Faces or Objects: Which are More Memorable?

Melisa Holdway and Brandy Bishop

Eastern Oregon University

Abstract

The aim of the present study was to investigate whether human faces were more accurately recognized than detailed non-living objects when they were presented in color across various categories. We hypothesized that faces of various races, ages, and genders would be recognized at higher rates than detailed non-living objects possibly due to an adaptive or social advantage because people embody a greater potential for threat and reward. To test this, we used a counterbalanced randomized within-subjects repeated measures design in which participants watched a video consisting of 20 trials. The participant was asked to indicate whether or not a probe image was recalled as an exact match to one of the images from the study slide in that trial. The results revealed that faces were recognized at a higher rate than detailed non-living objects.

Keywords: facial recognition, object recognition, holistic processing, visual working memory, working memory, recognition rate, face, object, detailed non-living object

Faces or Objects: Which One Is More Memorable?

The present study is concerned with whether or not faces of various races and ages have an advantage over detailed non-living objects in a recognition task. For the purposes of this study, detailed non-living objects consist of objects with complex details, such as grandfather clocks, monuments, and machinery, as opposed to simple objects such as colored squares or circles. Research which confirmed an advantage for face recognition over object recognition might provide insight into how visual information is processed in order to facilitate survival and social goals. An advantage for faces over objects could serve useful adaptive and social functions. The ability to recognize previously seen faces at a higher rate than previously seen detailed non-living objects may be advantageous because people are more unpredictable than inanimate objects and embody greater potential for social threat and reward. Recalling previously seen faces may trigger memories related to when the person was previously encountered. This kind of information would be essential to survival because it has the power to indicate whether approach or retreat is most advantageous. If the recalled face elicits memories of a battle, or raid, or a peaceful trade between groups, an individual has information about whether to flee, fight, or approach peacefully.We predict that faces will be recalled at a higher rate than detailed non-living objects because of their adaptive and social importance.

Research into the possible connection between enhanced memory and the social factors related to faces was conducted by Kajimura, Himichi, & Nomura (2014). They investigated whether the social reward of seeing a beautiful face enhances working memory (WM). A recognition task was used to test whether beautiful faces would enhance WM when they were used as a reward for correct answers. The beautiful faces were of famous persons, and the ones

presented as rewards were of the opposite sex of the participant. At the beginning of each trial, participants viewed a fixation cross after which an indication was given of whether a correct response would be rewarded or unrewarded. Five familiar four letter words were presented, and then were followed by a fixation cross. Participants then saw a one word cue and had to indicate whether it was a match or not a match. On trials where a reward was indicated, a correct answer resulted in a message informing the participants they had earned one attractive face. In non-rewarded trials a message was seen which indicated that the participant would begin the next trial. After all of the trials, the number of faces earned were shown to the participants as a reward. Results showed that when correct answers were rewarded with a beautiful face, more correct answers were given and response times were faster. The expectation of the sight of a beautiful face enhanced WM in this task. The sight of a beautiful face as a reward and increased memory performance. This result is important to our study because it indicates a possible adaptive memory advantage related to faces which has to do with social rewards. If the sight of a beautiful face is a reward and has an effect on memory, perhaps the sight of any face will activate reward centers within the brain more than the sight of a nonliving object. This may influence recall and memory rates in our study giving faces an advantage in a recognition task.

Although we hypothesize that faces will show an advantage over detailed non-living objects, Jackson and Raymond (2008) found an advantage for simple objects over faces. The experiment consisted of a test that presented the participant with a memory array comprised of 1 to 10 visual items. After studying the memory array for a designated amount of time, which varied for each participant, a 900 milliseconds (ms) break interval was presented. Following the break, a test array was shown in which either one item was different from the memory array or

the array was identical. After the test array, the participants were asked to indicate if the arrays were the same or different. The results indicate that visual working memory (VWM) is higher for simpler objects, such as colored squares, than it is for faces (whether familiar or unfamiliar).

Jackson and Raymond's finding that simple objects have an advantage over faces could be explained by research conducted by Curby and Gauthier (2007) who compared recognition rates of upright faces, inverted faces, and complex objects. Curby and Gauthier noted that a decrease in the number of objects able to be stored in visual short term memory (VSTM) is seen as visual information becomes more complex because of the increased time needed to encode more complicated figures; thus simple figures like colored squares can be encoded more easily than more complex figures like faces. They were interested in researching whether faces would be encoded better than inverted faces or objects due to holistic processing. In their third experiment, which is most relevant to this study, they hypothesized that at a longer encoding time of 4 seconds upright faces would have a recognition advantage over inverted faces or cars because of holistic processing. A matching-to-sample recognition task was used to compare the recognition rates of upright faces, inverted faces, upright cars, and inverted cars. The trials consisted of five items of a category in gray-scale arranged in a circle around a fixation cross which was studied for 4 seconds. After a brief interval, participants were presented a similar or dissimilar face or object and were asked to make a recognition determination of same or different. The results showed that the longer encoding time was advantageous for upright faces. More upright faces could be stored in VSTM than inverted faces, inverted cars, or upright cars at the longer encoding time of 4 seconds. Based upon this finding, Curby & Gauthier (2007) suggest a holistic processing for faces which allows the VSTM to store more faces than detailed

objects when adequate time is given for encoding. The finding of an advantage for upright faces when they are holistically processed at the longer encoding time may indicate an adaptive memory advantage for upright faces, the orientation in which faces are most often encountered, over the unnatural orientation of inverted faces and non-living complex objects like cars.

An adaptive memory advantage for faces may have a biological underpinning. In fact, faces do have an advantage over objects when activating some areas of the brain as Chan (2013) summarized in her review of the literature on the face-selective activation of the ventrolateral prefrontal cortex (VLPFC). She notes that the VLPFC has shown to be activated by both object and face stimuli in WM tasks and passive viewing; however when faces and nineteen different objects were passively viewed by subjects while activation of the VLPFC was monitored, the results showed faces selectively activated the VLPFC over objects. Chan further reported that comparisons between whole face, whole face eyes covered, and just eyes revealed that just eyes activated the VLPFC most strongly. Chan suggested the larger activation for faces and eyes might be due to selective specificity coding which activates a larger area of the VLPFC, and the activation is stronger and biased towards facial stimuli, particularly the eyes. She reported that face selective activity was found in the vertex positive potential (VPP) of the frontal channel within the VLPFC. The "...magnitude is comparable to the face selective N170 component in the temporal-occipital scalp" (Chan, 2013, p. 4), which indicates domain specific and facially biased activity within the VLPFC. This preference for faces in the VLPFC, a place associated with WM, may give faces an advantage over objects in this study.

In support of the research reported by Chan (2013) which shows that faces have similar activity within the VLPFC to the known face specific component N170, the commentary article

by Eimer (2011) gives an overview of the research currently available about the N170 face-sensitivity component of the event-related potential (ERP) that takes place during the neural processing of faces. The N170 component is larger in response to faces than it is for non-face objects, which is evidence for its face sensitivity. Findings from the experiments discussed by Eimer reveal that the N170 amplitudes appear to be larger for faces when compared to non-face stimuli. Therefore, we predict that faces will have an advantage over objects in a recognition task, perhaps due to the biological underpinnings of the N170 component.

The N170 component and VWM were studied by Meinhardt-Injac, Persike, and Berti (2013) in an event-related potential (ERP) and behavioral study. They calculated ERP's to investigate the N170 component and took behavioral measurements to investigate VWM. They investigated the N170 component, which has been related to the holistic processing of faces, to see if it is also related to the holistic processing of any complex object. They investigated this by testing memory load rather than perceptual load. They kept perceptual load constant by always presenting two stimuli in the stimulus arrays. They varied memory load by presenting either the same item (face or watch) twice on the memory array, or presenting two different faces or watches. This required participants to either store one item, or two items for the trial. A same-different task which consisted of the two memory load conditions was used in this experiment. Participants were shown a study display of either two identical or two different stimuli of the same category in grayscale (watches or human male faces). Participants briefly viewed the display which was removed before a probe was presented. The participants then indicated whether or not the watch or face was present in the original display. The researchers calculated VWM and computed ERPs as participants encoded and recalled the faces and

watches. The results from the study revealed the face-selectiveness of the N170 component and showed evidence of a holistic processing advantage for faces. The results also revealed an advantage for faces in VWM when compared to complex objects (i.e. watches). However, a limitation to the study was that it used faces of all the same race in the recognition task.

The use of same race participants and the effect on memory was investigated in a study by Lucas, Chiao, and Paller (2011) which compared SR (same race) faces and OR (other race) faces to see if the facial features of the SR or OR stimuli made a difference in recollection of the stimuli. Experiment 1 consisted of 18 participants, all of whom were classified as Caucasian, female adults. Participants were presented with various groupings of photographic stimuli of male faces. These male faces ranged in race from Caucasian, African-American, South Asian, East Asian, and/or Hispanic. The experiment was conducted in six study-test blocks, in which the participant studied the faces while they stayed fixated on a central cursor during the study phase. They were then asked to judge how much they thought they would remember each face on a 4-point scale. During the test phase, participants were shown faces from their most recent study session, along with other unstudied faces, and were asked to judge which faces had been previously studied. The results showed that SR faces were recognized more accurately than OR faces.

However, there appears to be a gap in the literature in regard to whether faces in general will be recognized more accurately than detailed non-living objects. Jackson and Raymond (2008) found an advantage for simple objects over faces, but they did not test more complex objects. Curby & Gauthier (2007) compared upright faces to cars, a complex object, and inverted faces and found the upright faces had an advantage, but, the faces they tested were in grayscale

and were all within the same age range. They did not test color photos, children's faces, or older adults' faces. A similar advantage for faces over the complex object watches was found by Meinhardt-Injac et al., (2013). However, their test consisted of all white male faces and they did not test faces of various races and ages. Lucas et al.'s, (2011) research showed that same race faces were remembered better than other race faces, but they did not test whether faces in general are remembered better than detailed objects. Kajimura, et al., (2014) investigated the effects of beautiful faces and found that the use of beautiful faces as a reward enhanced working memory. However, they did not test recognition rates of faces or objects.

Other research which looked into the effects of seeing a face on the activation of the VLPFC which is associated with memory was discussed in a review article by Chan (2013). Her review revealed that the VLPFC is more active after viewing faces, especially the eyes, than objects, and that the VLPFC is thought to contain face selective areas that produced responses similar to the N170 component found in the temporal-occipital scalp; a known face selective component. Her review did not discuss whether faces are recognized at a higher rate than detailed objects. Similarly, a review article by Eimer (2011) revealed that the N170 component is a face-selective neural component which occurs more strongly when faces are processed than when non-face items are processed. Eimer's review did not discuss recognition rates of faces or objects. While neither review addressed recognition rates of faces or objects, both of these reviews suggest a biological underpinning for a recognition advantage for faces over detailed objects.

None of the studies mentioned above answer the question we are attempting to answer, which is whether faces of various age, gender and race have a recognition advantage over

detailed non-living objects. We tested the recognition of detailed non-living objects against the recognition of faces because the two are always present in our environment and an advantage for faces may exist for adaptive reasons. We desire to test faces of various age, race, and gender and complex objects because it is more true to environmental experience where people encountered vary greatly, and where objects are often varied and of a complex nature. We did not find research which compared various detailed non-living object recognition to various race, gender, and age face recognition to see if either had an advantage. The current study could fill the gap in the literature in regard to an adaptive advantage for face recognition in general over detailed object recognition.

In order to test whether faces have a recognition advantage over objects, our study compares recognition of pictures of detailed non-living objects to recognition of pictures of faces of various ages, genders, and races. For this experiment, the participants will complete two recognition tasks: a facial recognition task and a complex object recognition task. Our study addresses the gap in the literature, because it compared the recognition rates of faces and detailed, non-living objects to see if either has an advantage. The recognition tasks were completed separately so that they did not compete for available capacity in the VLPFC. We also use faces of various race, gender, and age which were not included in any of the previous studies. In order to better investigate a recognition advantage for faces over objects, we test recognition rates with color pictures because both faces and objects are encountered in color in real life. Additionally, we use longer encoding times in our study which we expect will increase VSTM capacity. We hypothesize that faces of various race and age will be recognized at higher rates than detailed non-living objects when tested in a recognition task.

Method

Participants

There were 35 participants in the study, 27 females and 8 males, who were between the ages of 18 and 64 years of age. Participants were recruited online through Facebook posts and through undergraduate psychology courses at Eastern Oregon University. Responders under eighteen years of age were excluded. Participants were directed to an online YouTube video where they had the opportunity to participate in the online YouTube experiment. Participants recruited through Facebook were asked to copy and paste the link into their browser to protect their anonymity. Participants were aware that facial and object recognition were being examined before they participated. They were not aware of the specific hypothesis that faces would have a recognition advantage. Participants might have received extra credit in an undergraduate psychology course for their participation, but no direct compensation was offered.

Materials

For all conditions in this experiment, participants used their personal computers. They were asked to record their answers for each trial via paper and pencil until the end of the experiment where they transferred their answers into a survey at SurveyMonkey.com. The survey was designed to collect their answers, demographic information of gender, birth month, and age range, their assigned experimental condition, and a confirmation that they had voluntarily participated, been debriefed, and received relevant contact information. Names were not collected to protect individuals' identification and the survey was set up to not collect participants' IP addresses to further protect participants' anonymity.

Three YouTube videos made with Windows Movie Maker on Windows 8 were used in the study. All of the text in the videos was also presented audibly. The first video contained four displays of text in Times New Roman font which consisted of the brief overview of the experiment, the informed consent, and instructions on how to proceed with the experiment.

The two experimental videos each contained sixty-two displays: 10 face study displays, 10 detailed non-living object study displays, 10 face probe displays, 10 object probe displays, 20 simple math distractor displays, an initial display which gave instructions for the trials, and a final display which contained the debriefing text and a link to the survey. The study displays consisted of six different faces or six different objects presented in color and evenly distributed across the page. The probe displays consisted of one object or face centered in the middle of the display. For the first 4 participants, no additional instruction was seen on the probe display during the experiment. For the remaining 31 participants, each of the probe displays also contained a textbox at the top of the display which instructed the participants to pause the video, record the answer, and then resume the video. The item on the probe displays was either an exact match to a face or object from the previously seen display or was similar to a face or object on the previously seen display. Similar items were from a similar category for objects, or gender, age, and race for faces. The distractor displays consisted of sixteen addition, subtraction, multiplication, and/or division problems evenly arranged in four rows of four problems. Each math problem was in Times New Roman font. Some problems may have appeared more than once in the experimental videos, but this was not a concern as they were meant as a distraction for the following memory tests.

All faces and objects were approximately 250 pixels by 300 pixels when placed on their respective displays. No objects or faces appeared more than once in either experimental condition. The images of the objects were obtained using a google image search and consisted of objects from the categories of machinery, grandfather clocks, tools, shoes, monuments, and office equipment. The face images used were of faces of various age, genders, and races. They were obtained from a google image search and the Face Database: Neutral Faces (Minear & Park, 2004). We used one female and one male photo for all age ranges. We used two infant photos (estimated age 0 - 1), two children's photos (estimated age 2-12), two teen photos (estimated age 13-19), two young adult photos (estimated age 20 - 30), two adult photos (estimated age 36 - 49), and two older adult photos (estimated age 50 - 90) for each of the following races: Caucasian, African American, Asian, Hispanic, and Middle Eastern.

Procedure and Design

We used a randomized within-subjects repeated measures design which was counterbalanced over the two experimental conditions. Participants were asked to view a YouTube video if they were interested in participating in the experiment. The initial video presented a display which provided a consent form which listed potential risks, such as boredom, and provided contact information for the researchers and the head of the IRB board should they have questions and/or concerns. The display also informed the participants that they would complete recognition tasks for faces and objects. They were made aware that they did not have to participate and could stop the experiment at any time. The final display informed the participants that the experiment was expected to take between 15 and 20 minutes and directed them to choose either the first experimental video or the second experimental video based upon

the month of their birth if they consented to participate. Participants were supposed to choose the first video if their birth month was January, March, May, July, September or November. They were supposed to choose the second video if their birth month was February, April, June, August, October or December.

When participants consented to the experiment by clicking one of the two links based upon the month of their birth, they were taken to one of two experimental YouTube videos. Each video presented 20 recognition trials. Each trial consisted of a study display, a distractor display, and a probe display. A distraction task was used in order to make the recognition task more true to environmental experiences in which people may experience many distractions before encountering a person or object again.

The first display of each of the experimental videos asked participants to pause the video and collect a piece of paper and pencil. They were then instructed to number their paper from 1 - 20 in order to record whether they recognized the faces or objects in the 20 trials by writing Yes or No. When they restarted the video, they began the first trial. Participants saw a display of 6 objects or faces which they studied for 5 seconds. We had participants study the display for five seconds because of the research of Curby and Gauthier (2007) which showed an advantage for faces over objects at the longer encoding time of four seconds due to a suggested holistic processing advantage.

After the study period passed, the participants then viewed a distractor display for 10 seconds which consisted of an array of sixteen simple math problems which they were asked to solve mentally until the memory probe appeared. It was expected that sixteen problems would be more calculations than the participants could complete in ten seconds which would ensure the

participants were occupied on the distraction task for the entire distraction period. After the distraction period passed, participants saw a ten second probe display of a face or object which contained text asking them to pause the video and record whether they recognized the probe display from the previously seen study display. They were instructed to restart the video after they had recorded their answer. The probe period lasted ten seconds which was expected to allow the participants time to pause the video to record their answers. Participants restarted the video after recording their answers and waited for the remaining probe period to pass. After the probe period passed, the next trial began. Participants proceeded in this way until all twenty trials had been completed. They were debriefed by a final display which provided contact information and revealed the purpose and hypothesis of the study. The last display also directed them click on a survey link which connected them to surveymonkey.com where they would be able to record their answers. Upon opening the survey, participants were asked to enter their demographic information and record their answers for the 20 recognition trials. They also indicated on the last question that they had voluntarily consented to the study, been debriefed, and that they had been provided with contact information which was also provided one last time in the final question of the survey.

Results

We analyzed our data with an analysis of variance (ANOVA) which revealed that faces were recognized at a significantly higher rate than detailed non-living objects, $F(1, 34) = 4.39$, $p < 0.05$. We followed up the ANOVA with a paired t-test which confirmed that the mean recognition rate for faces ($M = 7.57$, $SD = 1.4$) was significantly higher than the mean

recognition rate for objects ($M = 6.89$, $SD = 1.49$), $t(34) = 2.09$, $p < 0.05$. Figure 1 shows the mean correct response rates for the face and object recognition tasks.

Discussion

The current study hypothesized that faces would be recognized at higher rates than detailed non-living objects when tested in a recognition task. Our results support this hypothesis. A facial recognition advantage may facilitate survival and social goals because faces embody a greater potential for threat and/or reward than non-living objects do.

The use of faces as a social reward to enhance memory was tested by Kajimura, Himichi, & Nomura (2014) who found that the use of beautiful faces as a reward enhanced working memory. They did not actually test recognition of faces or objects, but used the sight of faces as a reward for remembering a list of words. The use of beautiful faces as a social reward suggested a possible advantage to memory based upon the social reward of looking at faces which in our study might have lead to faces being recognized at a higher rate than objects.

Additionally, biological underpinnings may have influenced the recognition rates of faces causing them to be stored at higher rates than detailed non-living objects. Chan (2013) reviewed the role of the VLPFC in processing faces. She notes that the VLPFC is facially selective in its activation over objects and the VLPFC has been associated with WM. The facially selective activation of the VLPFC is similar to the facially selective activation of the N170 component. Meinhardt-Injac, Persike, and Berti (2013) studied the N170 component and VWM in a behavioral and ERP study. The results revealed a holistic processing advantage for faces, confirmed the facially selective activation of the N170, and showed a recognition advantage for

faces when compared to complex watches. These face specific biological underpinnings of memory tasks may have influenced facial recognition rates in our own study.

Previous research has found seemingly conflicting results regarding whether faces or objects are recognized at higher rates. This is most likely due to the level of complexity of the items in the study array and to the length of the encoding times. Jackson and Raymond (2008) found that simple objects are recognized at higher rates than faces when both are tested at short encoding times and Curby and Gauthier (2007) offered an explanation for this finding. They note that as visual information becomes more complex fewer items can be stored in working memory, thus simple objects are encoded more rapidly and at higher rates than are complex objects like faces. They found that faces were recognized at higher rates than complex objects when longer encoding times were used which allowed for holistic processing. They suggested that the holistic processing of faces allows for more faces to be stored in VSTM than complex objects. Their finding influenced our decisions to compare detailed non-living objects with faces, and to set our study array length at the longer encoding time of 5 seconds. This not only allowed for the holistic processing of both complex objects and faces so that we could more accurately compare the two recognition rates, but it is also more representative of real life where the viewing of objects and faces most likely involves holistic processes because encoding time is not often limited to 1 or 2 seconds.

However, our study differed from theirs in that we used various complex objects, all our images were seen in color, and our faces were of various races, ages, and genders. Since there is an advantage for facial recognition when same race faces are used when compared to other race

faces (Lucas, et al., 2011), the current study used faces of various race to mediate for any recognition advantage for same race faces over detailed non-living objects. We used various detailed non-living objects, color images, and varied types of faces to more accurately reflect environmental experience where everything is encountered in color, the objects that are encountered are often very complex and comprise many different categories, and the faces span the varied types of race, age, and gender. Our finding of a facial recognition advantage when using stimuli that is more representative of environmental experience is important to understanding a possible adaptive and/or social facilitation since if an advantage exists it should be seen when tested under these conditions. We suggest the finding of an advantage for faces in our experiment is most likely due to humans embodying a greater potential for threat and reward than detailed non-living objects. Due to this higher potential for threat and reward, facial recognition is more important to survival and to social goals than object recognition and thus occurs at a higher rate.

Our study does have limitations. Some issues that could be addressed in future studies are the use of Facebook as a platform for finding participants. It took a lot of time waiting for individuals to decide to volunteer for participation, and there was no way to guarantee that all participants were over the age of 18 years old because they were completing the experiment on their own. Additionally, there was no way to guarantee that participants did not rewind the video to give correct answers, even though they were instructed not to rewind and that there were no “right” or “wrong” answers. If participants did rewind in order to give the “right” answer as they perceived it, this may have affected our results. An additional issue may have been seen in the way we collected our data. SurveyMonkey was used to record the data from the recognition trials

which required participants to enter their own answers from the study. Confusion or mistakes may have interfered with the collection of data and affected our results. A laboratory study would prevent the possibility of both of these potential issues. Based on our results, researchers who want to further investigate the recognition rates of faces and objects could explore the recognition rates of various age groups, as well as gender differences.

Summary

The purpose of this study was to test whether faces of various races, ages, and genders would be recognized at higher rates than detailed non-living objects when presented in a series of recognition tasks. We hypothesized that faces would be recognized at higher rates than detailed non-living objects possibly due to an adaptive or social advantage because faces embody a greater potential for threat and reward than objects do. The results confirmed our hypothesis and showed that faces were recognized at a significantly higher rate than objects. We suggest that this is because of an adaptive and/or social advantage where due to the higher potential for threat and reward, facial recognition is more important to survival and to social goals than object recognition and thus occurs at a higher rate.

References

Chan, A. W. Y. (2013). Functional organization and visual representations of human ventral lateral prefrontal cortex. *Frontiers in Psychology, 4*, 1-15. doi:10.3389/fpsyg.2013.00371

Curby, K. M., & Gauthier, I. (2007). A visual short-term memory advantage for faces. *Psychonomic Bulletin & Review, 14*, 620-628. doi:10.3758/BF03196811

Eimer, M. (2011). The face-sensitivity of the N170 component. *Frontiers in Human Neuroscience, 5,* doi:10.3398/fnhum.2011.00119

Jackson, M. C., & Raymond, J. E. (2008). Familiarity enhances visual working memory for faces. *Journal of Experimental Psychology: Human Perception and Performance, 34,* 556-568. doi:10.1037/0096-1523.34.3.556

Kajimura, S., Himichi, T., & Nomura, M. (2014). Beautiful faces enhance verbal working memory performance: An NIRS study. *Psychologia: An International Journal of Psychological Sciences, 57*, 49-57. doi:10.2117/psysoc.2014.49

Lucas, H. D., Chiao, J. Y., & Paller, K. A. (2011). Why some face won't be remembered: Brain potentials illuminate successful versus unsuccessful encoding for same-race and other-race faces. *Frontiers in Human Neuroscience, 5*, 1-17. doi:10.3389/fnhum.2011.00020

Meinhardt-Injac, B., Persike, M., & Berti, S. (2013). Encoding of faces and objects into visual working memory: An event-related brain potential study. *NeuroReport: For Rapid Communication of Neuroscience Research, 24*, 735-740. doi:10.1097/WNR.0b013e328364a417

Minear, M. & Park, D.C.(2004). A lifespan database of adult facial stimuli. *Behavior Research Methods, Instruments, & Computers.* 36, 630-633.

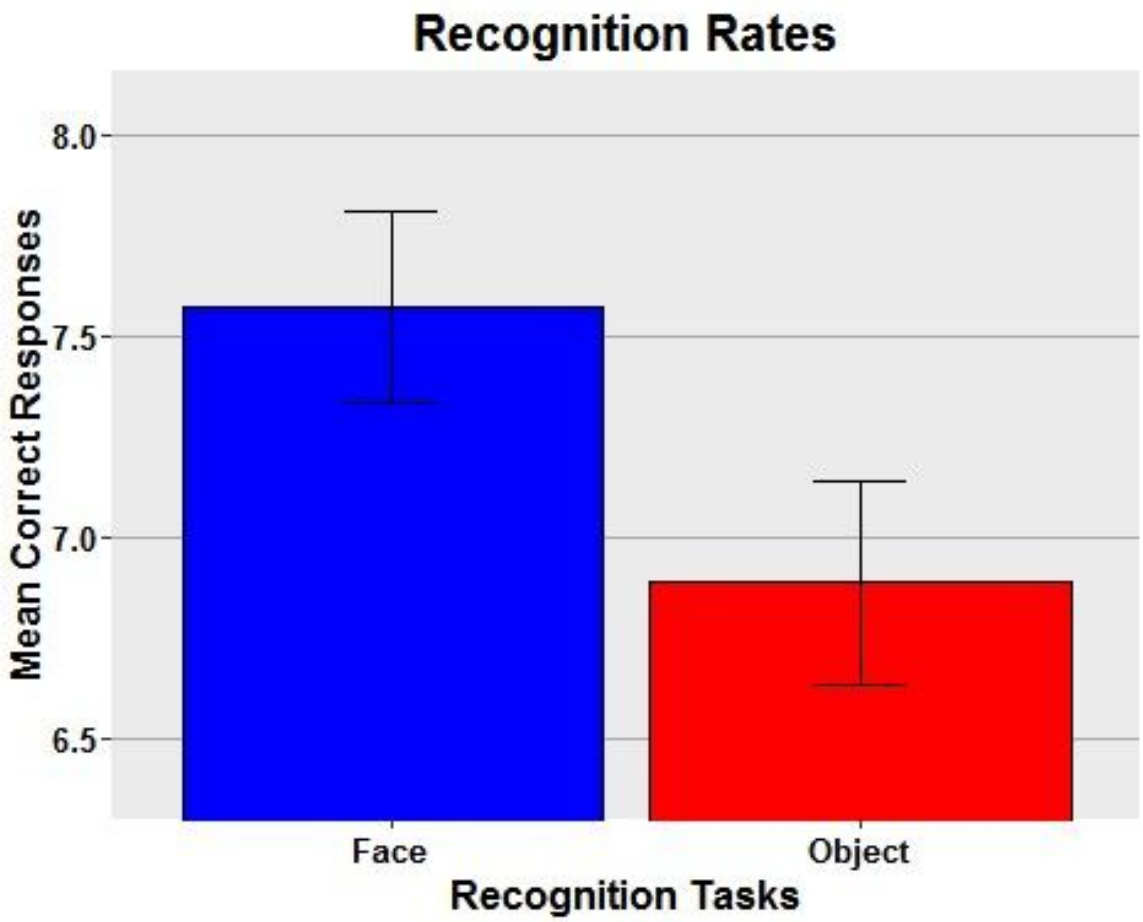

Figure 1: The mean correct responses for the face recognition and object recognition tasks. Error bars denote 95% confidence limits on the basis of the standard errors of measurement.