EFFECTS OF LABELS ON VISUAL PERCEPTIONS

A Senior Scholars Thesis

by

FRANKIE LARA

Submitted to the Office of Undergraduate Research
Texas A&M University
in partial fulfillment of the requirements for the designation as

UNDERGRADUATE RESEARCH SCHOLAR

April 2009

Major: Psychology

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Approved by:

Research Advisor: Takashi Yamauchi
Associate Dean for Undergraduate Research: Robert C. Webb

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ABSTRACT

Effects Of Labels On Visual Perceptions. (April 2009)

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Labels simplify our world by reducing complex ideas into simple phrases. Research suggests that labels even alter our visual perception to the point that we think images carrying common labels look similar to each other even when they are not. The present study shows that this is valid for perception of human faces and reveals that labels carrying specific categories of meaning are particularly more powerful in changing our perception. In two experiments, participants were presented with a triad of morphed human faces paired with arbitrary labels. The meanings of these labels were manipulated to represent the belief, the food, the disease, or the "face's" last name. The results indicated that labels carrying conceptual information such as beliefs, food, and diseases were particularly strong in modifying participants' judgment of similarity of individual faces, whereas labels characterized with last names of faces were least powerful. These results suggest that how we visually analyze an object is not confined to sensory modalities such as sight, hearing, or smell, but also to semantic information we relate to

it. In other words, we shape what we see in terms of what we know about what we are seeing

ACKNOWLEDGMENTS

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Na Yung Yu, Dr. Yamauchi's graduate student, was my trainer. She spent many long hours running through every software program I may need to use including SPSS, E-Prime, Adobe Photoshop, and Excel. She taught me the foundations of statistics, the fundamental theories of cognitive psychology, and the ins and outs of what it takes to be a good researcher and graduate student. Her concern was not that I get through 485 successfully, but that I leave A&M prepared for graduate school and prepared for life.

I would also like to thank my research colleague Donna Jauregui, who endured hearing my research from beginning to end. She was there to correct me in all my stages of design.

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TABLE OF CONTENTS

CHAPTER I

INTRODUCTION

We make sense of the world by simplifying and organizing it into meaningful ideas. We do this by experiencing things in our environment with our five senses, and then use our minds to interpret what these objects mean. The use of language is a method we have adopted to simplify this process. Language has allowed us to use words as symbols and to represent concepts. When we see a sign that reads “wet floor,” “wet floor” is a symbol that points to a concept indicating a dangerous surface we should avoid. We are alerted by it and take necessary actions to avoid that area. Hence, labels can be a powerful manipulator of our behavior. But how powerful are labels?

Imagine that you are walking through a supermarket. It is filled with products tagged with labels such as “They’re Gr-r-reat!” and “They're Magically Delicious!” which are meant to provoke us in buying the products. This type of phenomenon has obvious psychological importance and is studied often in many different dimensions of psychology because it affects our wallets and our economy (Teisl, Rubin, & Noblet, 2007). However, the impact of labels appears far more fundamental and deep-rooted. Yu and colleagues (Yu, Yamauchi, & Schumacher, 2008) investigated how labels affected

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This thesis follows the style of the journal of *Memory and Cognition*.

similarity judgments, or the process of comparing two or more objects to find resemblance (Gentner, & Medina, 1998). Philosophers and psychologists alike have long regarded similarity as the building block of human knowledge (Russell, 1945). Studies have demonstrated that this fundamental faculty of perception can be modified by labels when they compete with one another, and the effect of labels appears both in adults and young children (Brown, 1957; Gelman & Markman, 1986; Waxman & Booth, 2001; Yamauchi & Markman, 2000; Yamauchi & Yu, 2008; Yu, Yamauchi, & Schumacher, 2008). How?

In one condition of the Yu et al. study, participants viewed three images, one target and two base images, and were asked to judge which base image was more similar to the target image (Figure 1). In another condition, labels were added to the images and the researchers examined how this would affect participants' similarity judgments. The results of the experiments indicated that some labels could alter people's perception of similarity significantly but others did not. An important research question is "why did some labels modify participant's perception while others were ineffective?"

In the Yu et al study, the only thing that changed between labels was their "meanings" besides the change of the physical appearance of the words. Word meaning, however, is a broad concept and is learned and interpreted variously (Markman & Hutchinson, 1984). To specify and extract what each participant experiences when reading each label, controlling and measuring the meanings of the label should be crucial.

In the present experiment this was addressed by giving participants the same arbitrary non-sensible word, such as “Infaduenza,” but gave them different descriptions for that word depending on the condition. For instance, one condition would describe “Infaduenza” as the name of a disease and another condition might describe “Infaduenza” as someone’s last name. Participants were shown a triad of human faces (Figure 1a) and were asked to judge which face, bottom left or bottom right, was more similar to the target face on the top. This method followed the tasks similar to the Gelman & Markman, 1986 and Sloutsky & Fisher, 2004 experiments. Figure 1a represents the no label condition where participants were given instructions to make decisions using the images only. In the remaining conditions participants made the same decisions, but each image had a label underneath it (Figure 1b). We measured the performance of participants’ judgments by recording the number of times they chose the face that physically dissimilar to the target image. Recording how often the dissimilar image was chosen allowed us to see how often the labels misguided the participants in their task. These conditions where labels were attached to the images totaled eight between-subjects conditions: disease same, disease different, last name same, last name different, belief same, belief different, food same, and food different. The conditions refer to the category of meaning that represents the label and whether or not the label attached to the dissimilar image agreed with the target image (“same” or “different”). If the label of the dissimilar image matched the label of the target image, then this condition was named “same” (Figure 1b). If the label of the dissimilar image did not

match the label of the target image's label, then this condition was named "different" (Figure 1c). Note that these manipulations were given only to the labels and all participants received the same stimuli.

Our hypothesis is that participants will choose the dissimilar image significantly more often when labels of different categories of meaning compared to when the images have no labels. In other words, we predict that participants will produce "error" in their visual perceptions more often when they are confronted with the competing influence of meanings of labels. Our reasoning behind this assumption is that people have become dependent on labels so much that they can be misguided even in a visual perceptual task such as the similarity judgment we employed. When participants are faced with a difficult decision, they may become more confident in a decision if the labels agree with each other. Adding meaning to the label, we predict, should entice the participant to choose the dissimilar image more because it carries more informational weight about the image it is attached to.

CHAPTER II

METHOD

Experiment 1

Participants

A total of 174 undergraduate students participated in this experiment for course credit. They were randomly assigned to one of five conditions: no-label (n=35), last-name same (n=37), last-name different (n=35), disease-same (n=33), and disease-different (n=34) condition. The total number of participants was N=174.

Materials

Stimuli were triads of faces that were in color that either had a label or no label attached to them (Figures 1a and 1b). The target was an original picture of either a Hispanic or Caucasian face, and the two base pictures were a morph of the original Hispanic and Caucasian face. These faces were photographed with the consent of each individual.

In total, we photographed five pairs of original Hispanic and Caucasian faces (Figure 2). These photographs were cropped by Adobe Image Ready to remove their backgrounds. The faces were then imported into the Morph Man 4.0 (2003) software and were morphed into five pairs of 20 images, starting from the original Hispanic (Image 0) face and morphing towards the Caucasian face (Image 19) (Figure 3). Altogether there were

100 images that had varying degrees of Hispanic and Caucasian facial features: 10 original faces and 90 morphed images.

From the 90 morphed images, base pictures were selected controlling for physical differences between stimuli. Specifically we developed three levels of physical difference- low, medium and high physical difference within conditions – based on the degree of merging two of the original face pairs. In the low physical difference condition there is a small amount of physical difference between the two base picture, or, the appear to look very much like each other (Figure 4a); in the medium physical difference condition, the base pictures appear mildly similar to each other (Figure 4b); and in the high physical difference condition, the images looked very different from each other (Figure 4c). Two sets of base pictures were randomly selected at each level of physical difference and were combined with two original pictures in each pair, yielding 12 triads for each pair (a total of 60 triads = 5 face pairs X 12 triads).

Design

The experiment had a 3 (Physical Difference; low, medium, and high; within-subjects) X 5 (Label Condition; no-label, last-name same, last-name different, disease-same, and disease-different; between-subjects) mixed design. The meaning for the labels was described only in the introductory instructions. The labels between each condition were physically the same, but the story about the labels was altered (Figure 5a, 5b, and 5c).

Procedure

Participants were shown 60 triads of pictures, one at a time, and judged which base picture within the triad was more similar to the target image. This was done by pressing either the right or left arrow key, which were designated by the position of the base picture (base image on the left or base image on the right). The order of presenting the stimuli was determined randomly and the experiment took approximately 15 minutes to complete.

Experiment 2

Participants

A total of 191 undergraduate students participated in this experiment for course credit. They were randomly assigned to one of five conditions: no-label (n=39), food-same (n=38), food-different (n=35), belief-same (n=40), and belief-different (n=39) condition.

Materials and procedure

The materials and procedure used in Experiment 2 were identical to those described in Experiment 1.

Design

The experiment had a 3 (Physical Difference; low, medium, and high; within-subjects) X 5 (Label Condition; no-label, food-same, food-different, belief-same, and belief-

different; between-subjects) mixed design. The meaning of the labels was specified only in the introductory instructions, and no labels were attached to face pictures in the no-label condition. Except for these points, all participants received identical stimuli (Figure 5a, 5b, and 5c).

CHAPTER III

RESULTS

Do labels with different categories of meaning have a significant effect on our visual perception? As predicted certain labels produced stronger effects on the participant's similarity judgment. Specifically, when compared to the no label condition, the belief, food, and disease categories produced significant results, while the labels associated with the last name of faces produced null effects. Note that the only thing that was allowed to change between each of the label conditions was the prompt in the instructions which gave the non-sensible words their meaning. Therefore, the effects created by the labels were solely produced by the category of meaning they possessed. We believe that participants used the meanings of the labels to shape their perceptions in their similarity task. The results also suggested that the stronger effects came from the strength in the relationship of the meanings of each label in relation to the images they are attached to.

Experiment 1

In Experiment 1, participants were told that the labels represented either a disease the faces had, or the last name of that person, or no label. These labels also were broken down further into conditions where the labels of the dissimilar image either matched the target image (same) or did not match the target image (different). Five between

conditions were actually used, designated as “disease same”, “disease different”, “no label”, “last name same”, and “last name different.”

Disease-label vs. last-name-label vs. no-label

To paint a broader picture of the effects of Experiment 1, we first analyzed the main effect of the label condition. Testing all levels showed a significant main effect of labels; $F(4, 167) = 8.43$, $MSE = .08$, $p < .01$, $\eta^2 = .17$. Figure 6b presents a graph comparing the means of each label condition. To gain further insight, the results from pair-wise comparisons are reported below. To accommodate the effect of multiple comparisons, we set the alpha level at 0.01

Same-label vs. no-label

Disease-same vs. last-name-same vs. no-label

As predicted, when participants saw a label attached to an image that matched the label of the target image, they tended to choose dissimilar images more often; $F(2, 101) = 5.58$, $MSE = .1$, $p < .01$, $\eta^2 = .01$. The proportion of participants selecting the dissimilar image was higher in the disease-same condition ($M = 0.31$) than in the no-label condition ($M = 0.17$), $t(65) = 3.11$, $SE = .05$, $p < .01$, $d = .76$. The proportion of participants selecting the incorrect image was not statistically different in the last name-same condition ($M = 0.22$) and in the no-label condition; $t(69) = 1.84$, $SE = .03$, $p = .07$, $d = .44$.

Comparisons between the disease-same and no-label condition at the three levels of physical differences suggest that participants in the disease-same condition selected dissimilar images significantly more often than participants in the no-label condition at all levels of physical difference: low at (M = 0.46), $t(65) = 2.71$, SE = .05, p = .009, d = 0.66, medium at (M = 0.28), $t(65) = 2.81$, SE = .05, p = .007, d = 0.69, and high at (M = 0.21), $t(65) = 3.16$, SE = .06, p = .002, d = 0.77.

The performance in the last-name same condition and that in the no-label condition were statistically indistinguishable; at the low level condition, (M = 0.37), $t(69) = 1.13$, SE = .04, p = .26, d = 0.27, medium condition (M = 0.19), $t(69) = 1.82$, SE = .03, p = .07, d = 0.43 and high condition (M = 0.1), $t(69) = 1.92$, SE = .03, p = .06, d = 0.45.

Different-label vs. no-label

Disease-different vs. last-name-different vs. no-label

As predicted, when participants saw a label attached to an image that did not match the label of the target image, they tended not to select dissimilar images; $F(2, 99) = 2.40$, MSE = .04, p = .1, η^2 = .05. Planned comparisons show that this was significant between the disease different condition (M = 0.11) and the no-label condition (M = 0.17), $t(66) = 3.43$, SE = .02, $p < .01$, d = .83. In contrast, the last-name different condition (M = 0.13) was not significantly different from the no-label condition $t(66) = 1.13$, SE = .03, p = .26, d = .27.

The disease-different condition and the no-label condition were significantly different at the low physical difference level (M = 0.2), $t(66) = 4.58$, SE = .03, $p < .01$, $d = 1.11$, but not at the other levels of physical difference; the medium level (M = 0.08), $t(66) = 2.13$, SE = .02, $p = .04$, $d = 0.52$, and high level (M = 0.03), $t(66) = 0.00$, SE = .01, $p = 1.00$, $d = 0.00$.

The last-name different conditions all produced null effects with the exception of the low physical difference condition; M = 0.23, $t(66) = 2.7$, SE = .04, $p < .01$, $d = 0.65$; medium level condition, M = 0.11, $t(66) = 0.6$, SE = .03, $p = .55$, $d = 0.14$; and the high level condition, M = 0.05, $t(66) = 0.62$, SE = .03, $p = .54$, $d = 0.15$.

Disease-same, disease-different, last-name-same, last-name-different

The four conditions were significantly different; $F(3, 134) = 9.09$, MSE = .10, $p < 01$, $\eta^2 = .169$. However, the difference between the disease-same and last-name-same conditions was not significant; $t(68) = 1.79$, SE = .05, $p = .08$, $d = 0.43$; the difference between the disease-different and last-name-different conditions was not significant; $t(66) = 0.80$, SE = .03, $p = .43$, $d = 0.19$.

Based on the results of this first experiment, it is apparent that not all labels containing a specific category of meaning are effective. The strongest effect was obtained in the disease-label condition when compared to the no-label condition. Also, it was apparent that, when compared to each other, the disease and last-name labels did not produce

significant results. In summary, it appears that category labels hold power over our visual perception when they hold a specific meaning, and the differences between these two categories is not significant. It can be speculated from these results that the meanings of the labels need to hold a specific relationship to the images they represent in order to have an effect.

Experiment 2

Once again, the labels used in the second group of experiments were the exact same nonsense words that were used in the first experiment. The only thing we modified was the introductory prompt that explained what these labels meant. This time we told participants that the labels either represented someone's belief, what they eat, or no label at all.

Belief-label vs. food-label vs. no-label

As in Experiment 1, we first analyzed the main effect of the label condition. Testing all levels showed a significant main effect of labels; $F(4, 186) = 16.80$, $MSE = .113$, $p < .01$, $\eta^2 = .27$. Figure 6c presents a graph comparing the means of each condition. This graph compliments the following break down of statistics in Experiment 2.

Same-label vs. no-label

Belief-same vs. food-same vs. no-label

As predicted, when participants saw a label attached to an image that matched the label of the target image, their was a significant effect in the participant's similarity judgments; $F(2, 114) = 6.79$, $MSE = .17$, $p < .01$, $\eta^2 = .11$. The proportion of participants selecting the dissimilar image was higher in the belief-same condition ($M = 0.36$) than in the no-label condition ($M = 0.18$), $t(77) = 4.04$, $SE = .05$, $p < .01$, $d = 0.9$. The proportion of participants selecting the dissimilar image was significantly higher in the food-same condition ($M = 0.33$) than the no-label condition, $t(75) = 3.14$, $SE = .05$, $p < .01$, $d = 0.71$.

As in Experiment 1, we broke down the conditions into the within-subject factor featuring three levels of physical difference between the base pictures. The belief-same label condition was significantly different from the no-label condition at all levels of physical difference, $t's > 2.88$, $p's < .01$, $d's > 0.63$.

Comparisons between the food-label same and no-label conditions revealed significant differences at low and medium levels of physical difference; low level, $t(75) = 3.32$, $SE = .05$, $p < .01$, $d = 0.75$; medium level, $t(75) = 3.10$, $SE = .05$, $p < .01$, $d = 0.7$; but not at the high level of physical difference; $t(75) = 2.41$, $SE = .05$, $p = .02$, $d = 0.54$.

Different-label vs. no-label

Belief-different vs. food-different vs. no-label

As predicted, when participants saw a label attached to an image that did not match the label of the target image, they tended not to select dissimilar images; $F(2, 110) = 12.81$, $MSE = .02$, $p < .01$, $\eta^2 = .19$. In particular, there was a significant difference between the belief different condition ($M = 0.10$) and the no-label condition $t(76) = 3.76$, $SE = .02$, $p < .01$, $d = 0.84$. Similarly, there was a significant difference between the food different condition ($M = 0.08$) and the no-label condition; $t(72) = 5.66$, $SE = .02$, $p < .01$, $d = 1.31$.

We broke down the conditions into the within-subject factor featuring three levels of physical difference between the base pictures. The belief different condition was different from the no-label condition at the low level of physical difference; $t(76) = 4.92$, $SE = .03$, $p < .01$, $d = 1.10$, but not at the medium level, $t(76) = 1.9$, $SE = .03$, $p = .06$, $d = 0.43$, and high level, $t(76) = 1.89$, $SE = .18$, $p = .06$, $d = 0.43$.

The food different condition was different from the no-label condition at the low and medium levels of physical difference; low level, $t(72) = 5.48$, $SE = .03$, $p < .01$, $d = 0.7$, and the medium level, $t(72) = 4.90$, $SE = .02$, $p < .01$, $d = 1.14$, but not at the high level, $t(72) = 2.13$, $SE = .02$, $p = .04$, $d = 0.50$.

Belief-same, belief-different, food-same, food-different

Once again, the label conditions yielded a significant effect when compared to each other $F(3, 148) = 17.85$, $MSE = .14$, $p < .01$, $\eta^2 = .27$. However, the belief-same and food-same conditions were not significantly different; $t(76) = 0.49$, SE = .06, $p = .63$, $d = 0.11$. Similarly, the belief-different and the food-different conditions were statistically indistinguishable; $t(72) = 0.70$, $SE = .04$, $p = .49$, $d = 0.16$.

The results of Experiment 2 indicated that both the belief and food label conditions were significant in altering participant's visual perceptions when compared to the no label condition. Also, as in Experiment 1, when you compare the two label conditions, there is no significant effect. It is apparent now that the relationship between labels and their images can be significant and meaningful even with rudimentary categories of meaning such as food. Once again we speculate that the relationship of the meaning of the label in relation to its image is important. It is easy to conclude the next step in these experiments is to systematically determine what categories of meaning hold the most weight in this type of visual perception study.

CHAPTER IV

CONCLUSIONS

Do labels effect our perception of human faces? As predicted, the results indicate that labels did affect the participant's ability to perceive human faces. The participants were given a similarity task comparing faces and chose the dissimilar face more often than chance would allow. Specifically, participants chose the dissimilar face when they were told that the labels represented the name of belief, food, or disease. These results suggest that how we visually analyze an object is not confined to sensory modalities such as sight, hearing, or smell, but also to semantic information we relate to it. In other words, we shape what we see in terms of what we know about what we are seeing (Eberhardt, Dasgupta, & Banaszynski, 2003). A positive implication to these findings is that we can understand and interpret people more simply because we are able to put people in similar categories by what we know about them, and not just how they look. The danger in these findings, and a possible source of future research, are that these labels may be too misleading and we may overestimate similarities in people. Stereotypes are an easy example of this fallacy (Carnaghi & Maass, 2007).

Do certain labels have greater effects on visual perception? As predicted, some labels had greater significance than others. Specifically, the belief label was the strongest, the food label was the next strongest, and the disease label was the weakest label that showed significance (the last name condition showed no significance). Although the

participants in every condition were told that the labels “meant” something, in each condition they were given the same list of nonsense (arbitrary) words. With all else the same except for the meaning of the label, it appears that participants presumed certain labels are more powerful in terms of their meaning in relation to the image. From this, it seems that participants put more value on what people believe in when judging the faces for similarity compared to any other label. It is interesting, however, that food was the next powerful determiner of people’s judgments. Perhaps this can be correlated to society’s emphasis on weight watching and physical appearance (McVey, Pepler,Davis, Flett, & Abdolell, 2002). What showed least significance was the last name label. Because there was no informational history put in to the last names, it was most likely hard for participants to gather meaning from this label.

In conclusion, the results have indicated that labels do affect how we perceive human faces and that labels of different meaning hold different weights on these perceptions. Some research on racial face perception focuses solely on the physical perceptions of the face (Willadsen-Jensen & Ito, 2008). Research that incorporates labels and faces tends to change the actual label of the experiment (using real words), which altogether changes the meaning and appearance of the word(s). The current study contributes to previous research in that it allows “meaning” of labels to be manipulated in a more efficient way, so that there is more confidence that participants were manipulated by the category of meaning and nothing else.

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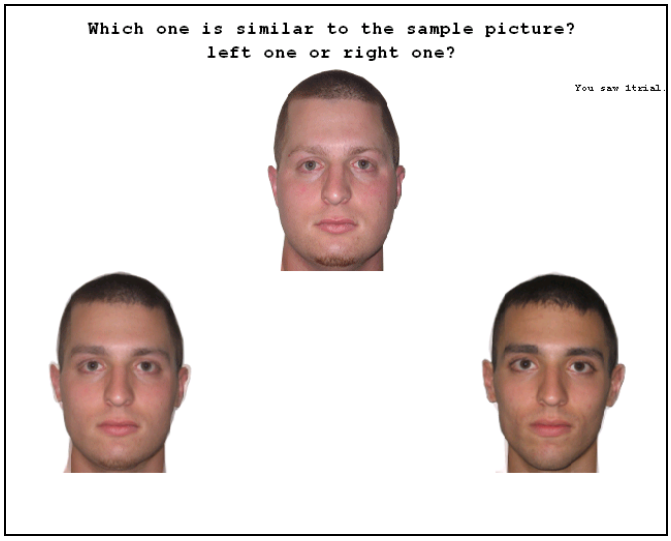
APPENDIX

FIGURES

a.



b.

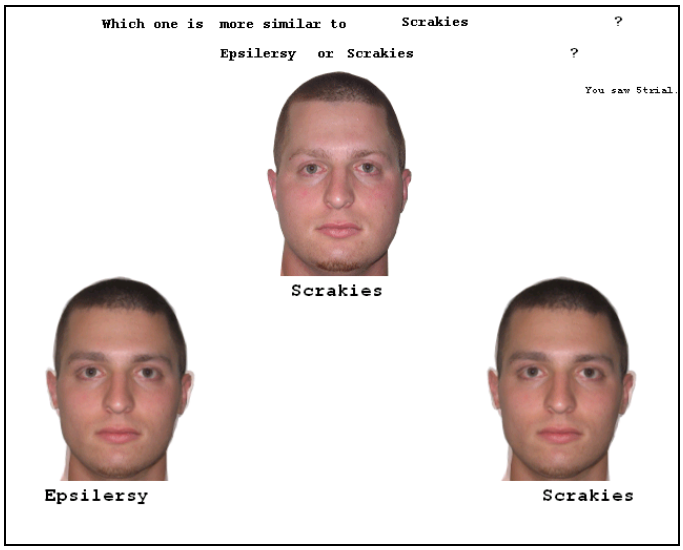


Figure 1. Samples of the stimuli used in Experiments 1 and 2. (a) – the no-label condition, (b) – the same label condition, and (c) – the different label condition.

c.

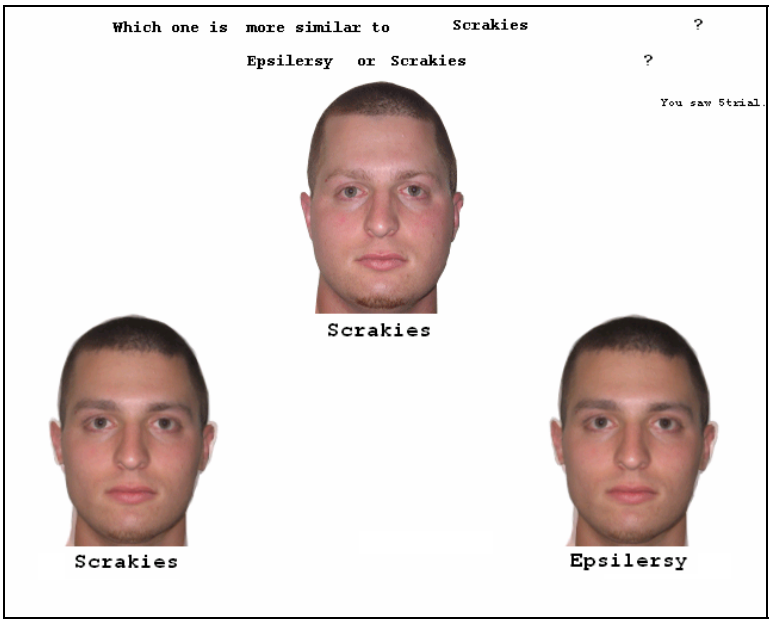


Figure 1 continued

Figure 2. Five pairs of real face pictures used to create morphed images.

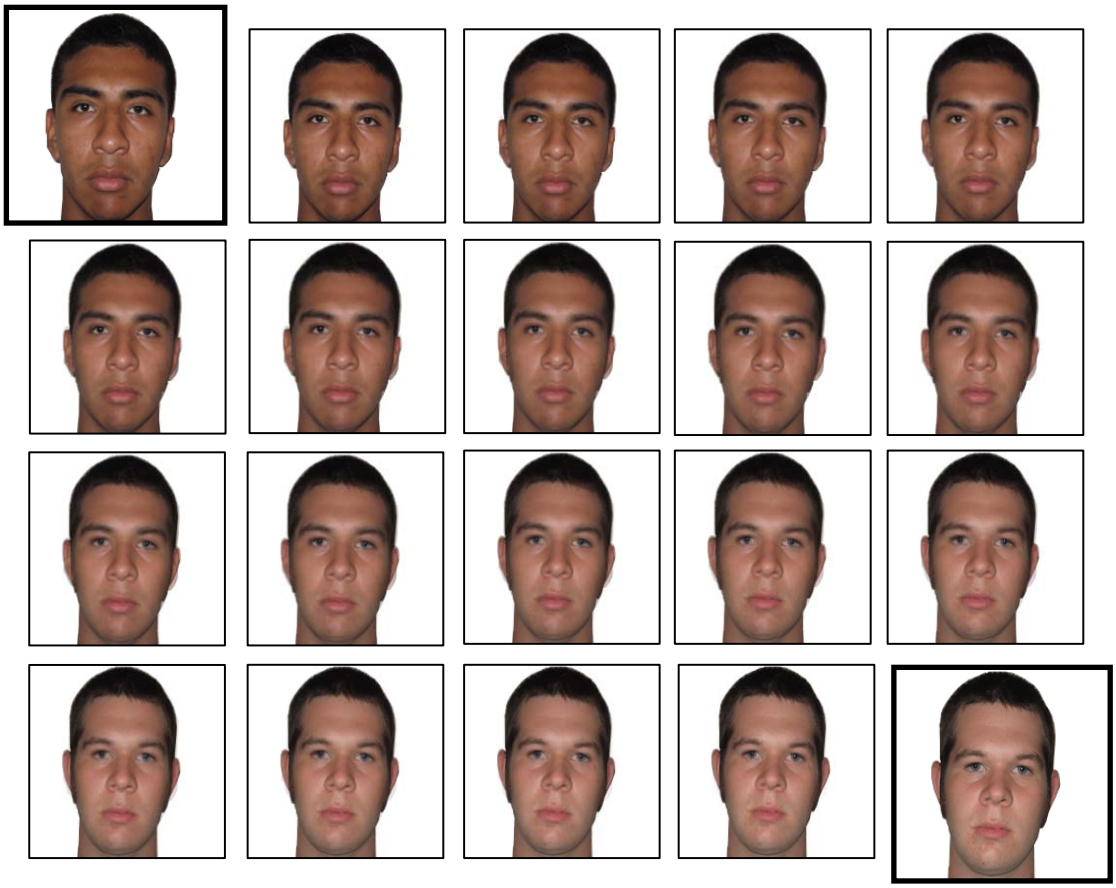


Figure 3. Morphed images created from two original face pictures. One real Hispanic face is morphed gradually with one real Caucasian face so that each face picture depicts different degrees of ethnic features.

a.

b.

Figure 4. Three levels of physical difference. (a) shows the low level of physical difference. (b) shows the medium level of physical difference. (c) shows the high level of physical difference.

c.

Figure 4 continued

a.

As you start this experiment, you will see pictures of people– a sample picture on the top and two test pictures below the sample (see the example below). Your task is to look at these pictures carefully, and decide which test picture, left or right, is more similar to the sample picture.

b.

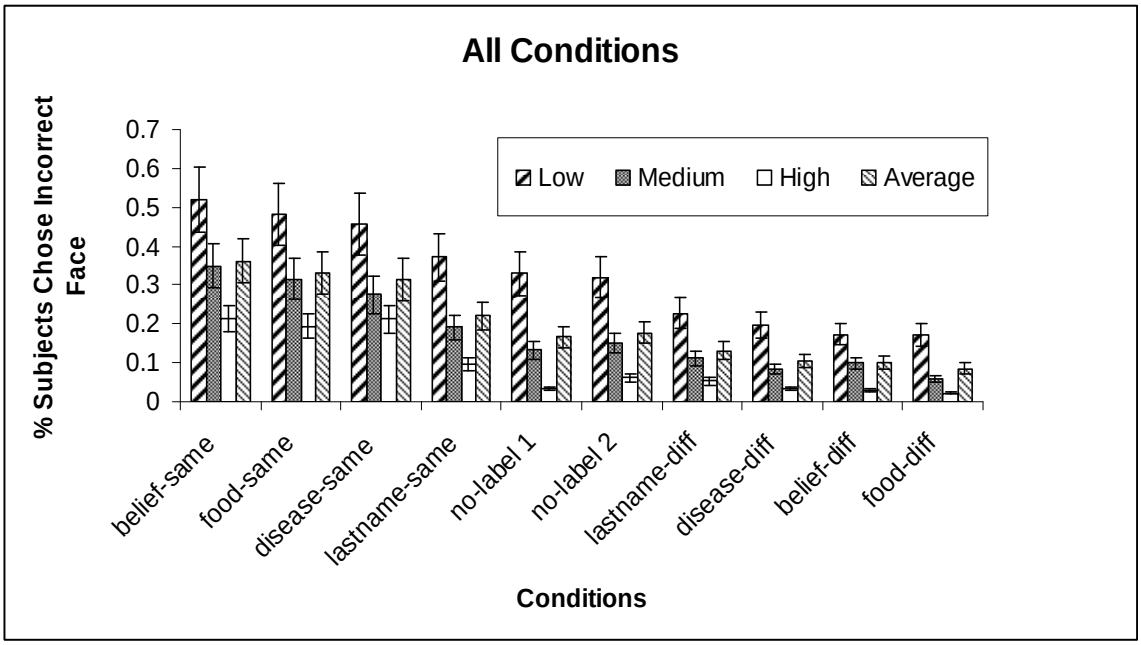
As you start this experiment, you will see pictures of people– a sample picture on the top and two test pictures below the sample (see the example below). Each person is infected by different diseases, which are specified with different names. In the example, the sample shown on the top is infected by "Gamgi," one test shown below is infected by "Chejangam," and the other is infected by "Sikjungdok." Your task is to look at these pictures carefully, and decide which test picture, left or right, is more similar to the sample picture.

c.

As you start this experiment, you will see pictures of people– a sample picture on the top and two test pictures below the sample (see the example below). Each person is specified by different last names. In the example, the sample shown on the top has the last name "Gamgi," one test shown below has the last name "Chejangam," and the other has the last name "Sikjungdok." Your task is to look at these pictures carefully, and decide which test picture, left or right, is more similar to the sample picture.

Figure 5. The instructions given in the introduction of the experiment. (a) shows a sample of the instructions for the no label condition. (b) shows a sample of the instructions for the disease label condition. (c) shows a sample of the last name condition.

a.



b.

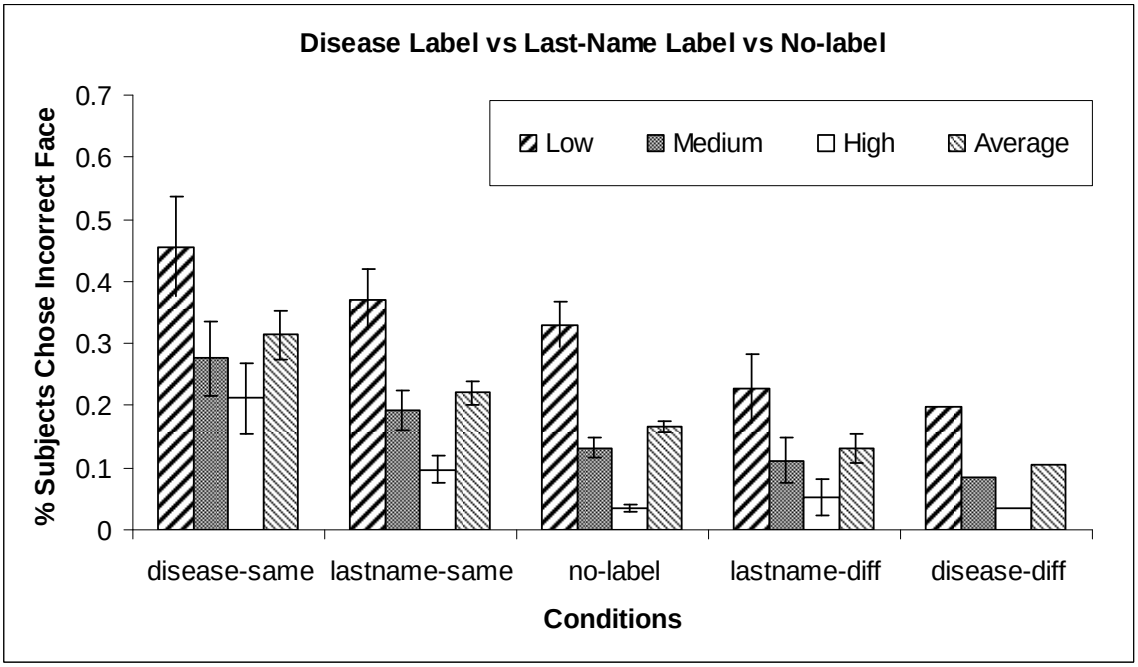


Figure 6. Results from all experiments. (a) The results of all conditions combined from Experiment 1 and Experiment 2. (b) The results from Experiment 1. (c) The results from Experiment 2.

c.

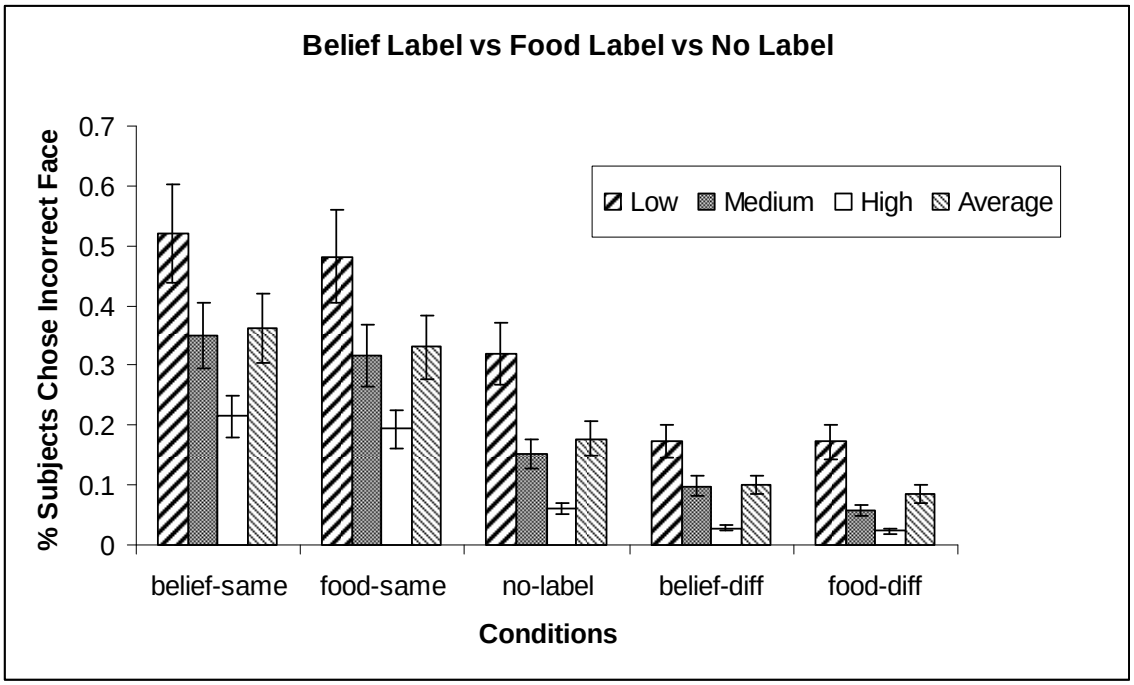


Figure 6 continued

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