

That's the man who did it, or was it a woman? Actor similarity and binding errors in event memory

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Mistakes in eyewitness identification frequently occur when incorrect associations are made between a familiar person and the actions of another person. The present research demonstrates that actors do not need to be similar in appearance for such conjunction errors to occur. The actors can, in fact, be very different in appearance, even of different sexes. Participants attempted to remember a series of brief everyday events, each involving an actor performing an action. Increases in actor similarity led to increases in conjunction errors in which participants incorrectly associated a familiar actor with a familiar action that was actually performed by someone else, but conjunction errors frequently occurred even when the familiar actor was of a different sex than the original actor, arguing against the hypothesis that these conjunction errors are due solely to mistaken identity.

Event memory depends not only on accurate memory for the individual features of an event (e.g., a person and an action), but also on accurate memory for the relationships among these features (e.g., which person performed which action). Accurate event memory, therefore, relies on binding together different features of an event into an integrated event representation.

Many apparent examples of binding errors in event memory are found in the eyewitness testimony literature on unconscious transference (e.g., Loftus, 1976; Perfect & Harris, 2003; Ross, Ceci, Dunning, & Togliani, 1994). In unconscious transference, an eyewitness associates a familiar person with a crime performed by someone else. Thus, the eyewitness may correctly remember having seen both the person and the crime but may have incorrectly associated the innocent person with the crime.

Although this phenomenon is referred to as *unconscious transference*, Ross et al. (1994) suggested that unconscious transference may actually be caused in large part by a process of conscious inference in which "the witness misperceives the assailant as the bystander and thinks that the assailant and the bystander are the same person who was seen in two different places" (p. 929). Unconscious transference is therefore hypothesized to occur during encoding when, upon encountering the assailant, the eyewitness believes that this is the same person as an innocent bystander encountered earlier. This theory suggests that the actor and the innocent person may need to be very similar in appearance in order for people to exhibit unconscious transference. As evidence for this theory, Ross et al. demonstrated that most of their participants who made transference errors did indeed think the perpetrator and bystander were

the same person. Furthermore, when participants were told that the perpetrator and bystander were not the same person, unconscious transference was eliminated.

An alternative explanation for unconscious transference, however, comes from research on associative recognition (e.g., Light, Patterson, Chung, & Healy, 2004). In the associative recognition paradigm, participants are presented with word pairs (e.g., *bread-diamond*, *drill-boat*) and are tested on their ability to discriminate old word pairs from new word pairs (e.g., *zebra-carrot*) and from novel recombinations of familiar words (e.g., *bread-boat*). Participants are more likely to falsely recognize these recombinations than to falsely recognize entirely new word pairs, although false recognition of both types of recognition lures is lower than true recognition of old word pairs.

Light et al. (2004) explained these findings in terms of dual process theory (e.g., Jacoby, 1999), in which familiarity and recollection separately influence the likelihood of recognition of an item. According to this theory, the greater rate of false recognition of novel recombinations than of entirely new word pairs reflects the familiarity of the recombined words in the absence of recollection of the contexts in which those words appeared. The greater rate of true recognition of old word pairs than of false recognition of recombined words reflects recollection of the context in which a word was presented at encoding, thus allowing one to reject a word presented in a new context (i.e., when recombined) but encouraging one to accept a word presented in the same context as at encoding. Consistent with this theory, Light et al. demonstrated that manipulations that selectively impair recollection while leaving familiarity intact (e.g., aging, response deadlines)

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led to reduced discrimination of recombined word pairs from old word pairs.

Similar to false recognition found in the associative recognition paradigm, unconscious transference involves the false recognition of a novel combination of two familiar stimulus components—a familiar actor and action. Thus, the memory processes underlying unconscious transference may be similar to those underlying false recognition of recombinations of familiar words. In particular, unconscious transference may reflect the familiarity of an actor and action in the absence of recollection of the contexts in which they were encountered. This theory suggests that actors do not need to be similar in appearance for unconscious transference to occur. Separate exposure to an actor and to an action could cause one to later experience a strong feeling of familiarity when considering the combination of that actor and action, even if the actor was quite different in appearance from the actor who had actually performed that action.

The present experiments were designed to test whether unconscious transference occurs even when the actor seen performing an action at retrieval is quite different from the actor seen performing the action at encoding. Participants watched a series of events in which different actors performed everyday actions. In Experiment 1, we tested whether unconscious transference would still occur even when the familiar but incorrect actor looked very different from the original actor. In Experiment 2, we dramatically increased the differences between actors by manipulating the sex of the actor.

EXPERIMENT 1

Method

Participants

Eighty-eight undergraduates received credit in general psychology for their participation.

Materials

Encoding lists. Four partially overlapping sets of 30 events were created using 60 video clips from Kersten, Earles, Curtayne, and Lane (2008). In each event, a different female actor performed a different everyday action (e.g., stapling papers) that lasted 3–4 sec.

Recognition lists. Four retrieval lists of 150 events were generated. Thirty old events were the same as during encoding. In 30 *new actor* events, a new actor performed an action seen during encoding. In 30 *new action* events, an actor seen during encoding performed a new action, and in 30 *conjunction* events, an action seen during encoding was performed by an actor who was seen performing a different action during encoding. An actor seen performing a different action at encoding thus played the same role as that of the bystander in Ross et al.'s (1994) study, appearing a randomly varying period of time before or after the actual perpetrator of an action in the same physical context but never appearing simultaneously with the perpetrator. Each list was counterbalanced in such a way that each actor seen by a given participant at encoding appeared in an old, a conjunction, and a new action event at retrieval, and each action seen at encoding appeared in an old, a conjunction, and a new actor event at retrieval. Across the four lists, each combination of actor and action was used equally often as a conjunction, new actor, and new action event.

There were three types of conjunction and new actor events, based on the similarity of the actor performing the action during retrieval to the actor performing the action during encoding. In a preliminary

study, 26 undergraduates saw pairs of faces and rated them on a scale of 1–5 in response to the question, “How similar in appearance are these two people?” (1, *very similar*; 2, *somewhat similar*; 3, *neither similar nor dissimilar*; 4, *somewhat dissimilar*; or 5, *very dissimilar*).

The conjunction events seen by a given participant were divided into quartiles on the basis of the similarity of the actor who performed an action at retrieval to the actor who performed the same action at encoding. Conjunction similar events were those from the quartile in which the actors were rated as most similar (8 events, $M = 2.68$, $SD = 0.30$); conjunction dissimilar events were from the quartile in which the actors were rated as least similar (8 events, $M = 4.26$, $SD = 0.16$); and conjunction middle events were from the middle two quartiles (14 events, $M = 3.38$, $SD = 0.24$). New actor events were divided in the same manner. The events were counterbalanced in such a way that a conjunction event for one participant became a new actor event for another participant, so that across participants, the similarity ratings for conjunction and new actor events were identical.

Procedure

Each participant watched a different random order of 30 events in which 30 different female actors each performed a different action. Participants were asked to remember which person performed which action. Following each event, participants clicked on a button to continue. Participants then completed a demographics questionnaire and the Shipley (1986) Vocabulary test.

One week later, participants returned for the recognition test. Each participant watched a different random order of 150 events. Following each event, participants were asked, “Did you see this person perform this action in the first part of the experiment?” They then rated their confidence in their *yes–no* response as *just guessing*, *pretty sure*, or *absolutely sure*.

Design

The independent variable was event type (old, conjunction similar, conjunction middle, conjunction dissimilar, new actor similar, new actor middle, new actor dissimilar, new action, new), manipulated within participants. The dependent variable was the proportion of *yes* responses in the recognition test.

Results

The proportions of *yes* responses and confidence ratings are shown in Table 1. An ANOVA comparing the proportions of *yes* responses to old, conjunction, new actor, new action, and new events revealed a significant effect of event type [$F(4,348) = 349.45$, $MS_e = .012$, $p < .001$]. Post hoc Newman–Keuls analyses revealed that participants made significantly more *yes* responses to old events than to any other type of event (smallest $Q = 25.66$) and significantly fewer *yes* responses to new events than to any other type of event (smallest $Q = 7.81$). Participants made significantly more incorrect *yes* responses to conjunction events than to new actor ($Q = 12.73$) or new action ($Q = 14.46$) events. There was no significant difference between new actor and new action events ($Q = 1.73$).

A 2 (event type: conjunction or new actor) \times 3 (actor similarity: similar, middle, or dissimilar) ANOVA revealed a significant effect of actor similarity [$F(2,174) = 8.38$, $MS_e = .021$, $p < .001$]. Post hoc Newman–Keuls analyses demonstrated that participants were significantly more likely to falsely recognize events involving an actor who was similar to the original actor than they were to recognize events involving a dissimilar actor ($Q = 3.67$). The proportion of *yes* responses to middle events was not significantly different from the proportion of *yes* responses to dissimilar ($Q = 2.34$) or similar ($Q = 1.32$) events.

Table 1
Proportion of Yes Responses and Mean Confidence Ratings
for Yes Responses in Experiment 1

	Yes Responses		Confidence Ratings	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
	Old Events	.68	.13	2.32
Conjunction Events				
Similar	.41	.19	2.07	0.46
Middle	.38	.16	2.09	0.49
Dissimilar	.35	.23	2.06	0.46
New Actor Events			1.99	0.42
Similar	.26	.21		
Middle	.24	.16		
Dissimilar	.19	.16		
New Action Events	.21	.14	1.85	0.42
New Events	.12	.09	1.73	0.46

Note— $n = 88$ for yes responses; $n = 70$ for confidence ratings. Confidence ratings for new actor events were collapsed across similarity conditions because 29 participants did not make any yes responses in at least one of the new actor event conditions. After collapsing across similarity conditions for the new actor events, 18 participants made zero yes responses to at least one type of event, so confidence ratings for these 18 participants were not included. Confidence ratings: 1, *just guessing*; 2, *pretty sure*; 3, *absolutely sure*.

There was also a significant effect of event type [$F(1,87) = 115.14$, $MS_e = .025$, $p < .001$]. Participants were more likely to falsely recognize conjunction ($M = .38$, $SD = .15$) than they were new actor ($M = .23$, $SD = .14$) events. This effect was found for similar [$t(87) = 5.78$, $p < .001$], middle [$t(87) = 8.63$, $p < .001$], and dissimilar [$t(87) = 6.39$, $p < .001$] actors. There was no significant interaction of event type and similarity [$F(2,174) < 1$].

Discussion

Participants were more likely to falsely recognize conjunction events when the familiar but incorrect actor was similar in appearance to the original actor than when the actors were not similar in appearance. Participants were still significantly more likely to falsely recognize conjunction events than new actor events, however, even when the actor presented at retrieval was not similar in appearance to the original actor. This result suggests that two people need not be similar in appearance for an eyewitness to incorrectly associate one with the actions of the other.

Although the dissimilar actors in Experiment 1 were rated as different in appearance, all of these actors were young women. In Experiment 2, we predicted that participants would still exhibit unconscious transference even when the actor's sex was different from that of the actor who originally performed the action. Experiment 2 also differed from Experiment 1 in that each actor and action appeared only once during the recognition test.

EXPERIMENT 2

Method

Participants

Sixty undergraduates, 30 men and 30 women, received credit in general psychology for their participation.

Materials

Encoding lists. We created two sets of 60 actions, 30 performed by 30 different male actors (e.g., a man rolling a ball, a man polishing a shoe, a man lighting a candle), and 30 performed by 30 different female actors (e.g., a woman opening a box, a woman setting a clock, a woman turning a globe).

Recognition lists. At recognition, each participant viewed 72 events. Twelve old events were the same as at encoding. In 12 new events, a new actor performed a new action. In 24 new actor events, participants saw an action that was seen during encoding performed by a new actor. For half of these events, the actor's sex was the same as that of the actor seen performing the action during encoding (e.g., a new woman turning a globe) and for half the actor's sex was different (e.g., a new woman lighting a candle). In 24 conjunction events, both the action and the actor were seen during encoding, but the actor had originally performed a different action. For half of these events, the actor's sex was the same as that of the original actor (e.g., the woman who had set a clock at encoding was now seen opening a box), and for half the actor's sex was different (e.g., the man who had polished a shoe at encoding was now seen setting a clock). For each type of recognition event, half of the actors were male and half were female.

There were two recognition conditions. The new events in one list became the old events in the other, and the new actor events in one list became the conjunction events in the other.

Procedure

Each participant watched a different random order of 60 events that each lasted 2–6 sec. Participants were asked to remember which person performed which action. Following each event, participants clicked on a button to continue. Participants then completed the demographics questionnaire and vocabulary test.

One week later, participants returned for a recognition test. Each participant watched a different random order of 72 events. Each event was followed by the same recognition question and confidence rating scale as in Experiment 1.

Design

The independent variable, event type (i.e., old, new, new actor same sex, new actor different sex, conjunction same sex, conjunction different sex), was manipulated within participants. The dependent variable was the proportion of yes responses in the recognition test.

Results

The proportions of yes responses and confidence ratings are presented in Table 2. An ANOVA comparing the proportion of yes responses to old, conjunction, new actor, and new events revealed a significant effect of event type [$F(3,177) = 230.186$, $MS_e = .016$, $p < .001$]. Post hoc Newman-Keuls analyses revealed that participants made significantly more yes responses to old events than to any other type of event (smallest $Q = 14.63$) and significantly fewer yes responses to new events than to any other type of event (smallest $Q = 15.74$). Participants made significantly more incorrect yes responses to conjunction events than to new actor events ($Q = 6.29$).

A 2 (event type: conjunction or new actor) \times 2 (sex: same or different) ANOVA revealed that participants were significantly more likely to respond yes to an event when the actor was of the same sex as the original actor than when the actor was of a different sex [$F(1,59) = 28.35$, $MS_e = .018$, $p < .001$]. Participants were also significantly more likely to respond yes to conjunction than to new actor events [$F(1,59) = 34.36$, $MS_e = .018$, $p < .001$]. The proportion of yes responses to conjunction events was

Table 2
Proportion of Yes Responses and Mean Confidence Ratings
for Yes Responses in Experiment 2

	Yes Responses		Confidence Ratings	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Old Events	.71	.16	2.50	0.31
Conjunction Events				
Same sex	.52	.17	2.24	0.40
Different sex	.43	.19	2.12	0.41
New Actor Events				
Same sex	.42	.22	2.07	0.49
Different sex	.32	.20	1.99	0.52
New Events	.11	.11		

Note— $n = 60$ for yes responses; $n = 53$ for confidence ratings. Nineteen participants did not make any yes responses to new events, so confidence ratings for yes responses to new events were not included. Seven participants did not make any yes responses to at least one other type of event, so confidence ratings for these participants were not included. Confidence ratings: 1, *just guessing*; 2, *pretty sure*; 3, *absolutely sure*.

significantly higher than the proportion of yes responses to new actor events both when the actor's sex was the same [$t(59) = 4.24, p < .001$] and when it was different [$t(59) = 4.42, p < .001$]. There was no significant interaction of event type and sex of the actor [$F(1,59) < 1$].

Discussion

Participants were more likely to falsely recognize conjunction events when the familiar but incorrect actor's sex was the same as that of the actor who had been seen performing the action during encoding. Participants, however, were still more likely to falsely recognize conjunction than new actor events, even when the actors were of different sexes, suggesting that unconscious transference can occur even when two people are very different in appearance.

GENERAL DISCUSSION

The present experiments were designed to test the theory of Ross et al. (1994) that unconscious transference occurs when an eyewitness believes that a bystander and the perpetrator of a crime are the same person and, thus, believes that the bystander committed the crime. Because Ross et al. assumed this to be a conscious reasoning process on the part of the eyewitness, they suggested that the phenomenon be renamed *conscious transference*. Moreover, they argued that "unconscious transference is far more widely accepted than it should be, given the current level of empirical support (or lack of support) for it" (p. 929) and that "additional research is needed before we can confirm or disconfirm the acceptance of this phenomenon" (p. 930).

The present results have revealed that participants often falsely recognized a familiar actor performing an action that had actually been performed by someone else, even when the two actors were of different sexes. These results suggest that a conscious decision process involving mistaken identity is not the only explanation for unconscious transference.

An alternative explanation for unconscious transference is that it reflects a feeling of familiarity for an actor and an action in the absence of recollection of the contexts in which that actor and action were encountered. Thus, unconscious transference can occur any time one considers the combination of a familiar person and the familiar actions of someone else, even if that person is quite dissimilar in appearance from the person who had originally performed those actions. This theory has the advantage that it bridges applied research on eyewitness testimony with more basic research on associative recognition (e.g., Light et al., 2004).

A similar theory has also been proposed to explain conjunction errors in recognition memory (Jones & Jacoby, 2001). These occur when participants view stimuli composed of multiple attributes (e.g., compound words or faces with multiple features) and later exhibit false recognition of novel combinations of familiar components of those stimuli. The principal difference between findings in the associative recognition literature and in the conjunction memory literature appears to be that participants are more successful at using recollection to reject novel recombinations of familiar stimulus components in the associative recognition paradigm than in the conjunction memory paradigm. This may be because the stimulus components in the associative recognition paradigm are whole words that usually retain their meanings when recombined, whereas the stimulus components are syllables or individual face parts in the conjunction memory paradigm.

False recognition of a novel recombination of a familiar actor and action appears to be more similar to the false recognition of novel recombinations of familiar words in the associative recognition paradigm than to the false recognition of novel recombinations of stimulus parts in the conjunction memory paradigm. In particular, just as in the associative recognition paradigm, there is evidence that participants can sometimes use recollection of the contexts in which an actor and action were encountered to reject novel recombinations involving that actor and action (Kersten et al., 2008).

Although participants often falsely recognized events involving a familiar actor performing an action that had in fact been performed by someone quite different in appearance, they were even more likely to falsely recognize conjunction events in which the actor was similar in appearance to the original actor. One explanation for this finding is that some cases of false recognition of conjunction events may indeed reflect mistaken identity. This result would then be consistent with the theory of Ross et al. (1994) and would suggest that unconscious transference in the present experiments could result either from mistaken identity or from familiarity in the absence of recollection, with these two mechanisms combining to lead to especially high rates of false recognition for conjunction events involving a familiar actor who was similar in appearance to the original actor who had performed that action at encoding.

Alternatively, if one assumes that recollection can be partial rather than all or none (Dodson, Holland, & Shi-

mamura, 1998; Johnson, Hashtroudi, & Lindsay, 1993), it is possible to explain the present combination of findings entirely in terms of familiarity in the absence of recollection. For example, when presented with a retrieval event, a participant may have been able to retrieve partial information about the actor who had performed that action at encoding (e.g., female, short hair), without full recollection of the exact appearance of that person. Thus, if the actor in a conjunction event matched the details that were recollected about the original actor, the participant would not be able to reject the conjunction event on the basis of recollection. The familiarity of the actor appearing in the conjunction event could then potentially lead the participant to falsely recognize the event. In contrast, if the actor in a conjunction event did not match the recollected details about the original actor (e.g., if he were male), the participant would be able to reject the conjunction event, even if he or she could not recollect exactly which actor had in fact performed that action at encoding. The more similar the actor in a conjunction event was to the actor who had performed the action at encoding, the more likely it would be that the actor in the conjunction event would match the recollected details of the actor seen at encoding, accounting for the pattern of results observed in the present experiments.

A similar explanation has been proposed to explain effects of source similarity on eyewitness suggestibility in the misinformation paradigm. In particular, Lindsay, Allen, Chan, and Dahl (2004) demonstrated that eyewitnesses were more likely to incorporate information from extra-event narratives into their memory for a witnessed event if the events described in the narratives were conceptually similar to the witnessed event, even though it was clear to participants that the events described in the narratives were different from the witnessed events. Lindsay et al. proposed that when participants recollected details that were presented only in the narrative, they had greater difficulty in attributing this information to the correct source (i.e., narrative vs. witnessed event) when those two sources were similar, presumably because recollected narrative details were more likely to be broadly consistent with the witnessed events when the narrative and the witnessed event overlapped conceptually. Similarly, in the present experiment, when participants recollected having seen a particular action, they had greater difficulty in attributing that action to the correct source (i.e., the actor seen performing that action at encoding vs. some other actor seen at encoding) when those two sources were similar.

Although we recognize that the stimuli used in the present study do not necessarily replicate what eyewitnesses

encounter in a real-life crime situation, and it is possible that the rate of binding errors may be lower in real eyewitness situations, it is likely that the same basic memory mechanisms that caused binding errors in the present research also sometimes lead to false recognition by eyewitnesses in the real world. Thus, it is likely not necessary for an eyewitness to explicitly believe during encoding that the perpetrator and an innocent person are the same person for the eyewitness to falsely accuse the innocent person of committing the crime. The innocent person need simply be familiar and consistent with the recollected details, if any, of the appearance of the perpetrator.

AUTHOR NOTE

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