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Brief article

Memory for "mean" over "nice": The influence of threat on children's face memory

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Abstract

Adults remember faces of threatening over non-threatening individuals. This memory advantage could be indicative of a system rooted deeply in cognitive evolution to track and remember individuals who have been harmful in the past and therefore might be harmful again. Conversely, adults may have learned through experience that it pays to be vigilant. In the present research, we investigated whether attention to threatening individuals is privileged in young children's face memory. In Experiment 1, preschool-age children showed a face recognition memory advantage for individuals who were said to have committed harmful rather than helpful actions. In a further experiment, children did not selectively remember individuals who were described as the recipients of these actions, suggesting that the memory enhancement was produced by threat rather than negative valence. Together, these findings provide evidence for an early-developing system for remembering threatening individuals, consistent with an evolutionary account of its origins.

Keywords: Social cognition; Face memory; Development

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1. Introduction

Although memory for individuals is ubiquitous and fundamental to human social cognition, not all faces are created equal in the domain of perception and memory. Properties such as race (for a review, see Meissner & Brigham, 2001), age (Anastasi & Rhodes, 2005), gender (Wright & Sladden, 2003), and actions (Mealey, Daood, & Krage, 1996) influence how well faces are encoded and recalled. Face memory therefore is a powerful tool for investigating social cognition, as the scope and malleability of memory for others may be used to determine which human qualities are considered most salient or important.

Research on memory for perpetrators of harmful vs. harmless actions provides one example of how the study of face memory illuminates psychologically relevant properties of individuals. When presented with faces of people who are said to have committed negative/threatening, neutral, or positive/trustworthy actions, adults are most likely to remember the negative/threatening individuals (Mealey et al., 1996; cf. Barclay & LaLumiere, 2006). An influence of threatening behavior on face memory is not surprising given the clear benefits of surveillance of the harmful. It has been proposed that computational machinery evolved in order to detect and reason about cheaters and hazardous situations (Cosmides, Tooby, Fiddick, & Bryant, 2005). On this view, enhanced face memory for threatening individuals may be an adaptive mechanism for guiding attention to those who have caused harm once and therefore may do so again.

Previous research with adults also demonstrates the impact of arousing and negatively valenced information on memory. ''Flashbulb'' memories are cited as extreme examples of emotional events eliciting the subjective experience of highly vivid memory (Brown & Kulik, 1977; Heuer & Reisberg, 1990; Rubin & Kozin, 1984; Talarico & Rubin, 2005), often reported in clinical situations by victims of trauma or assault (Schacter, 1996; Witvliet, 1997). While studies have shown enhanced memory for many types of emotionally valenced and/or arousing stimuli over neutral stimuli (e.g. Bradley, Greenwald, Petry, & Lang, 1992; Cahill & McGaugh, 1995; Cahill & McGaugh, 1998; Hamann, 2001), negativity seems to play a privileged role in memory processes. Negative visual information is more accurately remembered than positive visual information (Ochsner, 2000; Talmi, Schimmack, Paterson, & Moscovitch, 2007), as are negative words compared to positive words even when controlling for effects of arousal (Kensinger & Corkin, 2003).

Outside the domain of memory, potentially threatening stimuli have been shown to capture the attention of both children and adults. Children and adults show faster visual search for snakes and spiders than for harmless objects (LoBue & DeLoache, in press; Ohman, Flykt, & Esteves, 2001). Young infants devote greater attention to angry faces than to faces depicting other emotions (Schwartz, Izard, & Ansul, 1985), and children and adults show more efficient visual search for angry faces than for neutral, happy, sad, or fearful faces (Fox et al., 2000; Hansen & Hansen, 1988; LoBue, 2005; Williams & Mattingley, 2006). These findings demonstrate that children and adults alike attend to threat that is visible in a stimulus – such as an obviously harmful animal or apparently angry individual. Often in the environment, however,

useful information about potential threat is not immediately perceptible. In order to effectively monitor others, individuals must also be able to attend to and remember invisible properties, such as personality traits, dispositions, and past behaviors.

In the present work, we ask whether children, like adults, show enhanced recognition memory for previously harmful individuals. As children are especially dependent on other people and vulnerable to their harmful actions, an ability to learn about and remember harmful people – even those who are not outwardly recognizable as such – would be useful from a young age. The accordance of psychological salience to threatening individuals may have emerged over the course of cognitive evolution, and could subsequently facilitate young children's ability to attend to and remember potentially harmful people. Conversely, attention to and memory for untrustworthy individuals may develop only through independent experience with complex patterns of cooperation and exploitation in human societies. As young children are largely reliant on parents and caregivers to assist in their navigation of the social world, they might not show enhanced memory for individuals who were previously threatening but no longer visually marked as such.

Experiment 1 investigated whether children show better memory for threatening compared to non-threatening individuals. Experiment 2 tested whether children show differential memory for faces paired with events that are similarly either negatively or positively valenced, yet are not threatening.

2. Experiment 1

In Experiment 1 children aged 3–4 years were presented with faces that were said to have committed nice or mean actions (similar to facts used by Mealey et al. (1996), yet child-appropriate), and their recognition memory for each of the faces was later assessed.

2.1. Methods

2.1.1. Participants

The participants were 38 preschool children (15 males; mean age = 4 years, 1.5 months; range = 3 years, 2.5 months to 4 years, 11.5 months) raised in the greater New York and Boston areas. The majority of the sample was White (95%).

2.1.2. Materials

The stimuli consisted of 16 faces (8 males, 8 females) with neutral, but mildly positive, expressions. Eight faces served as target faces and eight as distractors. The faces measured 6×9 cm and were created by using the program Morpheus (version 1.85) to morph a White and a Black face together from the MacBrain Face Stimulus Set to produce 16 ambiguous-race faces (each 50% White and 50% Black). Faces were presented to children against a white background in PowerPoint on a 14-inch iBook laptop computer.

2.1.3. Design and procedure

The experiment consisted of a familiarization phase immediately followed by a test phase. During the familiarization phase, children were introduced to 8 target faces in series. On each trial, the face appeared in the center of the screen for 6 s, during which time the experimenter provided either a nice or mean fact about the face (e.g., "Kevin is always nice. Today he brought in cookies and everyone got some" or, "Kevin is always mean. Today he stole everyone's cookies and no one got any"). Nice and mean facts were presented in alternating order. The order of facts presented (nice first or mean first), and pairings of facts to faces were counterbalanced across subjects.

At test, children were presented with each of the faces from familiarization individually, each alongside a novel distractor. The faces were presented, with their distractors, in the same order in which they appeared during familiarization. Children were asked to identify the face they had seen before (e.g., "Which one is Kevin?"). The lateral positions of target faces were counterbalanced within and across subjects.

2.2. Results and discussion

Participants were above chance for memory for both types of test trials (Chance = 50%; $M_{nice} = 61.84\%$, $SE = 3.62\%$, $t(37) = 3.27$, $p < .01$, $d = .53$; $M_{mean} = 71.71\%$, $SE = 3.42\%$, $t(37) = 6.35$, $p < .001$, $d = 1.03$; see Fig. 1). Children showed better face memory for individuals who were said to have committed mean actions, compared to individuals who were said to have committed superficially similar, yet positive, actions ($t(36) = 2.66$, $p < .05$, $d = .45$). A Wilcoxon signed-rank test confirmed this effect: 17 subjects showed better memory for mean than nice trials, 16

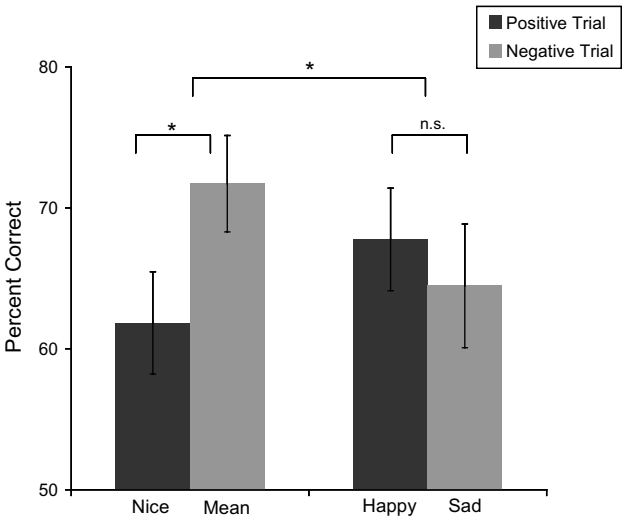

Fig. 1. Memory for "nice" and "mean" faces in Experiment 1 (left), and for "happy" and "sad" faces in Experiment 2 (right). Asterisks indicate $p < .05$. Error bars represent standard error.

subjects showed equal memory for the two types of test trials, and 5 subjects exhibited better memory for nice than mean trials ($Z = 2.43$, $p < .05$). Correlations between age (in months) and the difference in performance between mean and nice trials, as well as between age and overall performance on all types of trials were computed. These analyses revealed no relationship between age and relative or overall performance ($r = -.002$, $p =$ n.s., and $r = .071$, $p =$ n.s., respectively).

As the pairings of nice vs. mean actions to faces were counterbalanced across participants, differential memory was due to the information presented, rather than to any perceptual differences among the faces. The finding suggests that an ability to identify and remember harmful individuals is in place early in development. It is not clear, however, whether this memory advantage stemmed specifically from an orientation toward people who are threatening, or toward people who are associated with negative events. Experiment 2 was undertaken to distinguish these possibilities.

3. Experiment 2

Experiment 2 tested whether any negative information paired with faces would elicit a memory advantage, or whether the effect observed in Experiment 1 was specific to negative information denoting threat. Children were presented with the same faces, verbally described events, and test trials as in Experiment 1, but they were told that each person was "happy" or "sad" rather than "nice" or "mean." To accomplish this, each person was described as the recipient of the helpful or harmful event depicted in Experiment 1 rather than as its perpetrator.

3.1. Methods

The method was identical to Experiment 1, except as follows: The participants were a different group of 38 preschool children (16 males; mean age = 4 years, 2.5 months; range = 3 years, 3 months to 4 years, 10.5 months) drawn from the same population as in Experiment 1.

During familiarization, faces were presented with "happy" or "sad" information rather than "nice" or "mean" information. To accomplish this, each of the facts from Experiment 1 was changed from describing the person as an agent committing an action, to describing the person as a recipient of the same action (e.g., "Kevin is always happy. Today he was given cookies and he ate them" or, "Kevin is always sad. Today his cookies were stolen and he didn't get any").

3.2. Results

Participants were above chance for memory for both types of test trials (Chance = 50%; $M_{\text{happy}} = 67.76\%$, $SE = 3.64\%$, $t(37) = 4.88$, $p < .001$, $d = .79$; $M_{\text{sad}} = 64.47\%$, $SE = 4.39\%$, $t(37) = 3.30$, $p < .01$, $d = .54$). Children showed equal face memory for individuals who were paired with sad events and those paired with happy events, ($t(36) = .70$, $p =$ n.s., $d = .13$). A Wilcoxon signed-rank test confirmed

this results: 13 children displayed better memory faces paired with sad information than those paired with happy, 10 children exhibited equal memory for both types of trials, and 15 children exhibited better memory for faces paired with happy information ($Z = .642$, $p =$ n.s.).

An ANOVA with experiment (1 vs. 2) as a between-subjects factor and type of trial (negative vs. positive) as a within-subjects factor, revealed an interaction between experiment and trial type ($F(1,74) = 4.78$, $p < .05$, $d = 0.50$; Fig. 1). While children in Experiment 1 showed differential memory for faces presented with negative information compared to faces presented with positive information (i.e. mean vs. nice individuals), children in Experiment 2 showed equal memory for faces paired with negative and positive information (i.e. sad vs. happy individuals). Correlations between age and performance revealed no significant relationship between age and differential performance on happy and sad trials ($r = -.10$, $p =$ n.s.), however children's overall performance improved significantly with age ($r = .39$, $p < .05$).

3.3. Discussion

Children did not show differential face memory based on the type of information (happy vs. sad) presented with each face. Given that half of the faces were paired with positive and half with negative information, this finding suggests that the presence of negativity alone is not sufficient to produce differential memory effects. Moreover, the results of this experiment can be profitably compared with those obtained in Experiment 1, as the events described in each experiment used nearly identical language to portray the same situation, with the sole difference being that one scenario was depicted from the actor's and the other from the recipient's perspective. The significant difference between the findings of the two experiments provides evidence that children did not remember the "mean" faces over the "nice" faces in Experiment 1 because one type of information was negatively valenced whereas the other was not.

4. General discussion

The present findings provide evidence that a system supporting memory for faces of harmful individuals is in place early in development. In Experiment 1, children showed enhanced memory for faces that committed mean actions compared to faces that committed superficially similar, but positive, actions. In Experiment 2, children did not show differential memory for faces presented with happy vs. sad information, even though the verbal situations depicted across experiments were superficially similar. Thus, children showed enhanced face memory for threatening individuals, and this memory advantage did not obtain when faces were paired with negative information that was not threatening.

From an evolutionary perspective, tracking threatening individuals is a useful strategy, as remembering people who have been harmful in the past could reduce the likelihood of future personal harm. The presence of this effect in young children

suggests that attention to the perpetrators of harmful acts does not emerge through general learning mechanisms forming inductions from experience in complex social networks. Instead, humans may be predisposed to remember those who may cause them harm, even in the absence of outward signals denoting harmful behavior.

In each of the cases presented, children were third-party observers of the acts that transpired. Moreover, they were merely informed of the violations and instances of cooperation that occurred, rather than witnessing the actions themselves. A system providing for memory for the harmful may be even more robust outside of the laboratory setting where children directly witness transgressions. This difference would be suggested by research with adults showing an advantage in learned fear response for observational over verbally instructed situations (Olsson & Phelps, 2004).

Questions remain concerning the specific contributions of threat and arousal to children's face memory. Research with adults shows multiple interactions of arousal with memory, including increased memory for positively arousing information over neutral information (e.g., Bradley et al., 1992) and decreased memory for faces presented in an arousing but negative background context (Rainis, 2001). These results, in conjunction with Mealey et al. (1996), speak to a complex interplay among arousal, valence, and face memory in adults, and raise questions about the development of these relationships in children. For instance, it may be important for children to successfully attend to and remember both potentially threatening and potentially helpful individuals, yet threatening individuals may be the more salient of the two. Furthermore, given the possibility that "mean" events in our studies were more arousing than the "nice" events, and that events depicted from the perspective of an actor are more arousing than those depicted from the perspective of a recipient, arousal could be the proximal cause of children's memory patterns. More distally, however, natural selection might have favored the evolution of these arousal patterns, because they foster children's attention to and memory for the perpetrators of harmful actions.

Further research with children's face memory could follow the adult memory literature to investigate precisely which aspects of personality information, threat, and arousal impact memory, as well as the conditions under which face memory is enhanced or impaired. The experiments presented here demonstrate that from early in development, information denoting potential level of threat influences recognition memory for faces. While research with infants is needed to determine the existence of an innate and evolved faculty to support memory for threatening individuals, the present research provides evidence in this direction.

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