

Overview of Estimator Variables: Findings from Research on the Effects of Witness,
Crime and Perpetrator Characteristics on Eyewitness Accuracy

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Overview

Estimator variables refer to characteristics of the witness or perpetrator of the crime or the conditions in which a crime occurred, factors that are not under the control of crime investigators. Estimator variables are of interest because knowing how estimator variables influence identification accuracy gives us some basis for gauging the reliability of an eyewitness identification. The better we are able to assess identification accuracy, the better we are able to assess defendant culpability and ultimately determine the best way to resolve a criminal charge.

Considerable psychological research has addressed the question of whether there are reliable associations between estimator variables and eyewitness identification accuracy and which specific estimator variables predict identification accuracy. The purpose of this paper is to summarize some of the main findings from this research and to direct the interested reader to relevant summary papers concerning these and other estimator variables. For a more thorough review of estimator variables and related issues, see Cutler and Penrod (1995).

In this paper, I summarize six specific estimator variables. These were chosen from a more exhaustive set (Cutler & Penrod, 1995) for the following reasons: (1) research findings point to clear conclusions regarding their effects; (2) a survey of eyewitness researchers revealed substantial agreement about (most of) their effects; (3) my personal experience in about 50 cases in which I served as a consultant or expert witness reveals that these variables are common; and (4) research shows that most of the findings are not merely a matter of commonsense – a justification often given by judges for not admitting expert psychological testimony about estimator variables. An additional estimator variable, eyewitness confidence, also meets these criteria but is covered in a separate contribution to this conference (S. Penrod). First, I present a research summary for each factor. Next, I summarize the results from the survey of eyewitness researchers, and following that, I present research addressing the extent to which these factors are a matter of commonsense to jurors.

Summary of Research on Estimator Variables

Own-Race Bias

Own-race bias refers to the common finding that eyewitnesses are more accurate at identifying perpetrators of their own race than perpetrators of other races. A recent meta-analysis¹ (Meissner & Brigham, 2001) reviewed the results of 31 separate studies involving 91 separate experimental tests of own- versus same-race identifications. In total, over 5,000 eyewitnesses participated in these studies. Across all studies, witnesses were 1.4 times more likely to correctly identify a previously viewed own-race face when compared with performance for other-race faces. Witnesses were 1.56 times more likely to falsely identify a novel other-race face when compared with own-race faces. White participants demonstrated a significantly larger own-race bias when compared with Black participants but only with respect to false identifications. With respect to correct identifications, Whites and Blacks showed the same own-race bias. The own-race bias effect was larger with shorter exposure durations (i.e., the amount of time for which the eyewitness was able to view the perpetrator), and the relation between confidence and accuracy was weaker for other-race identifications than for same-race identifications.

For example, Platz and Hosch (1988) conducted a field study in which White, Black or Hispanic customers visited convenience clerks and had interactions with 90 White, Black, or Hispanic clerks. Two to three hours after each visit, an investigator asked the clerk to attempt an identification from photoarrays containing at least one of the customers. White clerks were more likely to correctly recognize White customers (53.2%) than Black (40.4%) or Mexican (34%) customers. Black clerks were more likely to correctly recognize Black (63.6%) than White (54.6) or Hispanic (45.4%) customers. Hispanic were more likely to correctly recognize Hispanic (53.6%) than White (35.7%) or Black (25%) customers.

Exposure Duration

Exposure duration refers to the amount of time for which an eyewitness has to view a perpetrator at the time of the crime. Some crimes occur in a matter of seconds or minutes (or the eyewitness's opportunity to view the perpetrator is very brief), others unfold over hours or, such as in the case of kidnapping, days. Not surprisingly, the more time an eyewitness has to view a perpetrator, the more time she has to encode the perpetrator's characteristics into memory, and the more likely she is to make a correct identification at a later time. In a meta-analysis of 128 studies involving nearly 17,000 participant-witnesses (Shapiro & Penrod, 1986), exposure duration significantly predicted identification accuracy. For example, in a study by Laughery, Alexander and Lane 128 subjects were shown 150 slides of peoples' faces. Each was shown for 10 or 32 seconds. Each subject then viewed another set of 150 faces, some of which they had seen before

¹ Meta-analysis is a research technique for statistically combining or averaging the results of multiple studies to arrive at a summary conclusion reflecting the trend of the research results.

and some they had not seen before. Subjects were better able to recognize faces that they had seen for 32 seconds than for 10 seconds.

Masking of Cues to Hair and Hairline

It is not uncommon for crime perpetrators to attempt to partially disguise themselves by wearing some kind of hat or hood that covers their hair and hairline. The hair and hairline have been found to be important cues for identification accuracy. In each of six studies (Cutler & Penrod, 1988; Cutler, Penrod, & Martens, 1987a, 1987b; Cutler et al., 1986; O'Rourke et al., 1989) eyewitnesses to simulated crimes viewed versions of a videotaped enactment of a robbery and at a later time attempted identifications from lineups in which the perpetrator was present (referred to as a perpetrator-present lineup, or one in which the suspect is guilty) or lineups in which the perpetrator was absent (referred to as a perpetrator-absent lineup, or one in which the suspect is innocent). Across these studies, many variables were systematically manipulated to examine their impact on identification accuracy. Masking of the cues to hair and hairline was one such variable manipulated in each of these studies. In half of the crimes from each study, the perpetrator wore a hat that covered his hair and hairline, thus masking these cues. In the other half, he wore no such hat.

The results of these studies are summarized below. In data from over 1300 eyewitnesses, the percentages of correct judgments on identification tests was lower (44%) among eyewitnesses who viewed perpetrators wearing hats that covered their hair and hairlines as compared to among eyewitnesses who viewed perpetrators who made no attempt to cover their hair and hairlines (57%). This trend is present in each study. This results was not qualified by type of lineup (perpetrator-present v. absent), suggesting that the masking of these cues comparably influenced correct and false identifications.

Effect of Masking the Cues to Hair and Hairline on Percent of Correct Judgments on a Perpetrator-Present or Perpetrator-Absent Identification Test			
Study	N	No Hat % Correct	Hat Worn % Correct
C P M 87a	165	45	27
C P M 87b	290	51	40
C P O M 86 I	320	46	30
C P O M 86 II	287	71	55
C & P 88	175	81	69
O et al 89	120	50	43
Total/Unweighted Average	1357	57	44

Weapon Focus

When a weapon is visually present, it has the potential to draw the eyewitness's attention. An eyewitness's capacity for attention is limited. To the extent that an

eyewitness focuses her attention on the weapon, she has less attention to focus on the perpetrator's characteristics. Consequently, when a weapon is visually present during a crime, there is a greater potential for mistakes in subsequent identification tests than if there is no weapon visually present. The "weapon focus" effect refers to the drawing of the eyewitness's attention to the weapon (and therefore from the perpetrator).

Stebly (1992) conducted a meta-analysis of 19 separate tests of the weapon focus effect with over 2,000 eyewitnesses to crime simulations. Weapon focus had a small but statistically significant effect on identification accuracy. For example, in a study by O'Rourke, Penrod, Cutler, and Stuve (1989), 120 community members (members of a church group, parents of a local Boy Scouts troop, undergraduate summer school students) viewed a videotaped crime enactment. In half of the videotapes a weapon was present, and in half the weapon was absent. Seven days later, each eyewitness was shown either a perpetrator-present or –absent videotaped lineups. Percent of correct decisions on the lineup test was 55% for weapon-hidden and 37% for weapon-present groups – a statistically significant difference. The weapon focus effect was comparable for perpetrator-present and –absent lineups.

Stress Experienced by the Eyewitness

While some eyewitnesses have claimed that extreme stress experienced as the result of an excessively violent crime had heightened their awareness and facilitated accurate memory, research shows, in contrast, that extreme stress has a debilitating effect on subsequent identification accuracy. A very recent meta-analysis by Deffenbacher, Bornstein, Penrod, and McGorty (in press) examined the effect of stress in 27 separate tests involving over 1700 participant-witnesses. The results clearly showed that stress had a negative impact on identification accuracy. Across all studies the percent of correct identifications was 39% under high stress conditions but 59% under low stress conditions. The percent of false identifications from perpetrator-absent was relatively high (66%) but was not significantly influenced by stress. The rate of (false) foil identifications from perpetrator-present lineups was higher in the high stress condition (34%) than in the low stress condition (19%). Thus, although the impact of stress was greater for correct identification and nonsignificant for false identifications, the authors make a compelling argument that stress will nevertheless adversely impact the relative mix of correct and false identifications.

As an example on study of stress and eyewitness performance, Morgan et al. (2004) investigated the impact of extreme versus mild stress on identification accuracy in a sample of 530 active-duty military personnel enrolled in military survival school training. As part of their training, some participants experienced two types of interrogation: a high-stress interrogation with real physical confrontation and a low-stress interrogation without real physical confrontation. Other participants experienced either high- or low-stress interrogations. Participants – as eyewitnesses to the interrogation -- attempted to identify their interrogators from lineups which were either live (simultaneous presentation) or photographic (simultaneous or sequential presentation).

Among eyewitnesses shown live, interrogator-present lineups, the percent of correct identifications was much higher in the low-stress condition (62%) than in the high stress condition (27%). False identification rates from interrogator-absent, live lineups were not affected by stress condition. The same pattern held for simultaneously presented perpetrator-present photographic lineups (76% v. 36%) and sequentially presented perpetrator-present photographic lineups (75% v. 49%, respectively), and again, stress did not significantly influence identification performance in the corresponding perpetrator-absent lineup conditions.

Passage of Time between the Crime and the Identification

Generally speaking, memory decays over time. The decay function is not linear, rather, greater decay occurs early on and the rate of decay lessens over time. This function has become to be known as the “forgetting curve.” The impact of the passage of time was investigated in the aforementioned meta-analysis by Shapiro and Penrod (1986). Longer time intervals led to lower likelihoods of correct identification.

For example, Krafka and Penrod (1985) conducted a field experiment in which 85 naïve convenience store clerks were asked to identify – from customer-present or –absent photoarrays -- a previously encountered customer either 2 hours or 24 hours after the customer encounter. False identifications from customer-absent photoarrays were far more prevalent after 24 hours (52.4%) than after two hours (15%) When the customer was present in the photoarrays, the difference in retention interval did not significantly affect performance (42.9% v. 39.1%, respectively).

Are These Findings Well-Accepted in the Scientific Community? A Survey of Experts

Kassin, Tubb, Hosch, and Memon (2001) reported the results of a study in which they identified and surveyed 64 psychologists with scholarly expertise in the area of eyewitness memory. Most of the respondents had doctoral degrees in social or cognitive psychology. On average, each expert had authored 2 books, 6 chapters in edited volumes, and 13 scientific journal articles on psychology of eyewitness memory, and 78% had been asked to testify as an expert at least once. The sample of experts reported having testified an average of 33 times as an expert witness each. In total, the 64 experts had testified 1,373 times.

The experts were asked whether (1) each phenomenon in a long list is reliable enough for psychologists to present it in courtroom testimony, and (2) was their opinion on the issue based on published, peer reviewed, scientific research. Results are as follows. The numbers in the second and third columns are percent of experts who answered affirmatively. Masking of cues to hair and hairline was not included as an eyewitness factor in the survey.

Level of Agreement Among Experts Regarding Reliability of Research Findings		
Eyewitness Factor	Reliable enough? % Agreeing	Opinion based on research? % Agreeing
Own-Race Bias	90	97
Exposure Duration	81	93
Weapon Focus	87	97
Stress	50	77
Passage of Time	83	93

Several findings are noteworthy. First, 81% to 90% of experts agreed that the findings regarding exposure duration, passage of time between the crime and the identification, weapon focus, and own-race bias are reliable enough for expert testimony, and 93% or more of experts stated that their opinions were based on the extant research. Half of the experts agreed that the research on stress is reliable enough for expert testimony. Note, however, that the meta-analysis described above, which provides the most compelling evidence of the impact of stress to date, had not been published at the time of this survey. Also, the Morgan et al. (2004) study, which is a very compelling demonstration using realistic stress levels, was published after the survey data were collected. The addition of these publications to the existing literature should further increase the level of agreement of experts about the reliability of research on stress and eyewitness identification.

Are Estimator Variables a Matter of Commonsense? A Study of Juror Decisions in Eyewitness Cases

Attempts to introduce expert testimony about estimator variables frequently fail. As noted above, the most common reason given by judges for refusing to admit expert testimony is that eyewitness memory is largely a matter of commonsense, and expert testimony is therefore not needed. A substantial body of scientific psychological research calls this assertion into question (see Cutler & Penrod, 1995, for a review of this research). For example, Cutler, Penrod, and Dexter (1990) showed various versions of a videotaped trial simulation to 450 experienced jurors and undergraduate students. Within these versions, the authors manipulated the masking of the cues to hair and hairline, weapon focus, stress experienced by the witness, and the amount of time between the crime and the identification, as follows.

Masking of Cues. In half the trials, the eyewitness testified that the perpetrator wore a hat covering his hair and hairline (high masking condition). In the other half of the trials, the eyewitness testified that the perpetrator wore no hat (low masking condition)

Weapon Focus. In half the trials, the eyewitness testified that throughout the robbery a handgun was outwardly brandished and pointed at her (high weapon focus

condition). In the other half she testified that the robber had a gun but it was hidden in his coat for most of the time (low weapon focus condition)

Stress. In half the trials the eyewitness testified that the robber threatened to kill her, manhandled her, fired his handgun into the floor, and pushed her to the floor before leaving (high stress condition). In the other half she testified that the robber calmly and quietly demanded the money and then left (low stress condition).

Passage of Time. In half the trials the eyewitness testified that she identified the robber 14 days after the crime (high passage of time condition). In the other half the eyewitness testified that she identified the robber 2 days after the crime (low passage of time condition).

After viewing the trial, participant-jurors rendered verdicts and evaluated the evidence. The following table summarizes the impact of the four estimator variables on jurors' verdicts.

Impact of Estimator Variables on Juror Verdict in a Trial Simulation		
Eyewitness Factor	Low Condition % Convictions	High Condition % Convictions
Masking of Cues	63	63
Weapon Focus	63	64
Stress	63	63
Passage of Time	63	63

As noted in this table, none of the four estimator variables had any impact on jurors' decisions, suggesting that the effects of these variables are not a matter of commonsense.

Conclusions

In Summary, six variables reviewed here, own-race bias, duration of exposure to the perpetrator, masking of cues to hair and hairline, weapon focus, stress experienced by the eyewitness, and the passage of time between the crime and the identification, are found to be reliable predictors of identification accuracy, as evidenced by scientific research findings and consensus among experts in the field. These factors are not merely a matter of commonsense, and individuals who have responsibilities for evaluating eyewitness identifications – investigators, attorneys, judges, and jurors – would therefore benefit from education about estimator variables. It should be noted that these six variables are merely a sample of estimator variables.

Some caveats are also appropriate. First, the effects of the estimator variables reviewed here are likely to be qualified by other factors, some of which are known and

discussed in the research and others remain unknown. Further, although psychology has made great strides in identifying reliable estimator variables, there are limitations in how this information should be used. While some may be comfortable drawing general conclusions about the effects of estimator variables (e.g., own-race recognitions are more likely to be accurate than other-race recognitions), no one should be comfortable stating precisely how much more accurate or worse, giving an opinion about the accuracy of a specific eyewitness based only on estimator variables. The scientific literature is not advanced enough to warrant such conclusions.

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