = 41$)	16.7 ($n = 10$)	15.0 ($n = 9$)
		SEQ	55.6 ($n = 30$)	11.1 ($n = 6$)	33.3 ($n = 18$)
	TA	SIM	70.6 ($n = 48$)	29.4 ($n = 20$)	
		SEQ	65.4 ($n = 34$)	34.6 ($n = 18$)	
Other-race faces	TP	SIM	50 ($n = 33$)	28.8 ($n = 19$)	21.2 ($n = 14$)
		SEQ	17.3 ($n = 9$)	61.5 ($n = 32$)	21.2 ($n = 11$)
	TA	SIM	48.3 ($n = 29$)	51.7 ($n = 31$)	
		SEQ	37 ($n = 20$)	63 ($n = 34$)	

Note. TP – target-present lineup; TA – target-absent lineup; SIM - simultaneous presentation method; SEQ – sequential presentation method; ID – correct identification in TP lineup or correct rejection in TA lineup; FA – false alarm; REJ – rejecting lineup.

When the correct identifications of own- and other-race faces were compared between different presentation methods, then the following effects occurred. In TP lineups, own-race faces were more correctly identified than other-races faces in both

simultaneous presentation method, $\chi^2(2) = 4.36$, $p < .05$, $\phi = .19$, and in sequential presentation method, $\chi^2(2) = 16.66$, $p < .001$, $\phi = .40$. In TA lineups, also own-race faces were more correctly rejected than other-races faces for simultaneous presentation method, $\chi^2(1) = 6.59$, $p < .01$, $\phi = .23$, and for sequential presentation method, $\chi^2(1) = 8.52$, $p < .01$, $\phi = .28$.

Table 4. The effects of confidence on own and other-race face recognition (means and standard deviations).

	Lineup format	ID	FA	REJ
Own-race faces	TP	6.91 (2.56)	5.50 (2.42)	7.33 (2.73)
	TA	7.46 (2.71)	6.52 (2.33)	
Other-race faces	TP	6.28 (2.43)	5.51 (2.85)	5.64 (2.71)
	TA	6.27 (2.79)	5.71 (2.67)	

Note. TP – target-present lineup; TA – target-absent lineup; ID – correct identification in TP lineup or correct rejection in TA lineup; FA – false alarm; REJ – rejecting lineup.

Confidence and recognition

The effect of confidence ratings on face recognition accuracy was analyzed with two-way ANOVA (see Table 4). No significant effects occurred for own-race TP lineup, $F(2,111) = 3.97$, *ns*, $\eta^2 = .027$, for own-race TA lineup, for $F(1,118) = 3.37$, *ns*, $\eta^2 = .028$, for other-race TP lineup, $F(2,115) = 1.04$, *ns*, $\eta^2 = .018$, and for other-race TA lineup, $F(1,112) = 1.17$, *ns*, $\eta^2 = .010$.

Table 5. The effects of semantic information on own- and other-race face recognition in percentages.

			ID	FA	REJ
			%	%	%
Own-race faces	TP	NONAME	58.1 ($n = 25$)	11.6 ($n = 5$)	30.2 ($n = 13$)
		EST	62.9 ($n = 22$)	14.3 ($n = 5$)	22.9 ($n = 8$)
		RUS	66.7 ($n = 24$)	16.7 ($n = 6$)	16.7 ($n = 6$)
	TA	NONAME	73.2 ($n = 30$)	26.8 ($n = 11$)	
		EST	70.7 ($n = 29$)	29.3 ($n = 12$)	
		RUS	60.5 ($n = 23$)	39.5 ($n = 15$)	
Other-race Faces	TP	NONAME	30.0 ($n = 12$)	47.5 ($n = 19$)	22.5 ($n = 9$)
		FRGN	38.5 ($n = 30$)	41.0 ($n = 32$)	20.5 ($n = 16$)
	TA	ILMA	37.2 ($n = 16$)	62.8 ($n = 27$)	
		FRGN	46.5 ($n = 33$)	53.5 ($n = 38$)	

Note. TP – target-present lineup; TA – target-absent lineup; NONAME – no ethnically suggestive name present; EST – Estonian name present; RUS – Russian name present; FRGN – foreign name present; ID – correct identification in TP lineup or correct rejection in TA lineup; FA – false alarm; REJ – rejecting lineup.

The effect of semantic information

Now the own- and other-race face recognition accuracy regarding the effect of semantic information is analysed using the chi-square analysis (see Table 5). For the recognition of own-race faces, there were no significant differences in the recognition of faces with Estonian or Russian stereotypical name (i.e. faces with Estonian name were not recognised more accurately than faces with Russian name or no name at all) for TP lineup, $\chi^2(4) = 1.71$, *ns*, $\phi = .05$, and for TA lineup, $\chi^2(2) = 1.62$, *ns*, $\phi = .10$. Concerning the recognition of other-race faces there were also no effects regarding stereotypical foreign name for TP lineup, $\chi^2(2) = .84$, *ns*, $\phi = .05$, and for TA lineup, $\chi^2(1) = .94$, *ns*, $\phi = .11$.

Discussion

The main focus of this study was to examine the effects of semantic information and different presentation methods on multi-ethnicity target recognition accuracy. Three main findings emerged.

First, a significant cross-race effect was observed. As hypothesized, own-race faces were more accurately recognised in the TP presentation and more correctly rejected in the TA presentation than the other-race faces. These findings are in line with Kask and Bull (2009) who found also that other-race faces were less correctly rejected than own-race faces. The proportion of incorrect rejections in TP lineup was similar between own- and other-race faces but there were large differences in false alarm rates. Thus, previous results in the field are confirmed indicating the presence of cross-race effect in different race face recognition (Meissner & Brigham, 2001; Sporer, 2001).

Second, effects between different presentation methods occurred. Namely, the correct identification rate in TP lineups (but not in TA lineups) was higher in both own- and other-race faces using simultaneous than sequential presentation. It could be that especially for other-race faces using simultaneous presentation makes the recognition process much easier for the participants compared to sequential presentation method. Hence, earlier research have stated that the sequential presentation methods may reduce the false identification rates for TA lineups (Lindsay & Wells, 1985; Sporer, 1993, 1994; Steblay, Dysart, Fulero, & Lindsay, 2001) which did not happen in the current

study. Our findings indicate that own-race faces were recognised better in simultaneous TP lineup (where correct identification rate was higher for simultaneous than for sequential presentation method). In own-race TP lineup, the false alarm rates between simultaneous and sequential presentation method were relatively similar, whereas incorrect rejection rates were larger for sequential presentation method. However, in other-race TP lineup, incorrect rejection rates were similar whereas more false alarms were made in sequential presentation method than in using simultaneous presentation method. It could be that when two different ethnicity faces are presented together and later recognised, then simultaneous presentation method is more effective in some domains in recognising other-race faces. However, more research should be done when examining this notion more closely.

Third, no significant differences between the recognition of faces with stereotypical names were found. Several studies (Hilliar & Kemp, 2008, Levin & Banaji, 2006) have indicated that semantic information (i.e. stereotypical names) has effect on participants' perceptions of the appearance of multiracial faces. However, there were no effects of stereotypical names on the recognition of own- and other-race faces in our study. This may indicate that although own- and other-race faces are processed differently, correct identification of faces is depending on the ability to process faces regardless of other information which may be presented together with the faces. Namely, the cognitive processes of encoding visual (e.g. faces) and semantic (e.g. names) are different, which is in line with the previous proposition of Chance and Goldstein (1981) who stated that own-race faces are processed at a deeper level than other-race faces. As a limitation in our study, the nationality of the participants was not asked, so there may have been participants of Russian origin in addition to the participants of Estonian origin and this may have caused that there were no effects of stereotypical names present.

In conclusion, the current study provides some new and yet contradictory information on the recognition of multi-ethnicity faces presented together to the participants. We found support to the existing literature concerning the cross-race effect and our analyses indicated that other-race faces were more correctly rejected in simultaneous than in sequential presentation method. However, there is more research needed to examine more thoroughly the effects of semantic information on the

recognition of different races faces. It can be concluded that the recognition process of perpetrators from different ethnicities creates difficulties and the culprit who is from different ethnicity than the witness will be more likely falsely identified compared to the one from the same ethnicity.

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