Lume B, et al., J Forensic Leg Investig Sci 2024, 10: 097
DOI: 10.24966/FLIS-733X/100097

HSOA Journal of Forensic, Legal & Investigative Sciences

Research Article

Knowledge on the Influence of Different Types of Variables on Eyewitness Testimony: A Survey of University Students and Other Individuals from the Working-Age Population

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Abstract

Over the years, mistaken eyewitnesses contributed to an alarming percentage of wrongful convictions. According to the Innocence Project, approximately 365 people have been exonerated of a crime they did not commit by DNA evidence, with most wrongful convictions being due to mistaken eyewitnesses. Eyewitnesses are influenced by several variables that can affect testimony. Being aware and knowing the influence of these variables is crucial to prevent unfair convictions. The present study, the first of our knowledge conducted in Portugal, aims to analyze the knowledge variables that impact the eyewitness accuracy. The participants (n = 150) answered the Kassin et al. questionnaire. The results suggest that for some of the variables that can influence eyewitnesses, the participants' knowledge is not in line with scientific findings. Thus, there is a need to both improve awareness and sensitize the population to unintentional errors in eyewitness testimony.

Keywords: Eyewitness testimony; Estimator variables; Postdiction variables; System variables

Introduction

Eyewitness testimony is seen as one of the most credible and persuasive pieces of evidence in criminal investigation [1-3], with Brandon and Davies [4] presenting it as the most incriminating evidence except for a confession made by the perpetrator.

However, the concern about the accuracy of eyewitness testimony has grown significantly with the introduction of DNA evidence in courts and the exoneration of innocent people [5,6]. According to the Innocence Project [1], hundreds of people (≈ 365) have been exonerated of a crime they did not commit by DNA evidence, with most wrongful convictions being due to mistaken eyewitnesses.

Several studies have shown eyewitness testimony can be incomplete and uncertain, as it can be inaccurate and lead to false identification of the offender, as well as erroneous rejections of police lineups [7,8]. Human memory is vulnerable to losses and mistakes [9], and when an individual confronted with a painful and/or threatening event, we cannot expect them to use strategies to memorize specific information [10]. Any information to be recorded in memory is likely to be influenced by the witness's emotions and understanding of the situation [11].

As a result, eyewitnesses are influenced by several variables that can affect their testimony, many of which cannot be controlled [12]. It is important to understand which variables can influence eyewitnesses, as well as the knowledge that people have regarding their influence.

Categories of Variables that Influence Eyewitness Testimony

A distinction made by Garry Wells in 1978 has resulted in two categories of variables: estimator variables and system variables. An estimator variable (e.g., child accuracy, child suggestibility, elderly witnesses, stress, cross-race bias, weapon focus, alcoholic intoxication, trained observers, exposure time, postevent information, color perception, unconscious transference, event violence) is a variable with an impact on witness memory over which the justice system exerts no control and whose effect can only be estimated [13]. A system variable (e.g., wording of questions, lineup instructions, showups, lineup fairness, hypnotic accuracy, hypnotic suggestibility, mugshot-induced bias, description-matched lineups, presentation formats) is a variable whose influence on testimony can be controlled directly by the judicial system, allowing the accuracy of eyewitness responses to be increased [14]. Beyond these, there also are postdiction variables (e.g., accuracy–confidence, identification speed), which are measurable variables related in a causal way to eyewitness accuracy [12].

Knowledge on the Influence of Different Variables in Eyewitness Testimony

In 2001, Kassin et al. conducted a survey of 64 American psychologists who were experts in eyewitnesses to update a survey conducted in 1989 by Kassin and colleagues to analyze their judgments about different variables that may influence eyewitnesses [2]. This most recent study revealed that: (1) as in 1989, the experts considered the following variables to be reliable enough to be presented in court: wording of questions, lineup instructions, attitudes and expectations,

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Citation: Lume B, Pinho MS (2024) Knowledge on the Influence of Different Types of Variables on Eyewitness Testimony: A Survey of University Students and Other Individuals from the Working-Age Population. Forensic Leg Investig Sci 10: 097.

Received: May 20, 2023; **Accepted:** May 29, 2024; **Published:** June 07, 2024

accuracy–confidence, forgetting curve, exposure time, and unconscious transference [2]; (2) they also considered the variables hypnotic suggestibility and weapon focus more reliable to be presented in court than in the previous research [2]; and (3) aspects related to trained observers, stress, hypnotic accuracy, event violence, and color perception were not considered valid enough to be presented in court, and this last variable was the one that elicited the most Level 7-"don't know" responses in both the 1989 and 2001 surveys [2,15].

Additionally, Kassin et al. [2] analyzed 13 new items, six of which were considered reliable by most eyewitness testimony experts, specifically confidence malleability, mugshot-induced bias, child suggestibility, alcohol intoxication, cross-race bias, and lineup presentation format (simultaneous/sequential). In a relatively lower percentage of agreement, the experts also considered the description-matched lineup, child accuracy, and false childhood memories as reliable variables. On the other hand, most of them agreed that the items on long-term repression, discrimination, and identification speed should not be presented in court, considering their low reliability. It also should be noted that expert eyewitness judgments were divided concerning the accuracy of elderly witnesses. Other studies [16-24] have analyzed the knowledge that agents in the justice system and people in general have on the influence of different variables on eyewitness testimony, as we can see in (Table 1).

Study	Samples
Kassin e Barndollar [16]	University Students and Adults (aged between 18 and over 60 and with a level of education between the tenth grade and university/professional education).
Wise e Safer [17]	160 US judges.
Granhag et al. [18]	Legal professionals (such as police officers, prosecutors and judges) from Sweden.
Magnussen et al. [19]	Comparison between 157 Norwegian judges and 160 US judges.
Magnussen et al. [20]	The responses of 164 members of the Court of Appeal's jury corps and a representative sample of 1,000 adult Norwegians without jury experience were compared with a previous survey of Norwegian judges.
Wise e Safer [21]	160 U.S. judges, 57 law students and 121 undergraduates.
Kask [22]	Law enforcement officers (such as judges, prosecutors, preliminary investigators and juvenile police officers) and laypeople (who could not have a educational background in psychology and/or law).
Jiang e Luo [23]	Legal professionals, judges, prosecutors, police officers and defense lawyers from China
Ferris et al. [24]	Police Students in Canada.

Table 1: Studies that analyzed the knowledge that agents of the judicial system and people in general have on the influence of different variables in eyewitness testimony.

In general, these studies revealed that people do not have a systematic knowledge on the influence of the many variables that influence eyewitness testimony.

The Present Study

Considering that the psychology of testimony is still at an embryonic stage in Portugal and that it is a scientific area that, in our country, is thus far disregarded, the main goal of this study is to contribute to understanding the extent to which the knowledge of psychological research in eyewitness accuracy is known by a sample of Portuguese adults. The objectives are to analyze the knowledge on variables that can influence the accuracy and reliability of the eyewitness memory, as well as their accuracy in offender identification, by graduate students and other individuals from the working-age population.

Based on the results in other studies, we hypothesized that the group of graduate psychology participants with education in forensic psychology (named "FP graduates") would have greater knowledge, in general, of the influence that different variables can have in eyewitness testimony than the group of undergraduate psychology participants who did not study forensic psychology (named "undergraduates without FP") and the group of participants with no background in psychology and/or knowledge of the legal system (named "laypeople").

Additionally, we hypothesized the most significant differences among the "FP graduates", "undergraduates without FP" and "laypeople" would be mainly related to information that requires more knowledge of the scientific research-guided procedures that should be adopted in legal practice. We also hypothesized the participants' answers were not in line with each other between the "undergraduates without FP" and "laypeople". Furthermore, considering the higher degree of scientific knowledge involved, we expected that the item that would elicit the most Level 7-"*don't know*" responses among the respondent groups would be Item (10): "*Judgments about color made under monochromatic light (e.g., an orange streetlight) are very unreliable*".

Finally, based on the idea that people are quite imprecise to some indicators of eyewitness accuracy [25], we hypothesized that the "undergraduates without FP" and "laypeople" would tend to underestimate the impact of the duration of exposure to an event and overestimate the influence of the degree of eyewitness confidence more than the "FP graduates".

Materials and Methods

Sample

This study comprised a sample of 150 participants, subdivided into three different groups: 1) graduate psychology participants with education in forensic psychology ("FP graduates"; n = 50), 2) undergraduate psychology participants who did not study forensic psychology ("undergraduates without FP"; n = 50), and 3) participants between the ages of 30-60, with no background in psychology and/or areas of knowledge related to the legal system ("laypeople" ; n = 50). The sociodemographic characteristics of the sample were obtained by calculating the descriptive statistics, such as mean, standard deviation, range, absolute frequency and relative frequency. The following is a summary of some descriptive statistical sample data. The "FP graduates" group had a mean age of 22.80 (SD = 0.22, range 21-29), and most were female (n = 44, 88%). Concerning the level of education, 60% were pursuing a master's degree. The remaining 40% had already completed their degrees. In the "undergraduates without FP" group, participants were between 17 and 28 years old (M = 21.10; SD = 0.26), were mostly female (n = 41, 82%), and most of them had completed the 12th grade (56%) and were currently studying for an undergraduate degree. The group "laypeople" had a mean age of 47.64 (SD = 1.22), 34 were women (n = 34, 68%) and 16 were men (n = 16, 32%), and most of them had an undergraduate degree (46%) or completed the 12th grade (28%).

Instrument

The Kassin et al. [2] questionnaire (see Table 2) is a self-answering instrument, originally designed to analyse experts' judgments on the reliability of variables that may affect eyewitness testimony. This questionnaire consists of 30 statements related to the accuracy of testimony to be answered on a Likert scale with seven alternatives: 1) "*the evidence suggests the reverse is probably true*", 2) "*the evidence does not support it*", 3) "*the evidence is inconclusive"*, 4) *"the evidence tends to favor it"*, 5) "*the evidence tends is generally reliable*", *6) "*the *evidence is very reliable"*, and *7) "I don't know".* For each statement the participants were asked to characterize the reliability of the variable described, according to the seven response alternatives mentioned above.

Topic	Statement
1. Stress	Very high levels of stress impair the accuracy of eyewitness testimony.
2. Weapon Focus	The presence of a weapon impairs an eyewitness's ability to accurately identify the perpetrator's face.
3. Showups	The use of a one-person showup instead of a full lineup increases the risk of misidentification.
4. Lineup fairness	The more members of a lineup resemble the suspect, the higher is the likelihood that identification of the suspect is accurate.
5. Lineup instructions	Police instructions can affect an eyewitness's willingness to make an identification.
6. Exposure time	The less time an eyewitness has to observe an event, the less well they will remember it.
7. Forgetting curve	The rate of memory loss for an event is greatest right after the event, wearing off over time.
8. Accuracy–confidence	An eyewitness's confidence is not a good predictor of their identification accuracy.
9. Postevent information	Eyewitness testimony about an event often reflects not only what they actually saw but information they obtained later one.
10. Color perception	Judgments of color made under monochromatic light (e.g., an orange streetlight) are highly unreliable.
11. Wording of questions	An eyewitness's testimony about an event can be affected by how the questions put to that witness are worded.
12. Unconscious transference	Eyewitnesses sometimes identify as a culprit someone they have seen in another situation or context.
13. Trained observers	Police officers and other trained observers are no more accurate as eyewitnesses than the average person.
14. Hypnotic accuracy	Hypnosis increases the accuracy of an eyewitness's reported memory.
15. Hypnotic suggestibility	Hypnosis increases suggestibility to leading and misleading questions.
16. Attitudes and expectations	An eyewitness's perception and memory for an event may be affected by their attitudes and expectations.
17. Event violence	Eyewitness have more difficulty remembering violent than nonviolent events.
18. Cross-race bias	Eyewitnesses are more accurate when identifying members of their own race than other races.
19. Confidence malleability	An eyewitness's confidence can be influenced by factors that are unrelated to identification accuracy.
20. Alcoholic intoxication	Alcoholic intoxication impairs an eyewitness's ability to recall persons and events.
21. Mugshot-induced bias	Exposure to mug shots of a suspect increases the likelihood the witness will later choose that suspect in a lineup.
22. Long-term repression	Traumatic experiences can be repressed for many years and then recovered.
23. False childhood memories	Memories people recover from their own childhood are often false or distorted in some way.
24. Discriminability	It is possible to reliably differentiate between true and false memories.
25. Child accuracy	Young children are less accurate as witnesses than adults.
26. Child suggestibility	Young children are more vulnerable than adults to interviewer suggestion, peer pressure, and other social influences.
27. Description-matched lineup	The more that members of a lineup resemble a witness's description of the culprit, the more accurate an identification of the suspect is likely to be.
28. Presentation format	Witnesses are more likely to misidentify someone by making a relative judgment when presented with a simultaneous (as opposed to sequential) lineup.
29. Elderly witnesses	Elderly eyewitnesses are less accurate than are younger adults.
30. Identification speed	The quicker a witness makes an identification upon seeing the lineup, the more accurate they are likely to be.

Table 2: Eyewitness Topics and Statements.

Procedures

The present study was approved by the Committee of Ethics and Research Deontology of the Faculty of Psychology and Education Sciences of University of Coimbra. Subsequently, the questionnaire by Kassin et al. [2] was translated for the Portuguese population by the first author and revised by the second author. Two answer formats were created, in person and online, with the online format for only members of the "FP graduates" group who could not answer in person due to restrictions imposed by the COVID-19 pandemic situation.

The eligibility criteria were: (1) for the "FP graduates" group, taking a master's degree in forensic psychology; (2) for the "undergraduates without FP" group, not having studied or currently studying subjects pertaining to the field of Forensic Psychology; and (3) for the "laypeople" group, not having a degree in psychology and/or related knowledge areas related to the legal system.

Participants were recruited through universities and social networks. Potential participants ("graduates FP" group) were invited to participate in the study through an email sent by authors, which contained summary information about the objectives of the study and the researchers' contact details, as well as the link to the online survey.

The participation in this study was voluntary, with anonymity and confidentiality being ensured. Before the questionnaire was filled in, a full explanation of the nature of the study and its objectives was given, as well as the opportunity to ask questions. Also before completing the questionnaire, each participant signed an informed consent form. The questionnaire was completed individually by each participant, with no pre-established time limit.

Results

Analyses were conducted using the Statistical Package for the Social Sciences (IBM SPSS, v25.0).

Internal Consistency of Kassin et al. [2]

To analyze the psychometric properties of the Portuguese research version of the Kassin et al. [2] questionnaire and to guarantee the reliability of the measurement instrument, internal consistency analysis was performed using Cronbach's alpha (α) for the entire sample and for each group of participants.

The internal consistency for the Portuguese research version of the Kassin et al. [2] questionnaire is .745, which is considered an acceptable value. For each group surveyed, there were recorded values of .593 ("FP graduates"; this value is slightly lower than advised, as it is on the limit between questionable and poor), .758 for the "undergraduates without FP" group, and .796 for the "laypeople" group.

Knowledge about the Influence of Different Variables in Eyewitness Testimony

To examine participants' knowledge on the impact of different variables in eyewitness testimony, chi-square tests of homogeneity ($\chi 2$) for each respondent group were performed with reference to the responses of eyewitness experts in the survey by Kassin et al. [2], using a Type I error probability (α) of .05 and considering Level 7-"*don't know*" missing values.

The results of the chi-square tests of homogeneity ($\chi 2$) show that the "FP graduates" group and the experts who participated in the study by Kassin et al. [2] have a similar proportion of answers on the Likert scale for to the following items: weapon focus, $\chi 2_{.05}(4) = 3.51$, $p < .05$; showups, $\chi 2_{.05}(5) = 5.18$, $p < .05$; lineup instructions, $\chi 2_{.05}(4) = 9.10$, $p < .05$; exposure time, $\chi 2_{.05}(5) = 6.50$, $p < .05$; color perception, $\chi 2_{.05}(4) = 3.89$, $p < .05$; wording of questions, $\chi 2_{.05}(2) = .71$, $p < .05$; attitudes and expectations, $\chi 2_{.05}(2) = 2.46$, $p < .05$; discriminability, $\chi 2_{.05}(5) = 7.81$, $p < .05$; child accuracy, $\chi 2_{.05}(5) = 6.17$ $p < .05$; and elderly witnesses, $\chi 2_{.05}(5) = 6.75$, $p < .05$. It should be noted that the "FP undergraduates" group selected the same response level as the experts in Kassin et al. [2] for the following items: weapon focus (30%), showups (22%), lineup instructions (42%), postevent information (40%), wording of questions (72%), hypnotic accuracy (26%), attitudes and expectations (38%), and child suggestibility (38%).

The results of the chi-square tests of homogeneity ($\chi 2$) reveal that the "graduates without FP" group and the experts who participated in the study by Kassin et al. [2] have a similar proportion of responses on the Likert scale for the following items: showups, $\chi 2_{.05}(5) = 6.30$, $p < .05$; color perception, $\chi 2_{.05}(4) = 9.03$, $p < .05$; event violence, $\chi 2_{.05}(5) = 7.83$, $p < .05$; child accuracy $\chi 2_{.05}(5) = 10.12$, $p < .05$; child suggestibility, $\chi 2_{.05}(5) = 10.18$, $p < .05$; description-matched lineup, $\chi 2_{.05}(5) = 7.17$, $p < .05$; and elderly witnesses, $\chi 2_{.05}(5) = 4.01$, $p < .05$. It becomes relevant to mention that the "graduates without FP" group selected the same level of response as the experts for the following items: stress (34%), false childhood memories (28%), child suggestibility (26%), and elderly witnesses (24%).

The results of the chi-square homogeneity tests ($\chi 2$) illustrate that the "laypeople" group and the experts who participated in the study by Kassin et al. [2] had an identical proportion of responses on the Likert scale for the following items: lineup fairness, $\chi 2_{.05}(5) = 4.97$, $p < .05$; description-matched lineup, $\chi 2_{.05}(5) = 10.53$, $p < .05$; and elderly witnesses, $\chi 2_{.05}(5) = 11.39$, $p < .05$. It also should be considered that the participants in the "laypeople" selected the same response level as the experts in Kassin et al. [2] for the following items: lineup fairness (28%), wording of questions (40%), false childhood memories (26%), child suggestibility (34%), and identification speed (32%).

When considering the answers to the 30 statements in the questionnaire administered, it was observed the "FP graduates" group had 12% of knowledge about the influence of different variables in eyewitness testimony, based on current literature and the experts' answers to the questionnaire by Kassin et al. [2], the "undergraduates without FP" group had 6%, and the "laypeople" group had 8%.

A summarized description of the results of the survey with experts conducted by Kassin et al. [2] and our study results is displayed in (Table 3) (cf. Appendices). We also provide the distribution of answers for each group in (Tables 4-6), respectively (cf. Appendices).

Items	% reliable			
	Kassin et al. (2001)	"FP graduates" group	"undergraduates without FP" group	"laypeople" group
5. Lineup instructions	98%	80%	76%	80%
11. Wording of questions	98%	100%	86%	90%
19. Confidence malleability	95%	80%	68%	72%
21. Mugshot-induced bias	95%	92%	86%	82%
9. Postevent information	94%	88%	58%	68%
26. Child suggestibility	94%	78%	78%	82%
16. Attitudes and expectations	92%	94%	80%	78%
15. Hypnotic suggestibility	91%	38%	34%	30%
18. Cross-race bias	90%	44%	22%	40%
20. Alcoholic intoxication	90%	96%	90%	94%
2. Weapon focus	87%	76%	68%	80%
8. Accuracy–confidence	87%	30%	26%	34%
7. Forgetting curve	83%	30%	34%	42%
6. Exposure time	81%	58%	58%	72%
12. Unconscious transference	81%	66%	46%	56%
28. Presentation format	81%	32%	24%	46%
3. Showups	74%	40%	58%	66%
27. Description-matched lineup	71%	28%	50%	40%

4. Lineup fairness	70%	24%	30%	46%
25. Child witness accuracy	70%	36%	40%	32%
23. False childhood memories	68%	58%	46%	32%
10. Color perception	63%	28%	20%	20%
1. Stress	60%	90%	88%	88%
29. Elderly witnesses	50%	50%	56%	52%
14. Hypnotic accuracy	45%	14%	42%	48%
Identification speed	40%	26%	32%	64%
13. Trained observers	39%	50%	20%	46%
Event violence	37%	36%	40%	56%
24. Discriminability	32%	16%	30%	52%
22. Long-term repression	22%	86%	90%	80%

Table 3: Summary of the findings of the survey with experts conducted by Kassin et al. (2001) and the present study.

Items	1	2	3	4	5	6	7
1. Stress	0	0	3	8	17	20	2
2. Weapon focus	0	1	5	11	15	12	6
3. Showups	5	3	5	5	11	4	17
4. Lineup fairness	15	13	3	2	5	5	7
5. Lineup instructions	1	0	3	7	12	21	6
6. Exposure time	2	1	8	7	12	10	10
7. Forgetting curve	9	14	5	2	10	3	7
8. Accuracy–confidence	9	11	8	6	4	5	7
9. Postevent information	0	2	0	9	15	20	4
10. Color perception	1	0	2	3	7	4	33
11. Wording of questions	0	0	0	2	12	36	0
12. Unconscious transference	0	4	7	8	16	9	6
13. Trained observers	8	7	3	4	10	11	7
14. Hypnotic accuracy	2	13	10	3	4	0	18
15. Hypnotic suggestibility	1	3	7	10	7	2	20
16. Attitudes and expectations	0	0	0	13	15	19	3
17. Event violence	10	8	6	2	11	5	8
18. Cross-race bias	1	2	5	5	9	8	20
19. Confidence malleability	1	0	0	10	19	11	9
20. Alcoholic intoxication	0	0	1	4	7	37	1
21. Mugshot-induced bias	1	0	2	3	20	23	1
22. Long-term repression	0	0	4	7	13	23	3
23. False childhood memories	4	9	7	6	20	3	1
24. Discriminability	6	13	16	2	5	1	7
25. Child accuracy	3	14	7	6	9	3	8
26. Child suggestibility	0	4	5	1	19	19	2
27. Description-matched lineup	12	10	4	4	5	5	10
28. Presentation format	4	9	5	6	8	2	16
29. Elderly witnesses	2	2	9	8	12	5	12
30. Identification speed	1	19	10	4	7	2	7

1) "the evidence suggests the reverse is probably true", 2) "the evidence does not support it", 3) "the evidence is inconclusive", 4) "the evidence tends to favor it", 5) "the evidence tends is generally reliable", 6) "the evidence is very reliable", and 7) "I don't know".

Table 4: Distribution of responses from the "FP graduates" group.

Items	1	2	3	4	5	6	7
1. Stress	2	1	1	14	17	13	2
2. Weapon focus	1	2	7	18	12	4	6
3. Showups	3	3	9	14	9	6	6
4. Lineup fairness	9	15	5	6	7	2	6
5. Lineup instructions	2	3	4	16	16	6	3
6. Exposure time	5	7	5	12	11	6	4
7. Forgetting curve	8	9	9	6	7	4	7
8. Accuracy–confidence	9	10	11	5	3	5	7
9. Postevent information	3	1	9	16	7	6	8
10. Color perception	0	1	6	3	2	5	33
11. Wording of questions	1	1	4	17	12	14	1
12. Unconscious transference	4	2	12	14	6	3	9
13. Trained observers	17	7	10	2	3	5	6
14. Hypnotic accuracy	2	0	9	16	3	2	18
15. Hypnotic suggestibility	1	5	8	11	4	2	19
16. Attitudes and expectations	3	1	1	22	9	9	5
17. Event violence	11	5	7	12	3	5	7
18. Cross-race bias	5	13	6	1	4	6	15
19. Confidence malleability	2	3	2	15	11	8	9
20. Alcoholic intoxication	1	0	3	4	11	30	1
21. Mugshot-induced bias	1	1	2	20	13	10	3
22. Long-term repression	1	1	1	17	16	12	2
23. False childhood memories	5	10	7	14	3	6	5
24. Discriminability	7	9	9	11	3	1	10
25. Child accuracy	6	6	13	10	5	5	5
26. Child suggestibility	2	2	4	13	13	13	3
27. Description-matched lineup	4	9	6	11	9	5	6
28. Presentation format	2	6	11	6	2	4	19
29. Elderly witnesses	1	8	9	12	8	8	4
30. Identification speed	4	12	11	11	3	2	7

1) "the evidence suggests the reverse is probably true", 2) "the evidence does not support it", 3) "the evidence is inconclusive", 4) "the evidence tends to favor it", 5) "the evidence tends is generally reliable", 6) "the evidence is very reliable", and 7) "I don't know".

Table 5: Distribution of responses from the "undergraduates without FP" group.

Items	1	2	3	4	5	6	7
1. Stress	2	0	2	16	11	17	2
2. Weapon focus	0	3	5	20	11	9	2
3. Showups	0	2	11	20	10	3	4
4. Lineup fairness	8	7	6	5	14	4	6
5. Lineup instructions	1	2	5	23	9	8	2
6. Exposure time	1	7	4	17	7	12	2
7. Forgetting curve	5	6	4	11	4	6	14
8. Accuracy–confidence	3	17	6	10	2	5	7
9. Postevent information	2	0	10	20	10	4	4
10. Color perception	1	2	8	6	1	3	29
11. Wording of questions	1	1	2	14	11	20	1
12. Unconscious transference	1	8	6	14	8	6	7
13. Trained observers	11	5	3	10	9	4	8
14. Hypnotic accuracy	1	3	3	12	3	9	19
15. Hypnotic suggestibility	2	7	6	8	5	2	20
16. Attitudes and expectations	1	1	3	20	13	6	6
17. Event violence	7	6	3	11	9	8	6
18. Cross-race bias	2	5	10	14	4	2	13
19. Confidence malleability	0	2	2	23	8	5	10
20. Alcoholic intoxication	0	1	2	10	6	31	0
21. Mugshot-induced bias	0	0	5	21	12	8	4
22. Long-term repression	1	2	3	16	13	11	4
23. False childhood memories	6	13	9	13	2	1	6
24. Discriminability	2	5	8	15	6	5	9
25. Child accuracy	5	11	13	9	5	2	5
26. Child suggestibility	2	3	3	15	9	17	1
27. Description-matched lineup	6	11	5	8	6	6	8
28. Presentation format	5	8	4	12	5	6	10
29. Elderly witnesses	1	10	4	9	8	9	9
30. Identification speed	2	4	6	16	5	11	6

1) "the evidence suggests the reverse is probably true", 2) "the evidence does not support it", 3) "the evidence is inconclusive", 4) "the evidence tends to favor it", 5) "the evidence tends is generally reliable", 6) "the evidence is very reliable", and 7) "I don't know".

Table 6: Distribution of responses from the "laypeople" group.

Differences between the "FP graduates" Group and the Groups of "undergraduates without FP" and "laypeople"

Given the number of respondent groups (3) and the ordinal data provided by the Likert scale, the nonparametric Kruskal–Wallis *H* test and a Type I error probability (α) of .05 were used to determine if the responses were significantly different among the three groups, and multiple bivariate comparisons also were performed using the nonparametric Mann–Whitney *U test*, adjusting for Type I error by Bonferroni correction and an adjusted significance level of $p < .017$. The effect measures for the three Mann–Whitney *U* tests also were calculated using the normalized *Z score*, to which the test statistic was converted $r = \frac{z}{\sqrt{N}}$.

The results of the Kruskal–Wallis *H* test (see Table 7; cf. Appendices) reveal statistically significant differences among the groups inquired in this study in their responses to the following items: weapon focus, lineup fairness, lineup instructions, postevent information, wording of questions, unconscious transference, trained observers, hypnotic accuracy, attitudes and expectations, cross-race bias, confidence malleability, mugshot-induced bias, long-term repression, false childhood memories, discriminability, and identification speed.

Items	"FP graduates" group	"undergraduates without FP" group	"laypeople" group		
	Mean	Mean	Mean	χ2 kw (gl)	p
	Position	Position	Position		
1. Stress	80.91	67.15	69.45	3.30 (2)	0.192
2. Weapon focus	79.52	59.32	66.81	6.41 (2)	.041*
3. Showups	61.47	61.99	62.39	.01 (2)	0.993
4. Lineup fairness	57.31	63.72	76.77	6.23 (2)	.044*
5. Lineup instructions	89.88	61.87	59.74	16.96 (2)	.000**
6. Exposure time	74.84	59.26	69.28	3.76 (2)	0.152
7.Forgetting curve	56.28	60.48	68.96	2.66 (2)	0.264
8. Accuracy–confidence	63.73	63.05	68.22	.51 (2)	0.776
9.Postevent in ormation	90.9	55.11	55.41	27.23 (2)	.000**
10. Color perception	34.03	28.94	22.36	5.35 (2)	0.069
11. Wording of questions	97.44	57.45	68.14	26.61 (2)	.000**
12. Unconscious transference	76.76	54.33	61.65	8.54 (2)	.014*
13. Trained observers	76.23	52.81	66.27	8.95 (2)	.011*
14. Hypnotic accuracy	31.3	51.91	61.21	20.64 (2)	.000**
15. Hypnotic suggestibility	50.6	44.98	42.45	1.59 (2)	0.453
16. Attitudes and expectations	85.63	59.76	59.15	15.11 (2)	.001**
17. Event violence	62.77	59.36	72.64	3.06 (2)	0.217
18. Cross-race bias	66.4	41.01	49.34	12.61 (2)	.002*
19. Confidence malleability	75.44	57.29	51.53	11.24 (2)	.004*
20. Alcoholic intoxication	82.17	71.35	70.07	3.37 (2)	0.186
21. Mugshot-induced bias	91.98	62.93	58.45	20.59 (2)	.000**
22. Long-term repression	84.39	66.64	61.87	8.62 (2)	.013*
23. False childhood memories	81.04	69.67	56.48	9.10 (2)	.011*
24. Discriminability	51.66	57.13	79.11	14.19 (2)	.001*
25. Child accuracy	67.19	69.86	62.5	.89 (2)	0.642

26. Child suggestibility	80.8	67.15	69.5	3.15 (2)	0.207
27.Description-matched lineup	54.1	70.67	64.94	4.56 (2)	0.102
28. Presentation format	51.16	51.89	55.43	.43 (2)	0.805
29. Elderly witnesses	65.47	60.91	63.05	.34 (2)	0.842
30. Identification speed	55.37	56.67	84.02	16.87 (2)	.000**

Table 7: Kruskal–Wallis H test values for the three groups in the present study.

*p < .05; ** p < .001

Through the Mann–Whitney *U test* (see Table 8; cf. Appendices), it was found that the "FP graduates" group differed from the "undergraduates without FP" group in responding to the following items: weapon focus, lineup instructions, postevent information, wording of questions, unconscious transference, trained observers, hypnotic accuracy, attitudes and expectations, cross-race bias, confidence malleability, and mugshot-induced bias. As can be seen in (Table 9) (cf. Appendices), the "FP graduates" group differs from the "laypeople" group in the proportion of responses on the Likert scale for the following items: lineup instructions, postevent information, wording of questions, hypnotic accuracy, attitudes and expectations, cross-race bias, confidence malleability, mugshot-induced bias, long-term repression, false childhood memories, discriminability, and identification speed.

The results obtained in the present study partially corroborate the second research hypothesis, as the most significant differences among the groups are related to the following items: lineup instructions, postevent information, wording of questions, hypnotic accuracy, attitudes and expectations, mugshot-induced bias, discriminability, and identification speed. However, such differences are not just relative to system variables but also relative to estimator and postdiction variables.

Agreement Between Participants of the Same Group and Items with More Answers of Level 7-"Don't Know" between Respondent Groups

To analyze whether the responses of the participants from the same group agreed, the Intraclass Correlation Coefficient (ICC) was calculated for each of the groups. Regarding the intragroup comparison, the "FP graduates" and "undergraduates without FP" groups show moderate reliability of .544 and .735, respectively. The group "laypeople" shows a good reliability of .782.

To examine the differences among the three respondent groups for Level 7-"*don't know*", the response levels were recoded (i.e., 1 to 6 = 1; 7 = 2), and homogeneity chi-square tests ($\chi 2$) were conducted with a significance level of .05. The results related to the distribution of Level 7-"*don't know*" responses, analyzed with the chi-square tests for homogeneity ($\chi 2$), are presented in (Table 10) (cf. Appendices) and reveal statistically significant differences among the groups for the following items: showups, $\chi 2_{.05}$ (2) = 13.28, $p < .05$ and exposure time, $\chi 2_{.05}$ (2) = 7.28, $p < .05$. For both, it is the "FP graduates" group that chooses Level 7-"*don't know*" more often. In general, 17.2% of

Items	"FP graduates" group	"undergraduates without FP" group	*U*	*Z*	*p*	*r*
	Mean Position	Mean Position				
2. Weapon focus	51.08	37.92	678.50	-2.509	.012*	-0.26
5. Lineup instructions	55.70	36.91	607.00	-3.520	.000*	-0.36
9. Postevent information	55.32	32.65	468.50	-4.299	.000*	-0.45
11. Wording of questions	63.28	36.45	561.00	-5.041	.000*	-0.50
12. Unconscious transference	50.22	35.26	584.50	-2.863	.004*	-0.31
13. Trained observers	51.53	36.64	622.00	-2.809	.005*	-0.30
14. Hypnotic accuracy	24.75	40.25	264.00	-3.438	.001*	-0.42
16. Attitudes and expectations	54.85	37.78	665.00	-3.233	.001*	-0.33
18. Cross-race bias	40.57	26.51	298.00	-3.043	.002*	-0.37
21. Mugshot-induced bias	58.15	38.44	678.50	-3.644	.000*	-0.37

Table 8: Mann–Whitney U test for the "FP graduates" and "undergraduates without FP" groups.

Items	"FP graduates" group	"laypeople" group	*U*	*Z*	*p*	*r*
	Mean Position	Mean Position				
5. Lineup instructions	56.67	37.18	608.50	-3.644	.000*	-0.37
9. Postevent information	59.09	33.91	479.00	-4.689	.000*	-0.48
11. Wording of questions	59.66	40.14	742.00	-3.774	.000*	-0.37
14. Hypnotic accuracy	23.05	41.24	209.50	-4.026	.000*	-0.50
16. Attitudes and expectations	54.78	36.63	621.50	-3.448	.001*	-0.36
18. Cross-race bias	41.33	28.05	335.00	-2.840	.005*	-0.34
19. Confidence malleability	49.21	32.59	483.50	-3.374	.001*	-0.37
21. Mugshot-induced bias	58.83	36.47	596.50	-4.140	.000*	-0.42
22. Long-term repression	54.17	39.67	744.00	-2.709	.007*	-0.28
23. False childhood memories	54.93	38.17	689.50	-3.053	.002*	-0.31

24. Discriminability	33.37	52.07	489.00	-3.594	.000*	-0.39
30. Identification speed	34.50	53.28	537.50	-3.545	.000*	-0.38

Table 9: Mann–Whitney U test for the "FP graduates" and "laypeople" groups.

* p < .017

the items from the " FP graduates" group lead to the Level 7-"*don't know*" answer, while the percentages corresponding to the groups "undergraduates without FP" and "laypeople" are 13.7% and 14.9%, respectively.

Items	χ^2	*gl*	*p*
1. Stress	.00	2	1.000
2. Weapon focus	2.52	2	.284
3. Showups	13.28	2	.001*
4. Lineup fairness	.12	2	.942
5. Lineup instructions	2.55	2	.279
6. Exposure time	7.28	2	.026*
7. Forgetting curve	4.30	2	.116
8. Accuracy–confidence	.00	2	1.000
9. Postevent information	2.24	2	.326
10. Color perception	.92	2	.632
11. Wording of questions	1.01	2	.602
12. Unconscious transference	.75	2	.689
13. Trained observers	.33	2	.847
14. Hypnotic accuracy	.06	2	.972
15. Hypnotic suggestibility	.06	2	.972
16. Attitudes and expectations	1.10	2	.576
17. Event violence	.33	2	.847
18. Cross-race bias	2.39	2	.303
19. Confidence malleability	.09	2	.957
20. Alcoholic intoxication	1.01	2	.602
21. Mugshot-induced bias	1.85	2	.397
22. Long-term repression	.71	2	.701
23. False childhood memories	3.80	2	.149
24. Discriminability	.65	2	.722
25. Child accuracy	1.14	2	.567
26. Child suggestibility	1.04	2	.594
27. Description-matched lineup	1.19	2	.551
28. Presentation format	4.00	2	.135
29. Elderly witnesses	4.70	2	.095
30. Identification speed	.11	2	.944

Table 10: Chi-square test of homogeneity ($\chi 2$) results concerning the differences in Level 7-"don't know" responses among the three groups.

Color perception is the item that elicits the most Level 7-"*don't know*" responses among respondents (66% for the "FP graduates" group, 66% for the "undergraduates without FP" group, and 58% for the "laypeople" group). Next are the items concerning hypnosis: hypnotic accuracy and hypnotic suggestibility. On the item hypnotic accuracy, 36% of the respondents from the "FP graduates" group, 36% from the "undergraduates without FP" group, and 38% from the "laypeople" group choose Level 7-"*don't know*". Concerning the item hypnotic suggestibility, the Level 7-"*don't know*" option was chosen by 40% of "FP graduates", 38% of "undergraduates without FP", and 40% of participants in the "laypeople" group.

Tendency to Underestimate the Impact of the Duration of Exposure to an Event and to Overestimate the Influence of Eyewitness Confidence

The Kruskal–Wallis *H* test was calculated to examine whether the "undergraduates without FP" and "laypeople" groups tended to underestimate items such as exposure time and/or overestimate items such as accuracy–confidence when compared to the "FP graduates" group.

The Kruskal–Wallis *H* test (see Table 7; cf. Appendices) indicates no statistically significant differences between the groups for the item exposure time, χ^2_{kw} (2) = 3.76, p =.152. The "FP graduates" group tended to answer Level 5-"*generally reliable*" more often (24%), while the "undergraduates without FP" and "laypeople" groups tended to select Level 4-"*tends to support*" more often, 24% and 34%, respectively. Relative to the tendency to overestimate the influence of the item accuracy–confidence, the Kruskal–Wallis *H* test also reveals no statistically significant differences between the groups, χ^2_{kw} (2) = .51, p = .776. The " FP graduates" and "laypeople" groups tended to indicate Level 2-"*don't support*" more often (22% and 34%, respectively), while the "undergraduates without FP" group tended to select Level 3-"*inconclusive*" more often (22%).

Discussion

The main results of this study show that there are large gaps in knowledge about the influence of different variables on eyewitness testimony. Specifically, it was observed that the "FP graduates" group had higher knowledge than the other two groups, which supports our first hypothesis. However, given the percentage of knowledge on the influence of different variables in eyewitness testimony obtained by the "FP graduates" group (12%), it can be concluded that this result is quite alarming, since it was expected these participants would have even more knowledge, since most of them have completed a course that approaches this subject.

For the item showups, the "FP graduates" group seems to be less familiar with the procedure when compared to the other groups. In Kassin and Barndollar's [16] investigation, college students also showed almost no knowledge about this procedure.

For the item lineup fairness, the "FP graduates" group tended to respond according to the principle of heterogeneity (i.e., the lineup filers should be neither too similar to each other nor too similar to the suspect) [26] and the detection of characteristics hypothesis, which supports the existence of heterogeneity among the lineup filers [27]. Most of the participants in the "undergraduates without FP" group agree that scientific research data do not support that the more the members present in the lineup resemble the suspect, the more likely the identification accuracy. On the other hand, the group "laypeople" considers that the scientific research data are generally reliable on this aspect. This variability of responses is not at all surprising, given the complexity surrounding this question [28], even the experts in the Kassin et al. [2] survey showed some indecision.

For the item forgetting curve, the groups "undergraduates without FP" and "laypeople" in general showed scarce knowledge and some indecision; only the "FP graduates" group tended to consider more consistently that the scientific research data do not support this aspect. The experts of the Kassin et al. [2] study consider that scientific research data are generally very reliable in this aspect. The idea that "*The rate of memory loss of an event is greatest soon after the event and then stabilizes over time.*" goes back to Ebbinghaus (1880, 1885) studies on retention interval.

For the item trained observers, it should be noted that the "FP graduates" and "laypeople" groups found this variable more reliable than the "undergraduates without FP" group and the experts in the Kassin et al. [2] survey did. The idea that police officers and other trained observers are not more accurate as eyewitnesses than other people has been supported in the more current literature [29].

Regarding hypnotic accuracy and hypnotic suggestibility, all three groups expressed a lack of knowledge, which is not completely unexpected, given the controversy and myths surrounding the effects of hypnosis on eyewitness testimony. The literature indicates that use of this procedure in court should be avoided [30].

Concerning the item violence of the event, the "FP graduates" and "undergraduates without FP" groups seem to show some indecision on this variable, while the "laypeople" group tends to consider that eyewitnesses have more difficulty recalling violent events than nonviolent ones. The experts in the Kassin et al. [2] survey, on the other hand, find the available data from science inconclusive. Generally, people tend to believe that it is easier to remember the details of a violent event than a nonviolent event [31].

For the item cross-race bias, the groups generally demonstrate a lack of knowledge, with the exception of the group "laypeople", who tend to select Level 4-"*Tend to support*", this response being the most accurate considering the propensity of people to more easily recognize faces belonging to their ethnic group compared to those of other ethnic groups [32].

For the item long-term repression, we find that all groups tend to agree that traumatic experiences can be repressed for many years and then be recovered. However, this is not a belief that goes along with the judgment of most experts in Kassin et al. [2], who consider the scientific research data to be inconclusive on this point. It is known that there are different opinions about the long-term repression of traumatic memories [33]; although the central idea is that people use certain defense mechanisms to deal with these overwhelming memories, one of these mechanisms is repression [34].

All groups tend to agree that the literature supports that the memories people recover from their own childhood are often false or somehow distorted (item false childhood memories), with the exception of the group "laypeople", which shows some indecision between whether the scientific research data support this or not. According to the literature, childhood memories are susceptible to amnesia, and most adults cannot remember many events that occurred before the age of five; when this happens, they cannot differentiate whether it is truly a memory or something that was constructed [35].

For the item discriminability, the "FP graduates" group tends to believe that the available scientific research data are inconclusive, while the other groups tend to consider that it is possible to make this distinction. Neither of these positions is compatible with the experts in the Kassin et al. [2] study, because they do not agree that this distinction is reliable. For The British Psychological Society [35], there are some exceptions where it is plausible to make this distinction (e.g., when the memory contains some contradiction).

For the item child accuracy, we find that all three groups tend to believe that children are no less accurate as witnesses than adults or that the scientific research data are inconclusive in this aspect. These answers are contrary to those of the experts in the study by Kassin et al. [2], who consider young children less accurate as witnesses than adults.

The item description-matched lineup was considered less reliable by the "FP graduates" group than by the other groups, but it is worth noting that this item elicited quite distinct responses between the "undergraduates without FP" and "laypeople" groups. The lack of knowledge on this item, and the disagreement with the experts of Kassin et al. [2] evidenced by the "FP graduates" and "laypeople" groups, can be explained by the fact that an "optimal level" of similarity between the perpetrator and lineup fillers is not yet well defined [36]. It seems important to emphasize that although this item had the consensus of the experts in the study by Kassin et al. [2], many of them selected the Level 7-"*don't know*" response. According to Wells [26], the selection of the members of the lineup should be based on the witness' description of the perpetrator, not on the shared characteristics of the individuals.

In general, the groups revealed poor knowledge for the item lineup presentation format, although the "laypeople" group more clearly indicated responses that matched what is described in the literature [37]. This lack of knowledge can be explained by unfamiliarity with the procedures used in lineups, especially the sequential lineup, and the concept of relative judgments. The truth is that most of the images shown by the media are of simultaneous lineups, and this is one of the possible reasons why participants have more difficulty understanding what a sequential lineup is.

The item elderly witnesses create some indecision among the "FP graduates" and "laypeople" groups. The "undergraduates without FP" group, on the other hand, believes that elderly eyewitnesses are less accurate than young adults, which may be closely related to the negative stereotypes attributed to the memories of old people [38]. Elderly witnesses show the ability to make credible statements; however, they tend to be more suggestible than young adults [39].

For the item identification speed, the majority of "FP graduates" do not consider it a good accuracy factor, while the "undergraduates without FP" group expresses some indecision on this item, and the "laypeople" group expresses judgments that are in agreement with what is described in the literature, i.e., in general, the faster the identification, the more likely it is to be correct [40].

Despite the participants' lack of knowledge, all groups tend to express opinions that are in agreement with what is described in the literature for the following items: stress [33], weapon focus [41], lineup instructions [42], exposure time [43,44], postevent information [45], wording of questions [46,47], unconscious transference [48], attitudes and expectations [49], confidence malleability [50], alcoholic intoxication [51,52], mugshot-induced bias [53], and child suggestibility [8,10,28,54]. Note that the above items, with the exception of the item stress, are part of the set of variables that achieved the

greatest consensus among the experts who participated in the Kassin et al. [2] survey.

Regarding the second hypothesis presented in this study, it was expected the differences between groups would be mostly related to information that requires greater knowledge of the procedures guided by scientific research that should be adopted in judicial practice. However, such differences are not just relative to system variables but also relative to estimator and postdiction variables. This is an unexpected result, since previous research [22] has emphasized the tendency of the most significant differences to be for items requiring more knowledge of the scientific research-guided procedures that should be adopted in judicial practice (i.e., system variables).

In opposition to what would be expected from our third hypothesis, the results of the present study reveal that it is the "FP graduates" group that shows a lower level of intragroup agreement. A possible explanation is the high percentage of Answer 7-"*don't know*" responses (17.2%). However, neither group shows an excellent level of reliability, suggesting that participants within the same group are not in complete agreement about the influence of different variables in eyewitness testimony.

In conformity with our fourth hypothesis, the item that elicited the most responses of Level 7-"*don't know*" in the groups was the item color perception, and in both the 1989 survey and the 2001 survey by Kassin and colleagues, this also was the item that elicited the most Level 7-"*don't know*" responses. The " FP graduates" group tended to select the seventh response alternative (7-"*don't know*") more often and consequently to admit that they had no knowledge. One possible explanation is that these participants may be slightly more aware of the impact and consequences that eyewitness errors can have on people's lives, so they may have chosen to answer that they did not know when they were unsure, rather than randomly selecting one of the other response alternatives. While the other two groups may not have selected response alternative 7-"*don't know*" as often, that may be because of social desirability and/or because they are embarrassed to show that they do not have this knowledge.

Regarding the hypotheses on the tendency of the "undergraduates without FP" and the "laypeople" groups to underestimate the impact of the time of exposure to an event and to overestimate the influence of eyewitness confidence more than the "FP graduates" group (Hypotheses five and six, respectively) it were not supported by our data. The results from previous research [25] and the Kassin et al. [2,15] study suggest that exposure time is a good indicator of accuracy, with longer exposure associated with better accuracy. However, more recent research has found that long exposure times can influence the accuracy of testimony [55]. Concerning the confidence expressed by an eyewitness, people tend to consider that there is a strong relationship between the confidence of a witness and their accuracy [56]. However, according to more recent research [57], the reliability of the idea that the confidence expressed by an eyewitness is not a good indicator of its accuracy depends on the conditions under which the confidence judgments are collected.

Limitations and Future Research

There are some limitations of the present study that need to be noted and considered when interpreting the results. First, we used the questionnaire by Kassin et al. [2], which was developed in the early 2000s. In order to overcome this limitation, we considered the experts' answers to the 30 statements and the current literature. It is a fact that the reliability of the items may change in light of new developments in scientific knowledge. Another limitation, although anonymity was guaranteed from the beginning, is related to the use of a self-report instrument and social desirability, because participants may not have more often admitted lack of knowledge (i.e., selecting response alternative 7-"*don't know*") to transmit a more favorable image of themselves. To some of the participants, the questionnaire was applied online, and we always tried to be available to answer questions by email. The participants may have misunderstood some of the items, although a brief explanation of the concepts that we considered most difficult to interpret were provided in footnotes to increase a clearer understanding of the items.

Despite these limitations, the lack of knowledge evidenced by the participants in our study is consistent with results obtained in other studies conducted with justice system agents and laypeople [22,23]. This is why we consider it important that future research replicate this study with judges, police officers, lawyers, and other agents in our country's judicial system to analyze their knowledge about the influence of different variables in eyewitness testimony.

Conclusion

Our results reveal a huge lack of knowledge concerning the influence of different variables on eyewitness testimony, and although these results are congruent with those of other research [16], they are nevertheless quite alarming. The poor knowledge, or lack of it, alerts us to the need to educate the entire community on the issue of unintentional errors in eyewitness testimony, as any one of us could be the victim of an inaccurate eyewitness. Accordingly, it becomes urgent that the all the individuals be aware of the influence that certain variables can have on eyewitness testimony, considering their impact on criminal investigations and court decisions.

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