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Discrimination of faces of the same and other race and gender modulated by familiarity

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This study aimed to replicate, for the first time on Serbian population, the own-race bias (ORB), a classical effect from the face perception domain. The ORB was additionally contrasted with familiarity and the own-gender bias (OGB).

Recognition accuracy for own race faces was higher in comparison both to African (Z=3.29, p<0.01) and Asian faces (Z= 2.59, p<0.01). The introduction of famous faces led to a significant drop in the ORB. However, in all of the conditions a “seen before” effect was measured, suggesting better recognition for own race faces, independent of familiarity.

The OGB was obtained for own-race faces (χ^2(28, 7) = 119, 34 p <0, 05), while there were no differences in recognition accuracy between the own and the other-race faces of the other gender. These results imply that the ORB could be explained, at least partially, by the OGB. However, these results were obtained on an exclusively female sample.

Keywords: *face perception, the own-race bias, the other-race effect, the own-gender bias, familiar faces*

Face recognition ability and impressive memory for faces (for latest review see Bruce & Young, 2012) allow us to function appropriately in society and to successfully interact with other people. Just by looking at someone’s face, we can obtain important information about their age, gender, race, as well as infer information about their mood and future actions. The information we “learn” from someone’s face determines our future behavior (for example, to interact with them or to avoid them).

Two types of findings suggest a special status for faces in our visual perception and cognition: clinical reports and fMRI studies on normal population. There is a disorder, called prosopagnosia, targeting exclusively perception of faces. Prosopagnosia represents a loss of face recognition while ability to recognize other (complex) visual stimuli may stay intact (Behrmann & Avidan, 2005). Another important line of evidence supporting the uniqueness of face perception comes from fMRI studies. This work has indicated the existence of a specialized brain area, FFA (fusiforme face area) that is significantly more active when participants are exposed to faces (Kanwisher et al., 1997). The activity of this area is even higher when viewing faces of one's own race (Golby et al., 2001). This highlights an important issue. Namely, though it seems that this form of perception works both perfectly and effortlessly – still there are situations when it could be improved. It seems that we are systematically better in recognition of particular faces, those that belong to the members of our own group (race, gender, age, etc).

Our research investigates the own-race bias (ORB), the own-gender bias (OGB) and familiarity. Although these effects have been established in a number of studies, they were never tested on Serbian population. Face perception phenomena are indeed general psychological phenomena, yet they also contain socially and culturally susceptible effects. Hence, there are certain particularities of any specific culture that might modulate the general effect in an informative way. Finally, previous studies have typically considered these phenomena (ORB or OGB or familiarity, etc.) in isolation, while we would like to test these phenomena together, gaining better insight into their relationship.

OWN-RACE BIAS (ORB)

The own-race bias (cross race effect, other race effect, non-native effect) manifests as faster and more accurate processing of own race faces. A number of studies have shown that the confidence–accuracy relationship was the strongest when making own-race judgments (Wright et al., 2003; Meissner & Brighman, 2001).

The Contact Hypothesis, initially introduced in social psychology (Allport, 1954), is one of the most influential explanations for better recognition of own-race faces. The occurrence of the ORB is moderated by quantity and/or quality of contacts (interactions) with members of other racial groups (Meissner et al., 2005). Participants that had numerous contacts with people from other races exhibited an own-race bias less frequently and the difference between recognition of own race and other-race faces was reduced (Lindsay, 1991; Tanaka et al., 2004; Wright et al., 2001; Wright et al., 2003).

However, other findings only partially support the contact hypothesis. Chiroro and Valentine (1995) showed that participants with fewer interactions with other race members manifest the ORB while for the participants with numerous interactions results were not consistent. Caucasian students exhibited the ORB while African students did not. Similarly, Walker and Tanaka (2003) showed that Asian subjects with fewer contacts with Caucasians were almost equally unsuccessful in the recognition of faces of both races. On the other hand, subject with more contact were generally good in face processing, independently of race.

All together, these results suggest that the quality of interaction with other race members is more important than the quantity. If there is no need for identification and recognition on the individual level, a large number of interactions with other race members will not necessarily lead to more successful recognition of other-race faces (MacLin & Malpass, 2001).

The Multidimensional Face Space Model provides an explanation for various face processing phenomena and suggests one possible mental representation for faces. According to this model, faces are encoded based on different relevant dimensions. These dimensions form a space in which individual facial exemplars can be located. The exact number of dimensions is not known, but it is assumed that the number of dimensions must be large enough to represent any aspect of faces that could help identification of any particular face (Valentine, 2001). When we see a new face, characteristics of that face are located to the nearest example on the dimension that best represents this face. If the new face were distinctive, there would be only a few similar facial exemplars (Valentine, 1991). Facial exemplars of distinctive faces are clearly separated from other exemplars in the face space and they are less likely confused with other faces. During processing of those faces more *hits* and fewer *false alarms* occur (Valentine, 1999).

Repeated exposure to certain faces (e.g. members of our group) leads to learning of the dimensions that represent both temporary and permanent facial features of members of this specific group (Corenblum & Meissner, 2006). The majority of people have most experience with members of their own race, leading to generation of dimensions that are optimal for distinguishing own group faces. Dimensions extracted from experience with own race members might not be relevant for the processing of faces from other races. That is, such dimensions only allow differentiation of members within (own) group or groups with whom we have the most contacts. Therefore, other-race faces are usually coded with less relevant, individual information, and consequently, they are grouped closer in the multidimensional face space. Accordingly, the recognition "expertise" for own race cannot be generalized to other-race faces (Chiroro & Valentine, 1995; Valentine, 1991; Valentine & Endo, 1992). Additionally, multidimensional scaling has shown that own-race faces and other-race faces make up two distinct clusters, where the cluster of the other-race faces is more densely grouped (Byatt & Rhodes, 2004).

This brief review of previous studies and models indicates a wide inconsistency of results, as well as a lack of answers to some general questions. We were hoping that the unique structure of the Serbian population would allow us to put the described models under scrutiny. Namely, the population mostly consists of Caucasian. The number of African living in Serbia is extremely small while Asians are slightly more numerous. However, there is a constant media exposure to African faces (movies, sport, and music). Our idea was to compare an effect of two different types of interaction: *direct* (in real life) and *indirect* (via media). The opportunity to see other-group members should not lead to better identification if there was no motivation to encode these faces on an individual level. Similarly, despite the fact that our participants have no direct interaction with celebrities, they possess enough information that facilitates correct identification. This is due to the fact that they see famous people in various situation and context and they usually have no problem to make distinction between two or more famous people. This is in sharp contrast with identification of particular member of other-race group. To summarize, we do not claim that direct contact does not enhance recognition of other-race members but only this factor is not sufficient if there is no motivation for encoding other-race faces at the individual level. Currently, in Serbian subculture as a consequence of poor integration of Chinese people into Serbian society, opportunities to see other-group members will not lead to improvement in face recognition.

OWN-GENDER BIAS (OGB)

The own gender bias refers to higher speed and accuracy in identifying faces of one's own gender. The majority of studies found the OGB only for female participants. Participants regardless of their gender, have almost the same recognition accuracy for male faces while female participants were better in recognition of female faces. The male participants were equally good in recognition of both female and male faces (Slone et al., 2000; Lewin & Herlitz, 2002). Wright (2003) however, demonstrated the OGB for both, female and male participants.

There are only a few studies that examined the ORB and the OGB together. In the study of Rehnman and Herlitz (2006) all children manifested the ORB while the OGB was measured only for girls.

It is important to point out the distinction between the gender of the presented faces (facial stimuli that are used in some particular study) and the gender of participants. While previous studies clearly demonstrated the OGB for female participants only few of them obtain same results for male participants. Due to the fact that we wished to compare the two types of bias (ORB and OGB), we decided to include only female participants in our sample, which would potentially allow us to measure both phenomena.

THE EFFECT OF FAMILIARITY ON FACE RECOGNITION

Recognition of familiar faces refers to (1) recognition of personally familiar faces (e.g., family, friends, neighbors, etc.), (2) recognition of famous faces (celebrities such as actors or musicians) but also (3) recognition of previously unfamiliar faces, which were only learned in the first, learning phase, of an experiment. These faces are usually presented as photographs and the task is to decide whether participants recognize the person in the photograph. Previous studies demonstrated faster and more accurate recognition of all mentioned types of familiar faces (Bruce et al., 2001; Bruce & Young, 2012) even when the quality of photographs was greatly reduced (Burton et al., 1999).

Recognition of unfamiliar faces is typically a decision whether a face was previously shown in the experiment's learning phase.

Here we also used such standard old/new paradigm in our experiments. In the first experiment we showed unfamiliar faces in the learning phase and proceeded to the recognition task. In the second experiment we tested recognition of celebrities. Unlike most of the previous studies we took into account both, the gender and the race of familiar faces, and we examined these effects trying to determine their relation.

EXPERIMENTS 1a AND 1b

Method

Participants: Thirty Caucasian female undergraduates from the Department of Psychology, University of Novi Sad, participated in the experiments; 15 in Experiment 1a and 15 participants in Experiment 1b. They received course credit for their participation.

Stimuli: 80 color photographs of African and Caucasian adults (Experiment 1a) and 80 photographs of Asian and Caucasian adults (Experiment 1b) were used. Each photograph contained only the head and shoulders of the depicted person. There were no photographs showing people with unusual facial expressions, eyeglasses or any additional details, which might have facilitated face memory and consequently face recognition. Out of the 80 presented faces, 20 were African (or Asian in Experiment 1b) males, 20 were African (or Asian) females, 20 Caucasian males and 20 Caucasian females. Pictures of unfamiliar Caucasian and African faces were chosen from the Center for Vital Longevity Face Database (Minear & Park, 2004). Pictures of Asian faces were chosen from TFEID (Taiwanese Facial Expression Image Database; Li-Fen & Yu-Shiuan, 2007). All photographs (300 by 400 pixels) were modified in Adobe Photoshop in order to obtain identical size and background color (gray color – "PANTONE 420C").

Experimental program Super Lab Pro software for Windows 2.0 was used for stimuli presentation and recording of responses.

Procedure: Participants were tested individually in the old/new recognition paradigm. In the first part of the experiment, 40 photographs of faces were presented on the computer screen. Each stimulus was present for 2 seconds followed by a 1 second inter-stimuli interval. Participants were instructed to observe these faces carefully as they would be answering questions about them in the second part of the experiment. In the second part of the experiment, the 40 photographs presented before (i.e. old) were randomly mixed with the 40 new photographs (i.e. new). The task was to indicate the faces that have been shown previously by pressing designated key on a standard keyboard. There was no additional retention period between the two parts of experiment, second part followed immediately upon the completion of the first part.

Experimental design: The independent variable was a race with two levels (Caucasian and African in Experiment 1a and Caucasian and Asian in Experiment 1b).

The dependent variable was accuracy A`, a nonparametric analogue of d`. Values of A` were derived from the computational formula shown below (Snodgrass & Corwin, 1988):

$$A' = 0{,}5 + [(H - FA)(1 + H - FA)] / [(4H(1 - FA)]$$

Hits (H) represent "yes" responses to already presented items (i.e. old), while false alarms (FA) are "yes" responses to previously not presented items (i.e. new).

Slone et al.(2004) showed that the ORB could result in a "seen before" effect for other race faces. This "seen before" effect is manifested as a higher number of false alarms for other – race faces. Hence the two measures explain part of the phenomena independent of overall A', and therefore we also included them into analysis. In fact we used corrected hits and false alarms (Snodgrass & Corwin, 1988):

$$H = \frac{H + 0.5}{old + 1} \quad FA = \frac{FA + 0.5}{new + 1}$$

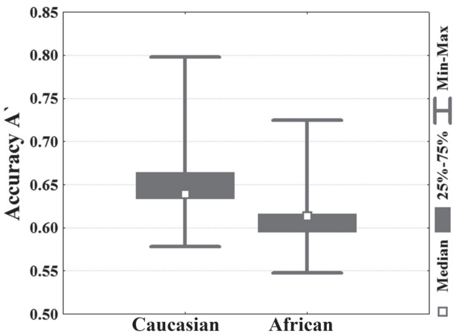
Results of Experiments 1a and 1b

The own-race bias analysis

This analysis compares recognition performance for faces of own and other-race.

Accuracy (A`)

We calculated recognition accuracy for Caucasian and African or Asian faces based on hits and false alarms for every subject. Values of A` were between 0 and 1 (1 is perfect recognition). Wilcoxon matched pairs test (for dependent samples), used to establish the difference in recognition accuracy for faces of own and other-race, was statistically significant (Z=3.29 $p<0.01$ Experiment 1a; Z= 2.59 $p<0.01$ Experiment 1b). In both experiments, participants were more successful when recognizing Caucasian faces, i.e. faces of their own race (figure 1).



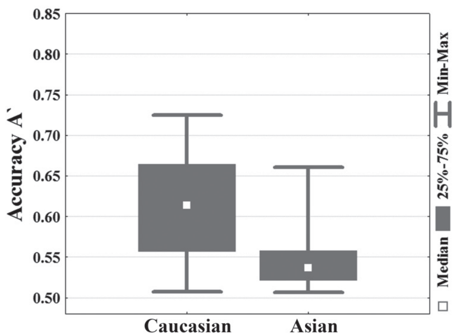


Figure 1. *Recognition accuracy in Experiment 1a on the left and Experiment 1b on the right*

Analysis of Hits and False alarms

Analysis of the proportion of hits did not show a significant effect for race in either of the two experiments showing that the observers are equally good in recognizing "old" photographs independent of race. This suggests that the difference in accuracy must come from misclassification of new photographs.

False alarm analysis showed a significant difference between own and other-race faces (Z=2.38 $p<0.01$ in Experiment1a; Z=2.57 $p<0.05$ in Experiment 1b). In both experiments a higher proportion of false alarms for other-race faces was obtained (figure 2).

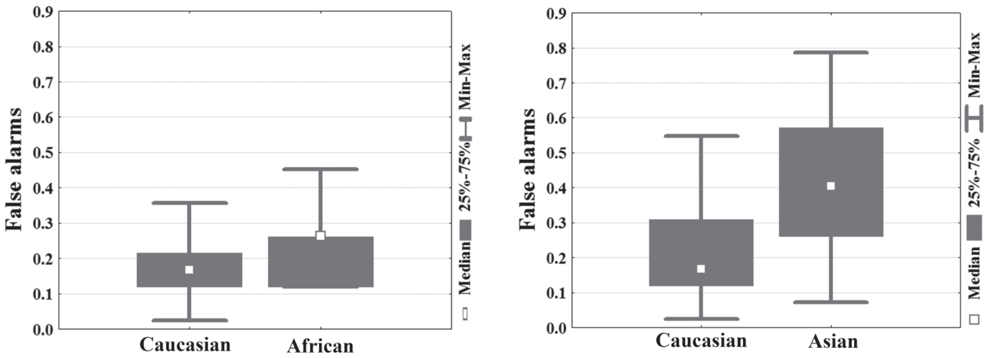


Figure 2. *False alarms in Experiment 1a on the left and Experiment 1b on the right*

The own gender bias analysis

While the ORB analysis compares recognition accuracy between own-race and other-race faces, analysis of the OGB, traditionally, takes into account a comparison of recognition accuracy between own-gender as well as other gender faces. Here we extended the analysis of OGB to include both the gender of facial stimuli as well as the race of facial stimuli used in our experiments. This allowed us to test potential relation between two types of biases: the OGB and the ORB.

Accuracy (A`)

We used Friedman's ANOVA to analyze differences in recognition accuracy of faces of different races and gender.

In Experiment 1a difference in recognition accuracy of Caucasian and African females and males did not reach statistical significance. However, the obtained trends of results are the same as those that will be presented for Experiment 1b.

In Experiment 1b differences between recognition accuracy for Caucasian and Asian female and male faces were significant ($\chi^2(15, 3) = 11, 71$ $p<0, 05$; Figure 3).

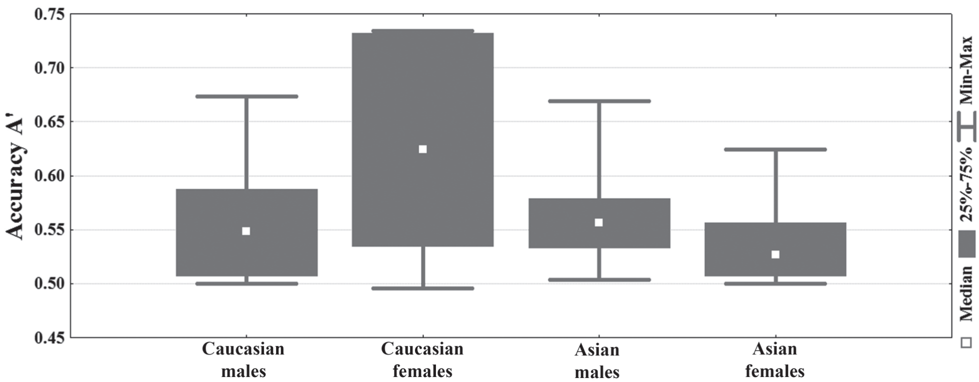
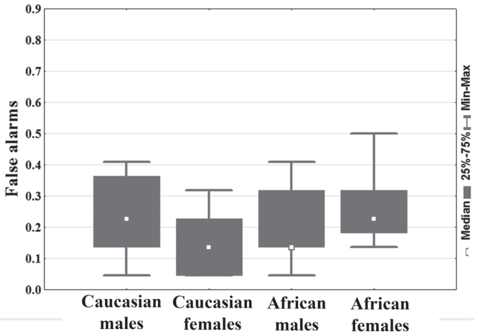


Figure 3. *Recognition accuracy in Experiment 1*

Wilcoxon Matched Pairs Test (for dependent samples) was used for further analysis. Recognition accuracy for Caucasian female faces was significantly better than Caucasian males ($Z=2.76$ $p<0.01$), but also better than Asian females ($Z=2.89$ $p<0.01$), and Asian males ($Z=2.32$ $p<0.05$). However, dispersions of results for Caucasian female faces were considerably larger than for other categories. There was no difference in recognition accuracy between Caucasian and Asian male faces. Finally, there was a difference between Asian males and females in unexpected direction: Asian male faces were recognized significantly better ($Z=1.98$ $p<0.05$).

Analysis of Hits and False Alarms

There was no difference in hits, regarding the different gender and race. However in both experiments, there were significant differences in false alarms ($\chi^2(12.3) =10, 86$ $p<0.05$ Experiment1a; $\chi^2(15, 3) = 16,31$ $p<0.05$ Experiment 1b; Figure 4).



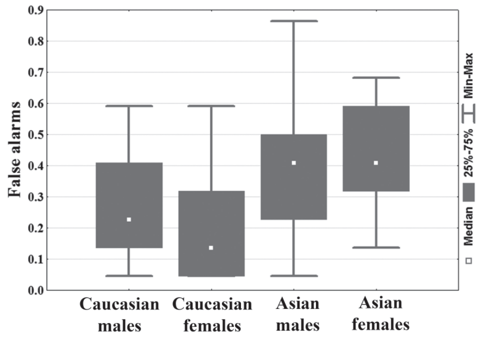


Figure 4. *False alarms in Experiment 1a on the left and Experiment 1b on the right*

Generally, there were the same trends in both experiments. In Experiment 1a there were significant differences in the number of false alarms between Caucasian females and Caucasian males, as well as between Caucasian females and African females. False alarms for Caucasian females occur less frequently. On the contrary, there was no difference between Caucasian females and Caucasian males regarding the false alarms in Experiment 1b. Similarly to Experiment 1a, in Experiment 1b, false alarms for Caucasian females occur less frequently than for Asian faces. False alarms for Asian female faces are significantly higher than false alarms for Caucasian males. It is interesting that there was no difference between the unfamiliar male faces whether they are own or other – race, while there was a difference for female faces. False alarms occur more often for other – race faces.

EXPERIMENT 2

Correct identification of some particular face is enhanced when that face belongs to one's own group (own-race faces or own-gender faces) as previous experiment demonstrated. However, there is yet another group of faces which has special, favorable status: familiar faces. Such would be the faces of people with whom we have numerous interactions or we are often exposed to.

In our second experiment, we wanted to contrast factor of familiarity to the ORB. This is not usually done, as it is assumed that familiar faces are processed on individual level and cannot additionally benefit from belonging to the observers' gender, race or age group. We wanted to test this well established idea and our rational was that the results would allow us to distinguish between the two types of experience and/or learning: (1) one so general, that creates dimensions in Multidimensional face space and (2) the other, so specific, that defines the level of familiarity for a particular face. The ORB would be in the former group and familiarity in the latter.

We also included gender as a factor. Previous studies (Slone et al., 2000; Lewin & Herlitz, 2002), as well as our research, have shown that gender plays an important role in correct recognition of unfamiliar faces.

In sum, following experiment would allow us to test whether the benefits of familiarity, the ORB and the OGB could be cumulative. Namely, in our experimental set up the question would be: are famous Caucasian women recognized with the highest accuracy?

In Experiment 2 we used Caucasian and African faces, although Experiment 1a and 1b suggested more pronounced difference in recognition of Caucasian and Asian faces. This decision was dictated by the results of Pilot study, performed on an independent group of students (coming from the same population as our subjects). These students were asked to rate the familiarity of famous Caucasian, Asian and African faces. The photographs represented faces of famous people such as actors, musicians, politicians, sportsmen and other celebrities. The pilot reveled that our students were familiar with only a very limited number of famous Asian people. This number was not large enough to produce the stimuli set for Experiment 2. On the contrary, usage of African faces enabled us to equate familiarity for different groups of stimulus faces.

Method

Participants: Participants were 30 Caucasian female undergraduate students from the Department of Psychology, University of Novi Sad. None of them took part in Experiment 1. They received course credit for their participation.

Stimuli: We used 104 (head and shoulder) color photographs of African and Caucasian famous and unfamiliar people. Photographs of famous people were downloaded from Internet. Particular celebrities have been chosen based on the results from Pilot study. Pictures of unfamiliar Caucasian and African faces have been taken from the Center for Vital Longevity Face Database (Minear & Park, 2004). All photographs were modified in the same way as in Experiment 1.

Experimental design: There were three repeated factors: (1) race with two levels (Caucasian and African), (2) familiarity with two levels (famous and unfamiliar faces) and (3) gender with two levels (females and males).

Procedure and Instruments: Procedure and instruments were the same as in Experiment 1. The only difference was categorization of the faces that were divided into eight groups in accordance to 3 factors with 2 levels.

Results of Experiment 2

Accuracy (A`)

We used Friedman's ANOVA to analyze difference between the groups. Results showed the difference in processing faces regarding race, gender and familiarity ($\chi^2(28,7)=119,344 p<0,05$; figure 5).

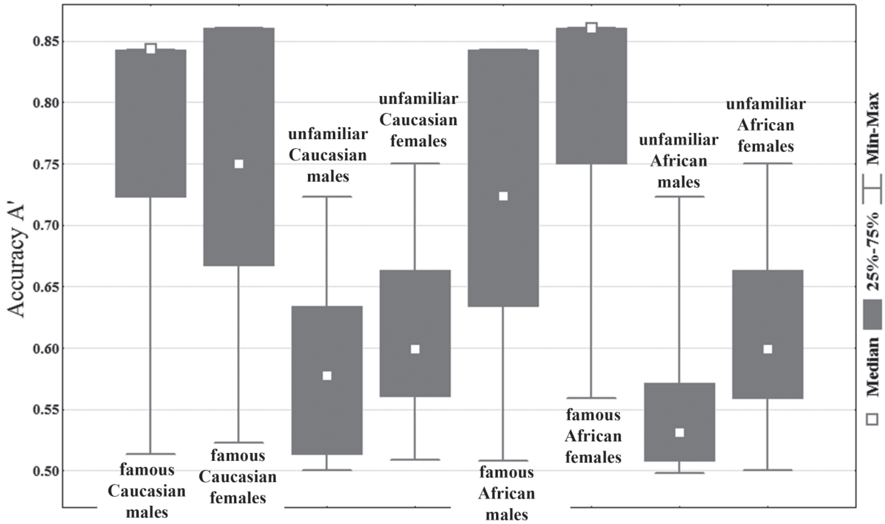


Figure 5. *Recognition accuracy in Experiment 2*

We used Wilcoxon Matched Pairs Test for further analysis. Our main interest was results for famous faces. Famous Caucasian faces of both genders were equally processed, showing no OGB. But, there was a difference in recognition accuracy between famous African female and male faces, exhibiting OGB ($Z= 2.83$ $p<0.05$). This difference overall means that there is the ORB, since the same gender contributes for other race but not own when recognizing famous faces. It seems that famous face could still benefit from gender or race but then the accuracy is so high that it is not possible to measure both the ORB and the OGB for famous faces.

Results for unfamiliar faces were mostly repetition of the results obtained in Experiment 1. We measured both the ORB and the OGB (for which effects were stronger than in Experiment 1a and reached significance $Z=2.25$ $p<0.05$). Unfamiliar Caucasian male faces were processed with more success than unfamiliar African male faces ($Z=2.6$ $p<0.01$). But the picture is complicated, as for example there was no difference between unfamiliar Caucasian male and unfamiliar African females. Further, unfamiliar female Caucasian faces were recognized more accurately than unfamiliar African male faces ($Z=3.75$ $p<0.01$) but there was no difference between unfamiliar Caucasian and African females.

In sum, OGB was present for all but famous own race, familiarity always increased the accuracy, and own race additionally modulated the accuracy.

Analysis of Hits and False Alarms

Analysis of hits showed that there was a difference in recognition of faces of different gender, race and familiarity ($\chi^2(27, 7) = 105{,}78$ $p<0{,}05$). Generally, famous faces were recognized more successfully (figure 6).

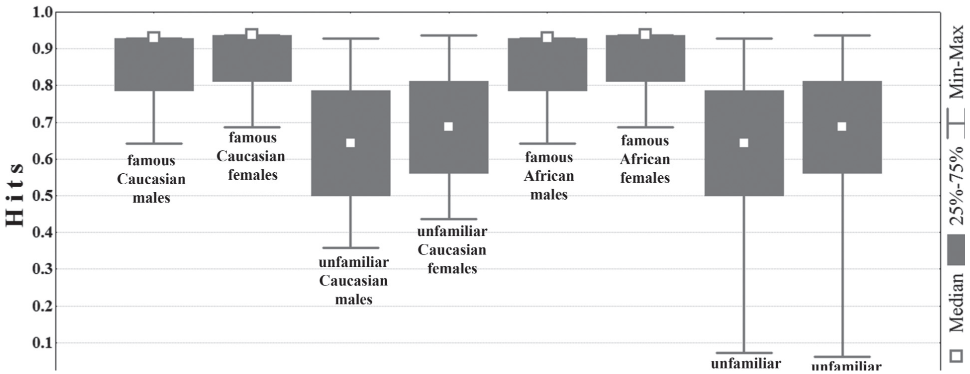


Figure 6. *Hits in Experiment 2*

Analysis of false alarms showed that there was a significant difference between groups ($\chi^2(27.7) = 76, 42$ $p<0, 01$). False alarms occur less frequently for celebrities (figure 7). The larger number of false alarms occurs during processing of unfamiliar African male faces and then Caucasian male faces. There were significant differences between unfamiliar Caucasian females and males, regarding the number of false alarms ($Z=3.6$ $p<0.01$). False alarms were less frequent during processing faces of Caucasian females, which is consistent with results from Experiment 1a. The same trend occurs for unfamiliar African female and male faces: there were a larger number of incorrect identifications for African male faces ($Z=4.12$ $p<0.01$). Another result from Experiment 1a was repeated: there was no difference in false alarms for unfamiliar male faces regarding race. Interestingly, there was also no difference between the unfamiliar female faces of own and other-race in relation to the occurrence of false alarms.

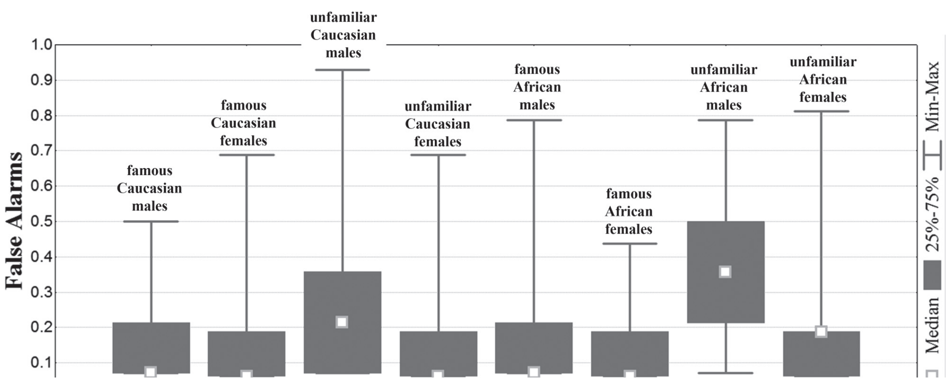


Figure 7. *False alarms in Experiment 2*

DISCUSSION

This study integrates and jointly tests several important phenomena that produce the same behavioral effects – higher speed and accuracy in face processing. In two experiments we tested the effects of the ORB, the OGB and familiarity. The ORB and the OGB represent a dominant experience with a certain subcategory (own race or own gender) while familiarity tests the position of a particular, prominent member of other subcategory (other-race/gender celebrity face).

The multidimensional face space model (Valentine, 2001) suggests the existence of dimensions that are crucial for correct face-identification. Importantly, in the current context this model also proposes more dimensions and better resolution for own group faces. The extreme examples are familiar faces. They are so prominent in this model as they are likely to be exemplars that help determine the structure and dimensions of the face space (Valentine & Endo, 1992). The question remains how and where are the celebrity faces of other race positioned in this space? What does it mean to be processed so accurately on an individual level when the dimensions for other race are few and crude in that mental face-space?

Experiment 1 replicated a well-documented race perception bias (Walker & Tanaka, 2003), but for the first time using a Serbian population. Our participants were much better in recognition of African faces (Experiment 1a) than Asian faces (Experiment 1b) We also observed the „seen before“ effect, measured as a greater number of false alarms for other-race faces. The interpretation of the effect is poor individuation among the other race members, leading to an impression that the particular face was already seen. Therefore, not only that the accuracy for own race is better, but the discrimination for the other race is worse.

A similar in-group vs. out-group perceptual phenomena is the OGB. The OGB has been less clearly demonstrated in the published literature (Cellerino et al., 2004). For this reason, in our study we chose the population that usually shows this bias, i.e. female population. In such conditions we obtained the OGB for own race but mixed results for other races. Specifically, it was not present for African faces and was in inverse direction for Asian faces. However in the second experiment the effect was more consistent and present both for own race and African faces. This inconclusive result appears to be in line with the rest of the literature, reflecting a relatively unstable phenomenon easily affected by other factors. To remind, Rehnman and Herlitz (2006) demonstrated that girls were showed OGB for both own-race as well as other-race faces while boys recognize equally well own-race faces of both gender, and they were better in recognition of female other-race faces. Additionally, study on the infants (Quinn et al., 2008) found that newborns did not show preference for faces of some particular gender and/or race. However, 3 months old infants have shown a preference for female faces of own race (Caucasian). OGB for other-race faces

(Asian) was not found. Another possibility is that the general Serbian population might be somewhat more exposed to Asian male than female faces, inverting the measured OGB.

Some previous studies have also analyzed results of the OGB in terms of signal detection theory. Shapiro's and Penrod's meta-analysis (1986, by Wright, 2003) demonstrated a bias for accurate identification of previously shown faces (hits), but not for correct rejection of faces that were not previously shown. In contrast, in Wright's study (2003), there was a bias regarding false alarms. Wright (2003) showed the occurrence of the OGB in hits as well in the number of false alarms. In our study, we only obtained differences in false alarms. This difference in results might well be a consequence of differences in experimental procedure. Although we also used old-new task, in our experiments, the second part of the experiment immediately followed the first, so there was no activity between the two sessions. Such a procedure could lead to a greater success in the recognition task, which could manifest as a higher total number of correct answers. This explanation is applicable to our results, because our participants showed very high overall accuracy.

Replication of standard literature findings (Rehnman & Herlitz, 2006) on our population enabled us to ask the question about the organization of face-space in Experiment 2. We introduced famous African faces, evaluating their position in the face-space. Would famous other-race faces be grouped in the center of the multidimensional space (like famous own-race faces)?

We measured a complex interplay of the three factors, showing that familiarity could be modulated by out-group biases. There is a difference in accuracy among famous own-race and other-race male faces. That means that even a famous face would benefit from the same race, especially when it is of the other gender. Famous African females had a benefit of the same gender and therefore higher accuracy was measured. But, when the famous faces already are of the same race, than there are no measurable extra effects of gender. Hence, there was no benefit for the female Caucasian celebrities. Based on our results we would suggest that the other race exemplars are not in the center of the face space and are in slightly less prominent position from the famous faces of own race and gender.

We would like to stress the benefit of studying face phenomena together. There is a clear difference in accuracy for unfamiliar faces between Experiment 1 and 2. This difference could only be the consequence of the presence of familiar faces in the second experiment, further suggesting the sensitivity to the stimuli set context.

Finally, given that our sample included only female participants, one should exercise caution in interpretation. Although the structure of the sample was a conscious decision at the beginning of the study, as we wanted to be sure that we would obtained all of the effects, it still might limit our conclusions. Still, our results are comparable to the large body of other findings, suggesting that these limitations are not intolerable.

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