The Effect of Wanted Posters on Prospective and Retrospective Memory

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Abstract The experiment tested prospective and retrospective memory for a person pictured on a wanted poster. Participants monitored the videotaped activity of a computer lab; one of their duties involved reporting if they saw a computer hacker. Half viewed a wanted poster of the hacker before the monitoring task and half after. For half the participants, the hacker appeared during monitoring and for half not. A diagnosticity ratio comparing the correct prospective memory identifications with false positive identifications showed that a prospective identification was 3.35 times more likely to be accurate than inaccurate. For those viewing the wanted poster after monitoring, the diagnosticity ratio was 1.21. Based on diagnosticity, a prospective identification had more value than a retrospective identification.

Keywords Wanted poster · Eyewitness ·
Prospective memory

The American public's exposure to pictures of individuals wanted by the authorities is undoubtedly at an all time high. Terrorists' pictures appear daily in the newspaper, on television, and on web sites (e.g., the F.B.I. web site; "American's Most Wanted" web site). Some television shows are totally devoted to enlisting the public's help in finding fugitives or missing persons. Recently, the FBI launched a new program to use large digital billboards to display pictures of fugitives and missing persons to passing motorists. During the early days of the war in Iraq, the US military gave troops a set of playing cards displaying the most wanted members of Saddam Hussein's government. Although pictures shown on web pages, TV, newspapers, digital billboards, and playing cards are not all technically wanted *posters*, the term *wanted poster* will be used as a general term applying to all procedures which provide a photograph or video in an attempt to locate a person.[1]

Clearly, the US criminal justice system and the US society view wanted posters as an important tool in apprehending terrorists and criminals as well as for locating missing persons. In contrast, the field of Psychology has exhibited very little research interest in wanted posters. Although anecdotal citing evidence the effectiveness of wanted posters does exit, little experimental research on even the most basic of questions has been conducted (see McAllister, 2008).

Comparison with Eyewitness Procedures

Given the extensive research literature on eyewitness testimony (see reviews in Lindsay, Ross, Read, & Toglia, 2007; Toglia, Read, Ross, & Lindsay, 2007), one would think that many of the questions about wanted posters would have been answered in research on other

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[1] Another investigation procedure used by the police is to construct a picture either through the use of a police artist or through by having the witness construct a composite drawing. Sketches and composite drawings are, in fact, used on a type of wanted poster. As with the wanted poster using a photograph, the purpose of a composite is to help locate someone wanted by the police; however, there are some real differences that make generalizations from the limited research on composites questionable (see review by Davies & Valentine, 2007). The current research focuses on wanted posters using actual photographs or videos.

identification procedures (i.e., lineups, mug books, or show-ups) which could then be simply generalized to the case of wanted posters. However, research shows that generalizing from one identification task to another is a questionable practice. McAllister, Michel, Tarcza, Fitzmorris, and Nguyen (2008) demonstrated the danger of generalizing lineup findings to mug books while Steblay, Dysart, Fulero, and Lindsay (2003) made a similar case against generalizing lineup findings to show-ups. On the surface eyewitness identification procedures may seem similar to a wanted poster situation; however, considerable differences exist.

Eyewitnesses to a crime undoubtedly pay attention to the perpetrator due to the encounter's importance. In contrast, someone viewing a wanted person in a non-crime situation (e.g., in line at the grocery store), is unlikely to pay particular attention. Any learning of the wanted person's face will be due to incidental learning. When someone encounters the wanted person and then later sees this person in a wanted poster, retrieving the memory is difficult because incidental learning is poorly retained. Moreover, the absence of specific retrieval cues, such as time and place, makes the task even more difficult.

Thus far we have focused on memory of a wanted person encountered before the wanted poster is viewed; however, not all wanted poster tasks are of this nature. Some wanted poster tasks involve being alert for a potential encounter in the future. We can view these two types of wanted poster tasks in terms cognitive psychology's distinction between *retrospective* memory tasks and *prospective* memory tasks (Meacham & Leiman, 1982; Wilkins & Baddeley, 1978). Retrospective memory tasks typically involve a search of memory for past events or information when that information is requested (e.g., by an experimenter, police officer, or wanted poster); both eyewitness procedures and the wanted posters described earlier fit this type of task. In contrast, prospective memory tasks involve remembering to perform some future behavior without any explicit reminder (e.g., I need to pick up my jacket when I go past the dry cleaners on my way home tonight). In addition to having no explicit request to retrieve the memory, other tasks compete for attention with the prospective memory task (e.g., I may be driving my car and talking on the cell phone as I am heading home tonight—these tasks compete with my remembering to pick up the jacket). Einstein and McDaniel (1990) discussed a type of prospective memory that they called *event-based prospective memory*; the prospective memory involves remembering to perform the behavior when some future target event occurs (e.g., I see the dry cleaners in front of me, resulting in my picking up my jacket). Some wanted posters involve event-based prospective memory. Consider a wanted poster showing a recently kidnapped

child. This is not a retrospective task because the child has just been kidnapped; whether the child was seen last week is irrelevant. The wanted poster gives the prospective memory task of contacting the police if the child is seen in the future. After viewing the poster, the viewer would go about his or her daily activity; the wanted poster task would not be the only task (or even the primary task). Just as in *event-based prospective memory* research, other tasks compete for attention as the person goes to work, picks children up from school, goes shopping, etc. The cue of seeing the kidnapped child (or a somewhat similar child) would remind the person of the task of calling the police.

Wanted Poster Task

What type of experimental procedures could be used to provide a reasonable test of prospective wanted posters? McDaniel and Einstein (2007) provide some guidance here; they detailed the parameters required for a prospective memory task. Two of the key parameters are that (a) "The prospective memory task is embedded in ongoing activity", and (b) "Execution of the intended action is not immediate" (McDaniel & Einstein, 2007, p. 5). These conditions were created in the current research by having participants monitor the activity of a university computer lab. The monitoring involved a number of tasks unrelated to a wanted person (e.g., recording violations of lab rules on an event form). Embedded in these other tasks was the task to be on the alert for a computer hacker who had been causing problems in other labs. Fulfilling the requirement that the intended action not be immediate, the monitoring task went on for half an hour before the wanted person entered the lab. McDaniel and Einstein (2007) made clear that the stimulus (in this case the wanted person) should "appear as a natural part of another task or situation" (p. 6); thus, it was important that the wanted person should behave just as the other lab patrons behaved.

Manipulated Variables

In order to demonstrate that the wanted poster caused the identification of the hacker, we included a variable of whether or not the wanted poster was presented before the monitoring session. We expected participants who viewed the poster before monitoring to show the prospective memory behavior of reporting the hacker sighting on their event form whereas those who did not view a wanted poster before the monitoring session would not. In addition to its usefulness for testing prospective memory, the manipulation of when the wanted poster picture was shown allowed for a test of a retrospective wanted poster. We

showed all groups the hacker's picture after the monitoring session and asked the retrospective question of whether he was seen during the monitoring session. For those not viewing a wanted poster before the monitoring, this would, in fact, provide a measure of the retrospective wanted poster situation.

A second manipulation involved whether the wanted hacker actually appeared during the monitoring session or not. This manipulation allowed for the testing of false positives on both the retrospective memory measures as well as the prospective memory measures. Assessing false positives using such a manipulation has a long history in eyewitness research. In contrast, most prospective memory research focuses on whether the individual correctly remembered to perform the specified behavior when the target event occurs. Behavior that is incorrectly performed when the target event has not occurred is of much less interest; data about the occurrence of these incorrect behaviors is not typically reported (and may not even have been analyzed). However, for both retrospective and prospective wanted poster situations, false positive identifications of a person who was not the wanted person are important. A false positive identification requires police to waste time and energy tracking down a false lead. In order to explore the extent to which wanted posters lead to false positive identifications as well as correct identifications, the current research included a manipulation of target presence or absence during the monitoring session.

In summary, the purpose of the current research was to test the impact of wanted posters on prospective and retrospective memory. For the measure of prospective memory (whether the participant recorded seeing the hacker on an event form), we predicted that those viewing the wanted poster would report the hacker's presence at a significantly higher rate when he appeared than when he did not. We measured retrospective memory by showing the hacker's picture and asking whether he appeared during the monitoring session. We predicted that those viewing the wanted poster before the monitoring would be more likely to correctly remember whether this person had appeared or not.

Method

Participants and Design

A total of 184 introductory psychology students volunteered to participate in the experiment in order to fulfill a class requirement. The design was a 2 (wanted poster: before or after) × 2 (hacker presence: present or absent) factorial. Each participant was randomly assigned to one of the four conditions.

Procedure

The experimenter led each participant into a lab room that contained a Television/VCR setup, a computer, and the various forms to be used in the monitoring task. After obtaining informed consent, the experimenter left the room and a computer-administered instructions. The computer informed participants that they were participating in an experiment designed to test the effectiveness of monitoring computer labs by using closed circuit television. Participants were to monitor the lab, watching for various events that might occur and to record these events on an Event Form. The Event Form had two columns: one column titled—*EVENT* and the other column titled—*TIME EVENT OCCURRED*. In addition to monitoring for rule violations, e.g., patrons failing to sign-in, the computer instructed them to watch for other events that might occur, e.g., computer repair technicians entering the lab. Finally, it told participants to be alert for an individual who had been hacking into university files. Half of the participants were then shown a color, head and shoulder still picture of the "hacker"; the other half were merely told to look for any suspicious behavior. Following the computer-administered instructions, the experimenter re-entered the room, started the monitoring tape, and then left the room. Participants then monitored the video-taped lab for the next 45 min. The tape showed lab patrons (volunteer introductory psychology students) enter and leave on a staggered basis. When patrons entered the lab, they appeared first in profile and then in a frontal close-up as they signed-in. Next, participants saw the lab patrons walking toward one of the five lab computers and then sitting down, profile view, in front of computers. During the monitoring period, lab patrons engaged in various behaviors that were potentially recordable events, e.g., student talking on cell phone, student opening a can of soda, etc. These events were relatively evenly spaced over the 45 min session. After 30 min, half of the participants saw the hacker enter the lab. After signing in, he went to one of the computers near the middle of the lab and began working on a paper. After 12 min, he got up from the computer and exited the lab, walking toward the video-camera as he exited. Participants in the hacker-absent condition viewed a similar tape that did not include the hacker. After participants completed the monitoring, the experimenter entered the lab cubicle and asked participants to fill out a brief, computer-administered questionnaire. The questionnaire consisted of a series of "yes" or "no" questions concerning whether certain events had occurred. Each question was followed by a seven-point scale measuring their confidence in their response. The first seven questions were filler questions (e.g., did the computer technicians show-up, did anyone use a cell phone, etc.) The eighth question asked, "Did you see the person in

the picture above in the lab?" The same picture used in the wanted poster condition appeared above this question. Participants responded by clicking a *Yes* or *No* button below the question. A seven-point response-confidence measure followed. We then debriefed participants answering all questions except whether any particular event happened or not during their session.

Results

Performance on Monitoring Task

We assessed general attentiveness to the monitoring task by totaling the number of correct responses to the seven questions dealing with events other than the presence of the hacker. We analyzed this measure in a 2 (wanted poster: before or after) × 2 (hacker presence: present or absent) ANOVA. We found no significant effects. Out of a possible score of 7, the average number of correct responses was extremely high ($M = 6.52$), suggesting a high level of attentiveness to the task.

Prospective Memory

For the prospective memory task, we predicted that those who viewed the wanted poster before monitoring would report the hacker's presence at a significantly higher rate when the hacker actually appeared than when he did not appear. We expected that few participants in the wanted-poster-after condition would make identifications during monitoring because they had only the vaguest of a prospective memory task (watch for any suspicious behavior). As can be seen in Table 1, none of the participants in the wanted-poster-after conditions reported seeing the hacker on the event form. Thus, any identification made in the wanted-poster-before condition would appear to be a function of the wanted poster rather than any suspicious behavior by the target (or others). Although the 0s in the two not-viewed cells reassure us that no suspicious

Table 1 Percentage of prospective and retrospective hacker identifications as a function of wanted poster and hacker presence

Wanted Poster	Hacker presence	
	Present	Absent
Prospective memory measure		
Before	54.2	16.3
After	0.0	0.0
Retrospective memory measure		
Before	70.8	16.3
After	56.5	46.8

behavior occurred, it does present a problem for data analysis. The two 0 cells violate the assumptions for conducting the most appropriate test—a 2 × 2 Chi square. However, rather than eschewing any test of significance, we analyzed the prospective memory measure within the wanted-poster-before condition. There was a significant effect for hacker presence, $\chi^2(1, N = 92) = 14.09$, $p < .001$, $\varphi = .39$. Those in the hacker-present condition made significantly more correct identifications than those in the hacker-absent conditions made false positive identifications (see Table 1 for percentages).

Diagnosticity Value of a Wanted Poster Prospective Identification. One technique for assessing the information gain coming from a lineup identification is to compute a diagnosticity ratio based on dividing correct identifications of the guilty suspect by the false positive identifications of the innocent suspect (Wells & Lindsay, 1980). One could similarly assess the value of a wanted poster identification through the creation of a slightly modified diagnosticity ratio. A prospective identification of a hacker who, in fact, appeared compares to an identification of a guilty suspect in a lineup. In the hacker-absent conditions, we considered an identification as a false positive if a participant reported *anyone* in the lab as being the hacker; this differs slightly from a lineup situation where only an identification of the innocent suspect is treated as a false positive. We computed the wanted poster diagnosticity ratio by dividing the correct prospective memory identifications when the hacker was present during monitoring by the false positive prospective memory identifications when the hacker was absent. This measure provides some indication of how useful a prospective wanted poster identification is. A diagnosticity ratio of 1 would indicate little value of an identification since an innocent individual would be just as likely to be identified as the wanted individual. The diagnosticity ratio for prospective memory was 3.35 (54.2/16.3), indicating that a prospective identification was 3.35 times more likely to be accurate than inaccurate.

Retrospective Memory

The retrospective measure was a participant's *Yes* or *No* response to the eighth question concerning whether the pictured individual had appeared during the monitoring session. We predicted that those in the before condition would be more likely to correctly answer this retrospective question. Given the dichotomous nature of the retrospective identification measure, we analyzed the data using a log-linear analysis that included wanted-poster (before or after) and hacker presence (present or absent). We found a significant wanted poster × hacker presence interaction,

χ^2 (1, $N = 184$) = 10.63, $p = .001$, $\varphi = .24$. We conducted follow-up chi-squares within each level of hacker presence. Within the wanted-poster-before condition, the effect of hacker presence was significant, $\chi^2(1, N = 92) = 25.27$, $p < .001$, $\varphi = .55$. Participants made more correct retrospective identifications in the hacker-present condition than incorrect false positive identifications in the hacker-absent condition (see Table 1). Within the wanted-poster-after condition, the effect for hacker presence was nonsignificant, χ^2 (1, $N = 92$) = .88, $p = .349$, $\varphi = .10$. Correct identifications in the hacker-present condition were only slightly higher than false positive identifications in the hacker-absent conditions (see Table 1).

Diagnosticity Value of a Wanted Poster Retrospective Identification. The diagnosticity ratio was 4.34 (70.8/16.3) for participants who viewed the wanted poster before monitoring and 1.21 (56.5/46.8) for participants who viewed the wanted poster after monitoring the lab. Thus, viewing a wanted poster before increased the diagnostic value of a retrospective identification by a factor of 3.59 (4.34/1.21).

Two Steps of Prospective Memory

A correct prospective memory in a wanted poster task involves two steps: (a) noticing that the hacker had entered the lab and (b) taking the action of reporting this on the event form. Clearly, someone who had viewed the wanted poster could take the first step of noticing the hacker, but not take the second step of recording it on the event form. Unfortunately, there was no direct measure of the first step of prospective memory. One can roughly estimate the first step by analyzing those in the wanted-poster-before/hacker-present condition who retrospectively reported having seen the hacker enter the lab. Based on the retrospective data in Table 1, we could estimate that 70.8% of those in the wanted-poster-before/hacker-present condition took the first step of noticing the hacker. This pool of those claiming to have noticed the hacker potentially contains three different types of individuals: (a) those who also prospectively reported the hacker on the event form, i.e., took the second step; (b) those who actually noticed the hacker, but failed to report him on the event form; and (c) those who neither noticed the hacker nor reported him on the event form, but had merely guessed that the hacker had been present when asked the retrospective question. An analysis of the prospective memory measure for this pool of participants showed that there was a significant difference, $\chi^2(1, N = 34) = 7.53$, $p = .006$, $\varphi = .47$, between those who prospectively reported the event (73.5%) and those who failed to report the event (26.5%). It would appear that most of those who noticed the hacker also reported him; however,

failure to report the hacker *could* include individuals who merely guessed that he had been present rather than really having noticed him but failed to act.

Discussion

Wanted Poster Prospective Memory

The purpose of the current research was to provide a controlled test of the impact of wanted posters on both prospective and retrospective memory. First, let us consider the impact of viewing a wanted poster on prospective memory. For those viewing a wanted poster before monitoring, there did seem to be clear evidence of prospective memory. More than half of the participants viewing a hacker-present tape correctly reported it on the monitoring event form. But even if wanted posters do result in the wanted person being reported, the concern still exists that these accurate reports of a sighting might get lost among many false sightings. A high number of false sightings could bog down the criminal justice system, wasting resources by following up on false leads. The current findings lessen such concerns. The diagnosticity ratio for prospective memory identifications indicated that a prospective memory identification was 3.35 times more likely to be accurate than inaccurate.

Although the diagnosticity ratio provides support for the effectiveness of prospective wanted posters, we must be cautious in making generalizations. The high diagnosticity ratios found in the current research might have been affected by the lack of similarity of the other males in the lab to the hacker. If the research had selected males specifically for their similarity to the hacker, then the diagnosticity ratio would have undoubtedly have been lower. Clearly, this is an issue for future research.

Wanted Poster Retrospective Memory

Retrospective Memory of Those Not Viewing a Wanted Poster Before Monitoring. The picture of the hacker followed by the question, "Did you see this person during the lab monitoring?" was, in essence, a retrospective wanted poster for participants only viewing a wanted poster after monitoring the lab. Rather surprisingly, no significant difference was found between the number of correct identifications of the hacker when he had actually appeared during monitoring and the number of false positives when he did not appear. The diagnosticity ratio of 1.21 shows that an identification was almost as likely to be inaccurate as accurate. Consistent with these findings, a high number of false positives have also been found in research on show-ups (Dysart & Lindsay, 2007).

Although the high level of false positive identifications based on retrospective memory would be a serious concern to the criminal justice system, certain limitations to the current research limit generalizations. The retrospective wanted poster used in the current research had some of the features of a real world retrospective wanted poster; however, it had a weak action component. The retrospective-wanted-poster task in the current research involved responding to a direct "yes" or "no" question about seeing the pictured hacker. In a real world retrospective-wanted-poster situation, the viewer of the poster must take a much more active role to report it. The results of the current research concerning retrospective wanted posters might have been somewhat different if a more involved action component had been included.

Retrospective Memory of Those Viewing a Wanted Poster Before Monitoring.   The retroactive memory of those participants who viewed a wanted poster before the monitoring session also merits discussion. When participants viewed the wanted poster before monitoring, the correct retrospective identifications of the hacker when he appeared were significantly greater than the false positive identifications when he did not. In contrast, as previously discussed, when the wanted poster came after the monitoring, correct identifications and false positives were equally likely. The wanted poster before monitoring may have had a sensitizing effect of improving the retrospective memory for the hacker's presence or absence during monitoring. An alternate explanation is that participants' retrospective responses merely reflected a commitment to the event form reports made (or not made) during monitoring.

We also used the retrospective memory measure as rough estimate of the extent to which participants noticed the hacker during monitoring as separate from a report on the event form. Presumably, a wanted poster could cause a wanted person to be noticed, but not necessarily to be reported. Most of the individuals who retroactively reported having seen the hacker also had remembered to report him on the form. It would appear that most individuals who take the first step in prospective memory of noticing the event also take the second step of reporting it.

Implications for Future Research

It is much too early to consider policy implications for the criminal system based on this one experiment; however, the strength of these findings suggest that future research is warranted. Just as theory and research on retrospective memory have provided insights into variables that affect eyewitness memory, the rapidly developing theory and research on prospective memory could help guide future research on wanted posters. Future research could also be guided by any number of ecologically based issues. For example, (a) are wanted posters equally successful for different types of wanted persons (e.g., terrorists, fugitive, adult kidnap victims, child kidnap victims, etc.)? (b) how should the wanted poster itself be designed/presented (e.g., reward included, location, modality, frequency, method for reporting, etc.)? (c) how do viewer variables impact on wanted poster effectiveness (e.g., age, gender, cross-race identification, etc.)? Yes, the research on wanted posters has only just begun.

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