Research Report

An Ambiguous-Race Illusion in Children's Face Memory

Kristin Shutts and Katherine D. Kinzler

Harvard University

ABSTRACT—*Adults show better memory for ambiguous faces of their own race than for ambiguous faces of another race, even when the faces are identical and differentiated only by extraneous cues to racial category. We investigated whether similar context effects operate early in development. Young children raised in predominantly White environments were presented with computer-generated White-Black morphed faces, each paired with either the White or the Black face that contributed to its construction, and were told that the two faces in each pair were siblings. The children's subsequent recognition memory was more accurate for faces that had been paired with White siblings than for faces that had been paired with Black siblings. The same effect did not obtain when the ambiguous faces were paired with White or Black faces that did not contribute to their construction and did not look like siblings. These findings suggest that face memory in children is not driven exclusively by visual information present in faces and instead depends on an interplay of categorical and perceptual information about race and relationships.*

Adults are more adept at recognizing faces of their own race than at recognizing faces of other races (see Meissner & Brigham, 2001, and Sporer, 2001, for reviews). This effect depends both on adults' greater perceptual expertise processing facial features and configurations typical of their in-group (e.g., Malpass & Kravitz, 1969; Rhodes, Brake, Taylor, & Tan, 1989; Turk, Handy, & Gazzaniga, 2005) and on categorical processes that may prevent adults from encoding out-group faces as individuals (e.g., Bernstein, Young, & Hugenberg, 2007; Hugenberg, Miller, & Claypool, 2007; Levin, 2000; Sporer, 2001; cf. Chiao, Heck, Nakayama, & Ambady, 2006). A similar own-race bias is present in children (e.g., Feinman & Entwhistle, 1976; Pezdek, Moore, & Blandon-Gitlin, 2003; Sangrigoli & de Schonen, 2004a, 2004b), but research to date has not revealed whether this effect is driven solely by children's greater ease in processing visual properties of same-race faces. In the study reported here, we investigated whether the perceived race of faces influences children's recognition memory when visual features of the faces are held constant.

In an experiment that was the inspiration for the current work, MacLin and Malpass (2003) created a set of computer-generated faces complemented by stereotypical Hispanic and Black hairstyles. In a recognition memory task, Hispanic adults showed better memory for faces presented with Hispanic hairstyles than for the same faces presented with Black hairstyles. This finding suggests that racial category information can influence memory for faces independently of perceptual differences.

In the present research, we borrowed the logic of MacLin and Malpass (2003), but modified the manner in which racial category information was presented. Children raised in predominantly White environments were shown a set of morphed faces, each constructed from one White and one Black parent face. The racially ambiguous faces were presented along with their White or Black parent faces, and the children were told that the faces in each pair were siblings. The children's memory for the morphed faces was then examined. We hypothesized that if children, like adults, are influenced by racial category information when remembering faces, our subjects would show better memory for morphs presented with a White sibling than for the same morphs presented with a Black sibling.

EXPERIMENT 1

Children were presented with each morphed face along with either its White or its Black parent face and were told that the parent face was a sibling of the target face. Because the faces in each pair strongly resembled one another, they plausibly looked like siblings. Memory for faces presented with Black versus White siblings was assessed and compared.

Address correspondence to Kristin Shutts, William James Hall, 33 Kirkland St., Cambridge, MA 02138, e-mail: shutts@fas.harvard.edu.

 Copyright © 2007 Association for Psychological Science

Method

Subjects

The subjects were 50 children (25 males) ages 2½ to 5 years (mean age = 4 years 0 months, range = 2 years 6 months to 5 years 1 month). The majority of subjects were White (84%), and all were from predominantly White neighborhoods and schools in New England.

Materials

The software program Morpheus (Version 1.85) was used to generate eight morphed faces (four male, four female), each composed from one White and one Black adult face (Fig. 1). Photoshop was used to trim hair and standardize clothing. The faces measured 6 cm × 9 cm and were presented against a white background in PowerPoint on a 14-in. iBook laptop computer.

Design and Procedure

The children were told that they would see faces and be asked to remember them. After one practice trial with cartoon characters, eight experimental trials were presented. On each experimental trial, one 6-s familiarization slide was followed immediately by a test slide. The familiarization slide contained a morph above its White or Black parent face. The experimenter, seated next to the child, pointed to the morph, then to the parent face, and then to the morph again while saying, for example, "This is Kevin, and this is his brother, and this is Kevin." The test slide contained the target morph alongside a distractor face (also a Black-White morph). The child was asked to touch the target face (e.g., "Which one is Kevin?") and was not given feedback about responding. Each child received one trial each with White and Black female and male siblings, and then the four trials were repeated in the same order, with the lateral positions of the test faces reversed. Trials with White and Black siblings alternated. The pairings of morphs to siblings (i.e., White or Black), order of trial types (i.e., White sibling or Black sibling first), lateral positions of the target and distractor faces on the first block of test slides, and morphs that served as targets versus distractors all were counterbalanced across subjects.

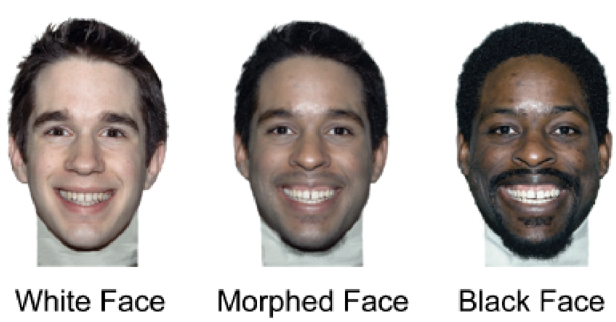

Fig. 1. A 50-50 morphed face from the MacBrain Face Stimulus Set (MacArthur Foundation Research Network on Early Experience and Brain Development), shown with the White and Black faces from which it was generated. Because of publishing restrictions, the morph-sibling sets used in the experiments cannot be shown here.

Results

Performance was above chance (chance = 50%) on both White-sibling trials (M = 75.5%, SE = 3.07), $t(49) = 8.30$, $p < .001$, $p_{rep} > .99$, $d = 1.17$, and Black-sibling trials (M = 65%, SE = 3.43), $t(49) = 4.38$, $p < .001$, $p_{rep} > .99$, $d = 0.62$. A repeated measures analysis of variance (ANOVA) with race of sibling (White vs. Black) and block (first half vs. second half) as within-subjects factors revealed that memory for morphed faces was greater on White-sibling trials than on Black-sibling trials, $F(1, 49) = 5.99$, $p < .05$, $p_{rep} = .93$, $d = 0.46$. There was no effect of block ($F < 1$), and no interaction of block by race of sibling ($F < 1$). Correlations between age (in months) and overall performance and between age and the difference in performance between White- and Black-sibling trials were computed to test for effects of age. These analyses revealed no effects of age on performance (rs = .07 and −.20, respectively).

Discussion

Children were better at remembering morphed faces paired with their White siblings than at remembering morphed faces paired with their Black siblings. The difference in performance between White- and Black-sibling trials was not due to visual information in the target faces, as the morphed faces were identical across those trials. Rather, children's memory was influenced by the racial context in which the faces were presented.

What is the nature of this context effect? It is possible that the presentation of morphed faces with their White or Black siblings led children to perceive the otherwise ambiguous target faces as being the same race as their siblings. This categorization, in turn, may have influenced children's encoding or retention of information about the faces' identity. An alternative explanation is that the mere presence of an other-race face interfered with children's processing of, or memory for, target faces (e.g., Kleider & Goldinger, 2001). Interference effects may have been greater when the race of the target face was Black because children in predominantly White environments have less perceptual expertise with Black than with White faces. The next experiment was conducted to distinguish between these two possibilities.

EXPERIMENT 2

In Experiment 2, a different group of children saw ambiguous-race morphed faces paired with unambiguous Black and White faces that did not contribute to their construction and did not look, to adults, like biological relatives of the morphed faces. Memory for the target faces was tested as in Experiment 1.

Method

The subjects were 50 children (24 males) ages 2½ to 5 years (mean age = 4 years 2 months, range = 2 years 7 months through 5 years 3 months). The majority of subjects were White (98%), and all were from predominantly White neighborhoods and schools in New England. The method was the same as in Experiment 1, except as follows. On each familiarization slide, subjects saw a morph presented with a White or Black face that had not contributed to its construction, and the subjects were told that the faces were siblings. Morpheus was used to create another set of eight (four male, four female) faces to be used as targets and distractors. In Block 1 of the experiment, all subjects saw four trials (two White siblings, two Black siblings) of the original stimuli from Experiment 1 and four trials (two White siblings, two Black siblings) of the new stimuli (order counterbalanced across subjects). In Block 2, the trials were repeated in the same order (lateral positions of targets and distractors were reversed on the test slides), for a total of 16 trials. Children therefore were tested on twice as many trials as in Experiment 1.

Results

Overall performance was above chance (chance = 50%) on both White-sibling trials (M = 68.75%, SE = 2.37), $t(49) = 7.92$, $p < .001$, $p_{rep} > .99$, $d = 1.12$, and Black-sibling trials (M = 69.56%, SE = 2.41), $t(49) = 8.10$, $p < .001$, $p_{rep} > .99$, d = 1.15.[1] An ANOVA with race of sibling and block as within-subjects factors revealed that memory for morphs on White-sibling trials was equal to memory for morphs on Black-sibling trials ($F < 1$). There was no significant effect of block, $F(1, 49)$ = 1.30, n.s., and no interaction of block by race ($F < 1$). Correlations between age and overall performance and between age and the difference between White- and Black-sibling trials revealed no significant effects (rs = .11 and .22, respectively). An ANOVA with experiment (Experiment 1 vs. Experiment 2) as a between-subjects factor and race as a within-subjects factor showed an interaction between experiment and race, $F(1, 98)$ = 4.83, $p < .05$, $p_{rep} = .91$, $d = 0.44$ (see Fig. 2).

Because subjects in Experiment 2 received twice as many trials as those in Experiment 1, it is possible that fatigue interfered with a potential cross-race-sibling effect in Experiment 2. To address this possibility, we repeated all analyses using only data from the first half of Experiment 2. Again, performance was above chance on both White-sibling trials (M = 70%, SE = 2.67), $t(49) = 7.48$, $p < .001$, $p_{rep} > .99$, $d = 1.06$, and Black-sibling trials (M = 71%, SE = 2.89), $t(49) = 7.27$, $p < .001$, $p_{rep} > .99$, $d = 1.03$, and memory on White- and Black-sibling trials was equivalent ($F < 1$). An ANOVA comparing Experiment 1 with the first half of Experiment 2 again showed an interaction between race and experiment, $F(1, 98) = 4.54$, $p < .05$, $p_{rep} = .90$, $d = 0.43$. An additional ANOVA was conducted to compare performance in Experiment 1 with performance on only those trials from Experiment 2 that displayed the same morphed faces used in Experiment 1. This analysis confirmed an interaction of race by experiment, $F(1, 98) = 4.37$, $p < .05$, $p_{rep} = .89$, $d = 0.42$.

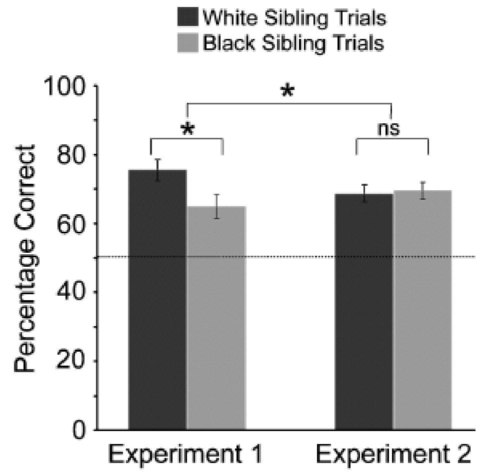

Fig. 2. Overall percentage correct on White- and Black-sibling trials in Experiments 1 and 2. Bars represent standard errors of the means. Asterisks indicate a statistically significant difference, $p < .05$.

Discussion

In Experiment 2, children's memory for ambiguous-race faces did not differ according to whether the faces were paired with a White or a Black face. Thus, this experiment provides evidence that not all racial contexts influence children's face memory. Experiment 2 therefore serves as a control for an alternative account of the effect observed in Experiment 1—namely, that a face paired with an other-race face on a screen will always be remembered less well than a face paired with a familiar-race face.

GENERAL DISCUSSION

The findings provide evidence that young children's better memory for familiar-race than for other-race faces is not driven exclusively by visual properties of those faces. In Experiment 1, when White-Black face morphs were introduced with the White or Black faces that contributed to their construction, young children raised in predominantly White environments showed better memory for faces presented in a White context than for faces presented in a Black context. This effect cannot be attributed to the mere presence of a second White or Black face in the display, as the effect was not observed in Experiment 2, in which target faces were accompanied by White or Black faces to which they did not appear to be related. One explanation for the

[1]Because of experimental error, Block 2 data from 10 subjects were excluded from analyses and replaced with column means from the 40 remaining subjects. Results of all analyses were the same regardless of whether these subjects were included or excluded.

findings obtained in Experiment 1 is that the presence of a visually similar sibling influenced children's perception of the race of the target face and that this perception in turn influenced children's face memory. Additional research is needed, however, to understand precisely how ambiguous-race faces are perceived by children, and in particular to understand the mechanisms by which category information affects children's processing of such faces.[2]

The findings from Experiment 2 suggest that purely semantic information does not influence children's face memory in the absence of visual support. In an effort to equate children's attention to and processing of the faces in the two experiments, we used the same cover story in Experiment 2 as in Experiment 1: The children were told that the accompanying face was the sibling of the target, even though the two siblings did not appear, to adults, to be related. Children's differing performance in the two experiments suggests that there are limits to the effects of top-down information on children's face processing: Merely telling children that a racially ambiguous target has a White or Black sibling evidently does not influence their memory for the target if the target and sibling do not appear to be visually related. Thus, children's greater memory for familiar-race faces appears to result from a complex interplay of perceptual and categorical information.

The results of the present experiments, together with those from adults, raise questions for future research regarding the nature and extent of category effects on face memory in children. If cross-race effects on face memory in children, as in adults, can be at least partially accounted for by differential processing of in-group versus out-group faces, rather than by differential processing of same- and other-race faces per se, then children may show differential memory for other categories of faces, outside the domain of race or ethnicity (Bernstein et al., 2007; Sporer, 2001). In addition, children's own social-group identity and experiences may influence these patterns of differential memory.

Most generally, our findings suggest that varying the context in which visually identical stimuli are presented provides an excellent tool for understanding interactions among children's perception, categorization, and memory. Cognitive psychologists have long used ambiguous or identical stimuli to investigate the effects of category information on children's reasoning about objects (e.g., Lavin & Hall, 2002; Soja, Carey, & Spelke, 1991). This approach can be profitably extended to the social realm.

[2]For example, in a study with adults, Webster, Kaping, Mizokami, and Duhamel (2004) found that after adapting to a face or to a series of faces that were unambiguous with regard to race, subjects perceived ambiguous-race faces as farther from the adapted-to race rather than closer to it. It is possible that children tested in the paradigm used by Webster et al. would show similar effects.

Acknowledgments—We thank Elizabeth Spelke, Gillian Rhodes, and Siegfried L. Sporer for their comments on this manuscript. This research was supported by National Institutes of Health Grant HD23103 to Elizabeth Spelke. We acknowledge use of the MacBrain Face Stimulus Set, whose development was overseen by Nim Tottenham and supported by the John D. and Catherine T. MacArthur Foundation Research Network on Early Experience and Brain Development. Please contact Nim Tottenham at tott0006@tc.umn.edu for more information concerning the stimulus set. Additional facial images were provided courtesy of Joan Chiao (Evanston, IL) and Jennifer Eberhardt (Stanford, CA).

REFERENCES

Bernstein, M.J., Young, S.G., & Hugenberg, K. (2007). The cross-category effect: Mere social categorization is sufficient to elicit an own-group bias in face recognition. *Psychological Science*, *18*, 706–712.

Chiao, J.Y., Heck, H.E., Nakayama, K., & Ambady, N. (2006). Priming race in biracial observers affects visual search for Black and White faces. *Psychological Science*, *17*, 387–392.

Feinman, S., & Entwhistle, D.R. (1976). Children's ability to recognize other children's faces. *Child Development*, *47*, 506–510.

Hugenberg, K., Miller, J., & Claypool, H.M. (2007). Categorization and individuation in the cross-race recognition deficit: Toward a solution to an insidious problem. *Journal of Experimental Social Psychology*, *43*, 334–340.

Kleider, H.M., & Goldinger, S.D. (2001). Stereotyping ricochet: Complex effects of racial distinctiveness on identification accuracy. *Law and Human Behavior*, *25*, 605–627.

Lavin, T.A., & Hall, D.G. (2002). Domain effects in lexical development: Learning words for foods and toys. *Cognitive Development*, *16*, 929–950.

Levin, D.T. (2000). Race as a visual feature: Using visual search and perceptual discrimination tasks to understand face categories and the cross-race recognition deficit. *Journal of Experimental Psychology: General*, *192*, 559–574.

MacLin, O.H., & Malpass, R.S. (2003). Last but not least. *Perception*, *32*, 249–252.

Malpass, R.S., & Kravitz, J. (1969). Recognition for faces of own and other race. *Journal of Personality and Social Psychology*, *13*, 330–334.

Meissner, C.A., & Brigham, J.C. (2001). Thirty years of investigating the own-race bias in memory for faces: A meta-analytic review. *Psychology, Public Policy, & Law*, *7*, 3–35.

Pezdek, K., Moore, C., & Blandon-Gitlin, I. (2003). Children's face recognition memory: More evidence for the cross-race effect. *Journal of Applied Psychology*, *88*, 760–763.

Rhodes, G., Brake, S., Taylor, K., & Tan, S. (1989). Expertise and configural encoding in face recognition. *British Journal of Psychology*, *80*, 313–331.

Sangrigoli, S., & de Schonen, S. (2004a). Effect of visual experience on face processing: A developmental study of inversion and non-native effects. *Developmental Science*, *7*, 74–87.

Sangrigoli, S., & de Schonen, S. (2004b). Recognition of own-race and other-race faces by three-month old infants. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *45*, 1–9.

Soja, N., Carey, S., & Spelke, E.S. (1991). Ontological categories guide young children's inductions of word meaning: Object terms and substance terms. *Cognition*, *38*, 179–211.

Sporer, S.L. (2001). Recognizing faces of other ethnic groups: An integration of theories. *Psychology, Public Policy, & Law*, *7*, 36–97.

Turk, D.J., Handy, T.C., & Gazzaniga, M.S. (2005). Can perceptual expertise account for the own-race bias in face recognition? A split-brain study. *Cognitive Neuropsychology*, *22*, 877–883.

Webster, M.A., Kaping, D., Mizokami, Y., & Duhamel, P. (2004). Adaptation to natural facial categories. *Nature*, *428*, 557–561.

(Received 10/22/06; Revision accepted 12/20/06; Final materials received 2/16/07)

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.