When Science Meets Justice: A Case Study on Eyewitness Misidentification and Wrongful Conviction

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In 2008, a group of three armed individuals entered a grocery store in the Buenos Aires area. The episode ended tragically with the death of the store owner. A local man, M.A.M., was accused of the crime and sentenced to life in prison. After the conviction, the defense filed an appeal with a higher court. There, legal organizations submitted amicus briefs raising concerns about M.A.M.'s factual innocence. Our team was consulted by Innocence Project Argentina to review the official records, providing a psychological and neuroscientific analysis of the eyewitness identification procedures that may have led to a wrongful conviction. Specifically, we examined the recognition procedures and the statements of key witnesses. Subsequently, we presented an amicus curiae with our findings. Here, we discuss the results of

that analysis in light of current theories on memory distortion, including reconsolidation, forgetting, and common errors in recognition. In 2022, the Provincial Court of Cassation acquitted M.A.M., citing the lack of reliable evidence to uphold the conviction. The expert report presented by our team was among the materials considered in reaching that decision.

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I.   Introduction

Errors in eyewitness identification are among the leading causes of wrongful convictions across various legal systems. Decades of empirical research have shown that memory is a reconstructive and fallible process, susceptible to distortion through suggestion, feedback, stress, and time.[1] Despite this, legal frameworks and courtroom procedures often treat eyewitness accounts as reliable, especially when delivered with high confidence.[2] This disconnect between scientific understanding and judicial practice has resulted in serious miscarriages of justice.[3]

In this article, we present an in-depth analysis of a real criminal case in Argentina involving the conviction of a young man, referred to here as M.A.M., based primarily on

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[1] Elizabeth F. Loftus, "Make-believe memories" (2003) 58:11 American Psychologist 867 at 867-873; Daniel Schacter & Elizabeth F Loftus "Memory and law: what can cognitive neuroscience contribute?" (2013) 16:2 Nature Neuroscience 119 at 119-120.

[2] John Wixted & Gary Wells, "The relationship between eyewitness confidence and identification accuracy: A new synthesis" (2017) 18:1 Psychological Science in the Pub Interest 10 at 11-12.

[3] Innocence Project, "Eyewitness Misidentification", online (website): <https://innocenceproject.org/eyewitness-misidentification/>

eyewitness identification. M.A.M. was sentenced to life in prison in 2010, but the Court of Cassation in the Province of Buenos Aires reviewed the case in 2022 and ultimately acquitted him. Our intervention consisted of an amicus brief submitted to the Court of Cassation of the Province of Buenos Aires, at the request of Innocence Project Argentina. This document included a psychological and neuroscientific assessment of the memory-related aspects of the case, with particular attention to eyewitness identification procedures.

The purpose of this article is threefold. First, we aim to present how well-established findings from cognitive psychology and neuroscience can be applied to the forensic evaluation of a specific case of potential misidentification. Second, we seek to illustrate how collaboration between legal and scientific experts can help identify procedural flaws and prevent wrongful convictions. Third, we aim to highlight that Argentina's legal system lagged behind in adopting scientifically grounded procedures for eyewitness identification. With relatively modest investments in training and the promotion of interdisciplinary dialogue between science and justice, many wrongful convictions in the country could potentially be prevented.

Unlike experimental studies, this case report is grounded in the real-world complexity of criminal proceedings and aims to contribute to ongoing efforts to improve the use of eyewitness evidence in legal systems.

Our analysis identifies six key factors that compromised the reliability of the identifications in this case: repeated lineups, insufficient instructions, lack of fairness, high emotional distress, a lengthy time lapse and witness contamination. These factors are discussed in light of relevant scientific literature, and their combined impact is assessed in the context of the defendant's eventual acquittal.

By presenting this case, we aim to strengthen the bridge between neuroscience, cognitive psychology, and legal practice, advocating for evidence-based reforms in the procedures surrounding eyewitness identification.

II. Material and Methods

A. Case Context and Legal Process

On June 14, 2008, at approximately 8:30 p.m., a group of three armed individuals entered a grocery store owned by a local shopkeeper with the intent to commit robbery. During a struggle with one of the perpetrators, the store owner was killed.

Following oral proceedings, on November 17, 2010, the Oral Criminal Court No. 1 of the Judicial Department of Mercedes issued a conviction against M.A.M. and R.J.V., finding them responsible for the events described above. The trial was conducted before professional judges, who are subsequently responsible for delivering a duly reasoned judgment.

According to the court, M.A.M, R.J.V., and a third unidentified individual entered the store for the purpose of robbery, each carrying a firearm. They first threatened the cashier (hereafter referred to as witness 1) with a gun, demanding the money from the register, which she handed over with help from her sister (witness 2). Meanwhile, R.J.V. went to the back of the store, specifically the butcher section, where the owner was located. A struggle ensued. At that moment, M.A.M. moved to the butcher section to assist his accomplice, while the third assailant remained near the cash register. Both R.J.V. and M.A.M. fired their weapons during

the struggle, inflicting wounds that led to the store owner's death hours later in the hospital. The assailants then fled the scene.

In addition to the cashier sisters (witnesses 1 and 2), who were also the victim's nieces, two other employees (witnesses 3 and 4) were present in the store and saw two of the assailants kill the owner.

According to the judgment, M.A.M.'s conviction was based on the testimonies of four witnesses. However, as explained below, neither witness 3 nor witness 4 identified M.A.M.

Co-defendant R.J.V. confessed to his participation in the crime and consistently stated that M.A.M. had not taken part. He also named those who allegedly accompanied him, although efforts to locate them were unsuccessful. R.J.V. was identified in a lineup by all witnesses in the case. All witnesses agreed in identifying him as the person who went to the back of the store and fired the gun after struggling with the victim.

Argentine law guarantees the right to a broad review of convictions by a higher court. Such review includes not only legal matters but also factual ones, as interpreted by the Supreme Court of Justice, the highest court in Argentina. As established in Casal ruling,[4] on the charge of attempted simple robbery, the right to a broad appellate review encompasses not only questions of law but also the assessment of evidence. In this context, the Court of Cassation of the Province of Buenos Aires[5] reviewed the conviction of M.A.M. on March 4, 2015, and concluded: *"(...) from the analysis of the case, it appears that the sentencing court reasonably assessed the collected evidence and concluded, without absurdity or doubt, the existence of the criminal acts and that the defendants were their perpetrators".*

In response, M.A.M.'s defense filed an Extraordinary Motion for the Inapplicability of Law. Under Argentine law, once a higher court has reviewed both the facts and the law and upheld the conviction, the filing of extraordinary appeals is authorized, with those appeals confined exclusively to issues of law. The defense argued that the Court of Cassation's ruling failed to adequately address the grievances raised, thereby violating the right to appeal as guaranteed by international instruments .[6] The Constitution of the Province of Buenos Aires supports a broad interpretation of the term "law,"[7] which includes constitutional and international norms. Therefore, limiting the scope of "substantive law" under Article 494 of the Criminal Procedure Code to merely infra-constitutional rules would constitute an unacceptable restriction of the right to appeal. Moreover, the Supreme Court of Buenos Aires (SCBA) has repeatedly held that constitutional violations must be addressed within the framework of this extraordinary motion (e.g., SCBA, Ac. 28.414).

On April 17, 2019, the Supreme Court of Justice of the Province granted the defense's motion and ordered the case be returned to the BA Cassation Court to issue a new ruling with a different panel of judges that would address the defense's arguments. Specifically, the court was ordered to assess the irregularities in the identification procedures involving two sisters

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[4] *Simón, Julio Héctor y otros s/ privación ilegítima de la libertad,* CSJN, 20 September 2005, SAIJ No FA05000322.

[5] BA Cassation Court

[6] American Convention on Human Rights, 22 November 1969, 1144 UNTS 123, art 8(2)(h); International Covenant on Civil and Political Rights, 16 December 1966, 999 UNTS 171, art 14(5).

[7] Art. 161 para. 3(a).

(witness 1 and 2), both nieces of the victim, who were the only individuals to identify M.A.M., and whose testimonies constituted the sole evidence on which his conviction was based.

On March 9, 2022, the Court of Cassation of the Province of Buenos Aires, with a newly composed panel, acquitted M.A.M. The decision was based on the following grounds: (1) irregularities in the inclusion of M.A.M. in the case; and (2) irregularities and contradictions in the identifications made by witnesses 1 and 2.

B. Irregularities in the inclusion of M.A.M. in the case

Lieutenant N.G.O.C. conducted the investigation aimed at identifying those responsible for the offense. During his inquiries, he reported, based on his findings, that M.A.M. was likely involved and that he was acquainted with the co-defendant, and he provided M.A.M.'s address. This information stemmed from data supplied by a witness who, a few days later, offered a statement under an identity-protection arrangement before the prosecuting authority.

During the trial, the witness was identified as H.J.V., a retired police officer who shared information with law enforcement based on comments he had gathered from local residents who declined to reveal their identities for fear of reprisals.

The court that acquitted M.A.M. found no link between him and R.J.V. beyond the information provided by the police. It emphasized that these references were no more than uncorroborated leads, since the police stated that their supposed sources feared reprisals and refused to testify publicly.

Additionally, police officers claimed that a vehicle allegedly owned by M.A.M. was used in the robbery and subsequent homicide. However, all witnesses agreed that the perpetrators fled the scene on motorcycles, not in a four-wheeled vehicle.

C. Irregularities and contradictions in the identifications by witness 1 and 2

a. Identification procedures in the Province of Buenos Aires

Identification procedures in the Province of Buenos Aires Chapter VIII of the Buenos Aires Criminal Procedure Code sets forth the following guidelines for lawful police identification procedures:

- Article 258: Before the identification, the witness shall be asked to describe the person in question and to state whether they have seen that person before, either in person or through images.
- Article 259: The identification procedure shall follow immediately after the questioning. The person to be identified shall be placed alongside at least three (3) individuals of similar outward appearance. The suspect may choose their position in the lineup.

In the presence of the group, or from a place where the witness cannot be seen, as deemed appropriate, the witness shall state whether the person referred to is in the lineup, and if so, must clearly and precisely indicate them, and describe any similarities or differences observed between their current appearance and their appearance at the time of the event.

The procedure shall be recorded in an official report, which must include all relevant circumstances, including the names and addresses of those who formed the lineup. If the identification concerns a defendant, the defense counsel must be notified at least twenty-four (24) hours in advance, under penalty of nullity.

b. Witness 1's Identification

On January 22, 2009, witness 1 participated in her first lineup. On that occasion, she stated that M.A.M. resembled the person who had approached the cash register and threatened her with a gun to take the money. However, the procedure was declared void because M.A.M.'s right to legal defense was not guaranteed. The public defender was dismissed on the grounds that M.A.M.'s trusted counsel was present. However, the lawyer had not yet formally accepted the appointment, and thus M.A.M. was left without technical legal representation.

A second lineup was conducted on April 1, 2009, this time in compliance with legal formalities. Witness 1 did identify M.A.M., but attributed a different role to him than in the first statement. This time, she claimed M.A.M. had gone to the butcher section and fired three shots at her uncle, specifying that the crime was committed with two other individuals: one who remained at the cash registers (the role she had initially attributed to M.A.M.), and another who accompanied him to the butcher section.

An important aspect to note regarding the conduct of the lineups in this case is that, in every instance, the witnesses observed the individuals through the peephole of a door, a factor that undoubtedly influenced the way they processed the faces of those included in the lineups.

c. Witness 2's Identification

On January 22, 2009, witness 2 participated in a properly conducted lineup concerning M.A.M. The result was negative: she identified a decoy as the perpetrator. She left the procedure aware that her selection was incorrect, having signed an official record confirming it, and had also seen M.A.M. among those she did not choose.

However, during the trial hearing (two years and five months after the event), she testified: *"I recognize both defendants, the ones sitting in the courtroom... I had already identified one in the lineup (referring to R.J.V.), and I recognize the other one here,"* referring to M.A.M., whom she had not identified in the earlier procedure.

It is noteworthy that, in her initial statement, the witness claimed she could identify only one individual, whom she described in detail, namely, R.J.V. Nonetheless, during the trial, she also identified M.A.M., whom she had not previously recognized in the lineup.

D. Role of the Authors and Amicus Curiae Intervention

In 2021, Innocence Project Argentina requested an expert psychological and neuroscientific opinion, to be submitted as an amicus brief, in order to provide scientific support for its filing before the Provincial Court of Cassation. Our research team, formed by F.A.U.B., C.S.L., M.B. and C.F. specialized in memory formation and modification, participated voluntarily and without remuneration. The amicus brief presented an evidence-based analysis of the memory-related risks present in the identification procedures used in the case. It focused specifically on how factors such as repeated exposure, suggestive instructions,

stress, delay, and contamination may have increased the likelihood of eyewitness misidentification.

The court accepted the amicus briefs submitted by various organizations, including ours. The reasons set forth in its decision indicate that the court adopted the arguments developed by our team. Indeed, as for the Innocence Project Argentina's amicus brief, the court expressly cited it among the grounds for its ruling. The Foundation's brief, which we helped prepare, was drafted in alignment with the same arguments advanced in our submission that is analyzed here.

This study follows ethical standards for the use of anonymized legal material for educational and scientific purposes. No personal data beyond public legal records were accessed, and all identifiers have been removed or coded to protect privacy.

No direct assessment or psychological testing of the witnesses was performed, as the analysis was based entirely on official court documents, police records, and available transcripts.

III. Results

The following results are based on a comprehensive review of the official court records and police documentation related to the case against M.A.M. Although four store employees, witnesses 1, 2, witness 3, and 4, were present during the robbery and cited in the original conviction, only two (witness 1 and 2) ultimately identified M.A.M. Their identifications were fraught with inconsistencies and procedural irregularities, raising serious concerns about the reliability of their testimony. Additional testimonies from the co-defendant, who exonerated M.A.M., and a police intelligence source whose account could not be independently verified, further complicate the evidentiary landscape. Each of the following subsections details a specific set of irregularities observed in the identification process, which collectively contributed to M.A.M.'s wrongful conviction.

A. Repeated Lineups

The use of repeated lineups is considered scientifically problematic, as the outcome of a second identification can be influenced by the experience of the first one.[8] A key indicator of such influence is an increase in witness confidence between lineups.[9] Importantly, M.A.M. was the only individual who appeared in both lineups. This repetition constitutes a critical procedural flaw, as it increased the likelihood that witnesses would later select him. Several theoretical mechanisms have been proposed to explain this effect. One of them is the

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[8] Loftus, *supra* note 1 at 867-873; Kenneth A Deffenbacher et al, "Mugshot exposure effects: Retroactive interference, mugshot commitment, source confusion, and unconscious transference" (2006) 30 L & Human Behavior 287 at 289-292, 300; Jason Chan & Jessica LaPaglia, "The dark side of testing memory: Repeated retrieval can enhance eyewitness suggestibility" (2011) 17:4 J of Experimental Psychology: Applied 418 at 419-420; Wenbo Lin et al, "The effects of repeated lineups and delay on eyewitness identification" (2019) 4 Cognitive Research: Principles and Implications 16 at 2-3.

[9] Melissa Paiva et al, "Influence of confidence inflation and explanations for changes in confidence on evaluations of eyewitness identification accuracy" (2011) 16:2 Leg & Criminological Psychology 266 at 267; Wixted & Wells, *supra* note 2 at 13, 18-19.

commitment effect, whereby witnesses seek consistency and are thus less likely to reject a prior selection .[10] Valentine et al, for instance, found that 88% of participants selected the same suspect in a second lineup as they did in the first, regardless of accuracy.[11] This pattern has been replicated in numerous studies .[12]

Another explanation is the transference effect, where witnesses may select a suspect in a subsequent lineup based on familiarity rather than true episodic memory of the perpetrator.[13] In this scenario, the memory being accessed may pertain to the prior lineup, rather than the original crime.

A third and increasingly supported mechanism is memory reconsolidation, which proposes that consolidated memories can become labile and modifiable after reactivation, particularly in the presence of a prediction error.[14] If a suspect in a new lineup resembles, but is not identical to, the perpetrator, this mismatch may trigger memory destabilization. The original memory may then be altered to incorporate new, misleading features.[15]

In the case of M.A.M., four eyewitnesses underwent identification procedures, but only two ultimately identified him (witnesses 1 and 2). Notably, one of these two witnesses did not make her identification during the lineup but rather during the debate hearing, two and a half years after the incident, with M.A.M. seated on the defendants' bench alongside R.J.V., whom she had previously recognized in the lineup (witness 2). Witness 1 participated in an initial lineup on January 22, 2009, and described M.A.M. as having "similar characteristics" to one

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[10] Thomas Schreiber & Susan Sergent "The role of commitment in producing misinformation effects in eyewitness memory" (1998) 5 Psychonomic Bulletin & Rev 443 at 444, 448.

[11] Tim Valentine et al, "Live showups and their influence on a subsequent video line-up" (2012) 26:1 Applied Cognitive Psychology 1 at 53.

[12] Jennifer Dysart et al, "Mugshot exposure prior to lineup identification: Interference, transference, and commitment effects" (2001) 86 J of App Psych 1280 at 1283; Ryan Godfrey & Stephen Clark, "Repeated eyewitness identification procedures: Memory, decision making, and probative value" (2010) 34 L & Human Behavior 241 at 246-257; Ryann M Haw et al, "The phenomenology of carryover effects between show-up and line-up identification" (2007) 15:1 Memory 117 at 118.

[13] Elizabeth Loftus, "Unconscious transference in eyewitness identification" (1976) 2 L & Psychology Rev 93 at 93-98; David Ross et al, "Unconscious transference and mistaken identity: When a witness misidentifies a familiar but innocent person" (1994) 79 J of Applied Psychology 918 at 918-922; Dysart et al, *Ibid* at 1280-1281.

[14] Karim Nader et al, "The labile nature of consolidation theory" (2000) 1:3 Nature Reviews. Neuroscience 216 at 216-219; Cecilia Forcato et al, "Human reconsolidation does not always occur when a memory is retrieved: the relevance of the reminder structure." Neurobiology of Learning & Memory (2009) 91:1 50 at 50-51; Alyssa Sinclair & Morgan Barense, "Prediction error and memory reactivation: how incomplete reminders drive reconsolidation" (2019) 42:10 Trends in neurosciences 727 at 1-11.

[15] Cecilia Forcato et al, "Reconsolidation in humans opens up declarative memory to the entrance of new information" (2010) 93:1 Neurobiology of Learning & Memory 77 at 77-84; Rodrigo Fernández et al, "The role of GABAA in the expression of updated information through the reconsolidation process in humans" (2017) 142: Neurobiology of Learning & Memory 146 at 146-152; Schacter & Loftus, *supra* note 1 at 119-120; Facundo Urreta-Benítez et al, "Identification performance during quarantine by COVID-19 pandemic: Influence of emotional variables and sleep quality" (2021) Frontiers in Psychology 4734 at 9-12.

of the perpetrators, but noted that the suspect had a thicker build than their memory suggested. This lineup was deemed invalid due to the absence of a defense attorney.

Three months later, a second lineup was conducted. On this occasion, witness 1 again identified M.A.M. and expressed increased confidence. Such an increase is frequently reported in flawed identification procedures.[16] When witnesses receive some form of feedback or reinforcement, even subtle, their confidence in a prior selection can become inflated.[17] This is particularly true in cases of weak memory traces, where external cues disproportionately shape judgment.[18] Although it is not known whether witness 1 received any confirmation between lineups, the lack of systematic recording makes it difficult to rule out this possibility. It is widely recommended that identification procedures be videotaped to detect any unintentional or intentional cueing.[19] This is especially important because witness confidence is often given considerable weight in court decisions,[20] even when jurors are instructed not to equate confidence with accuracy.[21]

Witness 2, the sibling of witness 1, initially participated in a lineup in which she selected a filler rather than M.A.M. However, two years later, during the trial, witness 2 positively identified M.A.M., this time under conditions even less reliable than those of a formal showup procedure. Showups, in which a single suspect is presented without alternatives, have been shown to yield lower discriminability and reliability than lineups.[22] In this particular instance, reliability is even more questionable than in a single-suspect lineup, given that the defendant was seated in the dock alongside another suspect whom witness 2 had previously identified, thereby further skewing the situation. Showups conducted after witnesses are informed that the authorities have arrested a suspect increase the likelihood of false identifications, without improving accuracy.[23] In addition to these showup-related concerns, the identification made by witness 2 may also reflect a case of transference. Because she had previously been exposed to M.A.M. during the first lineup, where she selected a filler instead of him, her later recognition in court could have been driven by familiarity with the lineup

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[16] Amy Bradfield et al, "The damaging effect of confirming feedback on the relation between eyewitness certainty and identification accuracy" (2002) 87:1 J of Applied Psychology 112 at 112-119.

[17] Nancy Steblay et al, "The eyewitness post identification feedback effect 15 years later: Theoretical and policy implications" (2014) 20:1 Psychology, Pub Pol'y & L 1 at 6-7.

[18] Charles Brainerd & Valerie Reyna, "Fuzzy-trace theory and false memory" (2002) 11:5 Current Directions in Psychological Science 164 at 164-168.

[19] Gary Wells et al, "Policy and procedure recommendations for the collection and preservation of eyewitness identification evidence" (2020) 44:1 L & Human Behavior 3 at 23-24.

[20] Brian Cutler et al, "Jury decision making in eyewitness identification cases" (1988) 12 L & Human Behavior 41 at 41-43; Brian Cutler et al, "Juror sensitivity to eyewitness identification evidence" (1990) 14:2 L & Human Behavior 185 at 190-191.

[21] Steven G Fox & HA Walters, "The impact of general versus specific expert testimony and eyewitness confidence upon mock juror judgment" (1986) 10:3 L & Human Behavior 215 at 224-227.

[22] Daniel Yarmey et al, "Accuracy of eyewitness identifications in showups and lineups" (1996) 20 L & Human Behavior 459 at 459-461; Stacy Wetmore et al, "Effect of retention interval on showup and lineup performance" (2015) 4:1 J of Applied Research in Memory & Cognition 8 at 13; Laura Mickes, "Receiver operating characteristic analysis and confidence–accuracy characteristic analysis in investigations of system variables and estimator variables that affect eyewitness memory" (2015) 4 J of Experimental Psychology: Applied 93 at 100-102.

[23] Mitchell Eisen et al, "Pre-admonition suggestion in live showups: When witnesses learn that the cops caught 'the' guy" (2017) 31 Applied Cognitive Psychology 520 at 527-529.

exposure rather than by episodic memory of the crime itself. This mechanism, known as the transference effect[24], underscores how repeated exposure to a suspect across different contexts can bias memory and inflate the likelihood of a positive identification even in the absence of genuine recognition.

Taken together, these findings illustrate the dangers of repeated and non-standardized identification procedures. In the present case, they contributed to the increased confidence and eventual identification of M.A.M., in the absence of corroborating evidence.

B. Insufficient Instructions

The manner in which instructions are delivered to witnesses during identification procedures can significantly influence both the reliability and the outcome of the recognition.[25] Research has shown that when witnesses are not explicitly informed that the perpetrator may or may not be present in the lineup, the rate of false identifications increases.[26] Additionally, even when standardized instructions are used, they often fail to control for meta-communicative cues such as tone of voice, body posture, or subtle gestures that may unintentionally influence witness responses.[27]

Best practices in lineup administration recommend the use of double-blind procedures and the thorough documentation of each session, including audiovisual recording, to prevent both conscious and unconscious suggestion.[28] However, these practices are not routinely implemented in many judicial systems, particularly in countries such as Argentina, where regulation of identification protocols remains inconsistent and underdeveloped.

In the case of M.A.M., no written or audiovisual records of the instructions provided to witnesses during the lineup procedures were available in the court files. Nevertheless, inconsistencies in the delivery of instructions can be inferred from the testimony of witness 1, who participated in both the first and second lineups. During their testimony regarding the second identification procedure, witness 1 stated: *"The other time it was all faster, and it wasn't explained to me that I could take a long time to observe and carefully look at the people in the lineup. Now I was able to do it and come to the conclusion that the recognized individual was the perpetrator."* This statement suggests that the first lineup was conducted under time pressure and without appropriate guidance, while the second lineup included a more relaxed and structured approach. Later in the testimony, witness 1 added: *"The certainty is greater in this act, as it was explained to me that I could take all the time I wanted, and thus I could observe better, reaching the conclusion."*

This contrast implies a lack of standardization between the two procedures and raises concerns about the validity of the increased certainty expressed during the second identification. If the instructions and context varied significantly between procedures, it

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[24] Loftus, Ross, and Dysart, *supra* note 13.

[25] Nancy Steblay, "Social influence in eyewitness recall: A meta-analytic review of lineup instruction effects" (1997) 21:3 L & Human Behavior 283 at 294-295.

[26] Roy Malpass & Patricia Devine, "Eyewitness identification: Lineup instructions and the absence of the offender" (1981) 66:4 J of Applied Psychology 482 at 486-489.

[27] Gary L Wells et al, *supra* note 19 at 14-17.

[28] *Ibid* at 14-17.

becomes problematic to compare the outcomes or to use confidence as an indicator of accuracy.[29]

Moreover, the absence of neutral and consistent instructions could have introduced implicit pressure on the witness to choose someone, particularly if the procedures lacked safeguards against expectation bias. These inconsistencies, when combined with the repeated exposure to the same suspect, may have inflated confidence without a corresponding increase in actual memory accuracy.

C. Lack of Fairness

The fairness of a lineup is fundamentally dependent on the construction of the array, particularly the selection of fillers who accompany the suspect. According to internationally accepted standards, fairness requires that the suspect not unduly stand out in physical appearance, attire, or contextual presentation.[30] When this requirement is violated, witnesses may select the suspect not based on genuine memory, but due to the suspect's salience within the lineup. In the case of M.A.M., the method used by police to select the fillers for each lineup was not documented in the case file. However, a review of the photographic evidence from the first and second lineups shows no conspicuous visual discrepancies in clothing or physical features among the participants. On the surface, the lineups may appear visually balanced. However, a critical procedural flaw arises from the fact that M.A.M. was the only individual repeated across both lineups for witness 1. In the second procedure, all other lineup members were different from those in the first, which effectively made M.A.M. the only familiar face to witness 1. This recurrence could have unintentionally highlighted M.A.M. to witness 1, thereby undermining the fairness of the second lineup. This violation of lineup independence compromises the validity of any subsequent identification. It becomes unclear whether the witness recognized M.A.M. from the original criminal event or from prior exposure during the earlier lineup. Such a scenario heightens the risk of source monitoring errors, wherein witnesses confuse the origin of their memory.[31] It also increases susceptibility to commitment effects, as previously discussed, which reinforce initial choices across repeated procedures.

Regarding the identification made by witness 2, the conditions were so far removed from a formal lineup that conventional fairness metrics cannot be meaningfully applied. The recognition act took place in open court, akin to a showup, where the accused was seated beside another co-defendant already identified by the same witness. Such a setup lacked the structural safeguards of a properly designed lineup, including the use of non-suspect fillers[32] and unbiased instructions.[33] Consequently, the procedure did not provide a neutral context for testing recognition and rendered the identification highly susceptible to bias.

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[29] Wixted & Wells, *supra* note 2 at 12.

[30] Gary L Wells, Michael R Leippe & Thomas M Ostrom, "Guidelines for empirically assessing the fairness of a lineup" (1979) 3:4 L & Human Behavior 285 at 286-287.

[31] Marcia K Johnson, Shahin Hashtroudi & D Stephen Lindsay, "Source monitoring" (1993) 114:1 Psychological Bulletin 3 at 4-8.

[32] Melissa F Colloff & John T Wixted, "Why are lineups better than showups? A test of the filler siphoning and enhanced discriminability accounts" (2020) 26:1 J of Experimental Psychology: Applied 124 at 124-127.

[33] Steven E Clark, "A re-examination of the effects of biased lineup instructions in eyewitness identification" (2005) 29:5 L & Human Behavior 575 at 598-602.

D. High Emotional Distress

The relationship between stress and memory performance has been extensively studied, revealing a complex and sometimes contradictory picture. However, a substantial body of evidence suggests that elevated stress during the retrieval phase, such as during a lineup, can impair memory accuracy and increase susceptibility to suggestive influences.[34] These findings support the notion that every effort should be made to reduce the emotional distress experienced by witnesses during identification procedures. Indeed, practical experience frequently shows that witnesses perceive such procedures as psychologically demanding or distressing.[35]

In the case of M.A.M., there is no official record describing the emotional state of witness 1 during the first lineup. However, testimony and procedural notes from the second lineup provide clear indications of psychological distress. When asked about the first identification, witness 1 stated: *"I think it was conducted before last year's holidays, but I can't be sure because I was very nervous"*. Moreover, the police officer responsible for documenting the second identification reported *"The witness, when asked, mentions being very nervous, breaking into tears and stating that she does not want to remember the situation anymore, that this is harmful to her, and that she is nervous about having to go through this task."* This emotional state, characterized by distress and avoidance, raises serious concerns about the cognitive environment in which the identification was made. Although legal systems may not always be able to eliminate stress from criminal proceedings, psychological best practices suggest that personnel should be trained to recognize and mitigate emotional disturbances during such procedures.[36] In this case, there is no record of any attempt to reduce the witness's emotional burden during the process.

Importantly, the evaluation of witness performance should take into account not only the formal elements of the identification procedure but also the internal psychological state of the witness. Stress-related cognitive impairments may reduce the reliability of recognition judgments, and therefore must be considered when interpreting the probative value of such evidence.

E. Long Time Lapse

The detrimental effects of time on the stability of declarative memory have been recognized for more than a century, beginning with the foundational work of Ebbinghaus (1885). As time passes between the encoding of an event and its retrieval, the likelihood of memory degradation increases significantly. This principle is particularly critical in the context of eyewitness identification, where delays can profoundly impair recognition accuracy.

Although well-established in the scientific literature, the time-related decay of memory is seldom accounted for in judicial procedures across many Latin American countries, where delays in investigations and trials are pervasive.[37] Experimental studies have

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[34] Lars Schwabe et al, "Stress effects on memory: An update and integration" (2012) 36:7 Neuroscience & Biobehavioral Reviews 1740 at 1740-1747.

[35] Facundo A Urreta Benítez et al, *supra* note 15 at 9-12.

[36] Kenneth A Deffenbacher et al, "A meta-analytic review of the effects of high stress on eyewitness memory" (2004) 28:6 L & Human Behavior 687 at 702-704.

[37] Pablo Ciocchini, "Campaigning to eradicate court delay: power shifts and new governance in criminal justice in Argentina" (2014) 61:1 Crime L & Soc Change 61 at 61-77.

demonstrated that even a delay of just one week can significantly reduce the accuracy of identification in lineup procedures, with correct identifications dropping to 65%.[38]

In the case of M.A.M., the two key witnesses were not summoned for the first identification procedure until January 2009, more than seven months after the robbery in June 2008, and a second lineup was conducted nearly ten months after the incident. Both intervals represent substantial delays, long enough to severely compromise the reliability of eyewitness memory.[39]

The extended lapse between the crime and the identification procedures, combined with other procedural flaws such as repeated exposure to the same suspect and lack of standardized instructions, compounds the risk of misidentification. In such conditions, the weight given to eyewitness testimony must be carefully reevaluated, as its probative value may be significantly compromised.

F. Witness Contamination

In legal contexts, it is common for witnesses to provide multiple statements over the course of an investigation or trial. Although the emergence of new details across statements is not inherently problematic,[40] significant contradictions may signal reduced reliability and accuracy.[41] These inconsistencies may result from differences in interview technique,[42] repeated questioning, or external influences such as contact with media, investigators, or other witnesses.[43] In the case of M.A.M., notable contradictions emerged in the two statements provided by witness 1. During the first lineup, when asked to describe the role of the individual identified, she responded: *"He presented similar characteristics to the person I mentioned in my testimony as the one who entered the store, went to the cash register, and pointed a gun at me, forcing me to hand over the money."* However, in the second lineup, the same witness provided a substantially different account: *"He was the one who passed behind the counter that led to the butcher's area and fired three shots with the gun he was carrying at my uncle. He was accompanied by two other men, one stayed in the cash register area while the other, accompanied by the identified individual, went to the back where my uncle's death occurred."*

These statements are not only inconsistent but suggest radically different roles for the identified individual, one as a participant in the robbery and the other as the alleged shooter.

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[38] Tim Valentine, Alan Pickering & Stephen Darling, "Characteristics of Eyewitness Identification that Predict the Outcome of Real Lineups" (2003) 17:8 Applied Cognitive Psychology 969 at 983-984.

[39] Wenbo Lin, *supra* note 8; Michael J Strube & Henry L Roediger III, "The effects of repeated lineups and delay on eyewitness identification" (2019) 4 Cognitive Research: Principles & Implications 1 at 3-4.

[40] Alana C Krix et al, "Consistency across Repeated Eyewitness Interviews: Contrasting Police Detectives' Beliefs with Actual Eyewitness Performance" (2015) 10:2 PLoS One 1 at 13.

[41] Ronald P Fisher, Aldert Vrij & Drew A Leins, "Does Testimonial Inconsistency Indicate Memory Inaccuracy and Deception? Beliefs, Empirical Research, and Theory" in Barry S. Cooper, Dorothee Griesel & Marguerite Ternes, eds, *Applied Issues in Investigative Interviewing, Eyewitness Memory, and Credibility Assessment* (New York: Springer, 2013) 173 at 173-187.

[42] Julian AE Gilbert & Ronald P Fisher, "The Effects of Varied Retrieval Cues on Reminiscence in Eyewitness Memory" (2006) 20:6 Applied Cognitive Psychology 723 at 734-737.

[43] Mitchell L Eisen, "'I Think He Had A Tattoo On His Neck': How Co-Witness Discussions About A Perpetrator's Description Can Affect Eyewitness Identification Decisions" (2019) 6:3 J of Applied Research in Memory & Cognition 274 at 274-276.

Such a shift significantly affects the legal interpretation of the witness's testimony. Additionally, witness 2, the sibling of witness 1, provided a version of events during the trial that appeared to blend elements of both prior accounts: *"One of the individuals who had threatened me at the cash register and then headed to the back."* This convergence raises the possibility of memory contamination through cohabitation or discussion between witnesses, particularly given that the two lived together between their respective testimonies. Furthermore, another critical problem in this case was the inconsistent matching of perpetrators with their alleged roles in the crime. Research on eyewitness identification in multiple-perpetrator contexts shows that such scenarios are particularly prone to error, as witnesses must not only recall individual faces but also bind them to specific roles or actions. Hobson and Wilcock demonstrated that accuracy decreases substantially when multiple perpetrators are involved, especially when witnesses attempt to match suspects to roles.[44] Similarly, Nortje et al. highlighted the limitations of human face memory capacity, underscoring why misattributions are common in multi-perpetrator cases.[45] These findings suggest that the role-inconsistencies observed in the present case reflect well-documented cognitive constraints rather than reliable identifications.

The interview records suggest a semi-structured questioning format, with defense-initiated prompts documented in the transcripts. Statements often appear in the form: *"In response to questions about the involvement of the identified individual, she commented that..."* *"In response to questions posed regarding the defense's requests...".* Although this consistent format limits variability attributable to interview technique, it does not rule out external contamination. In fact, the evolution of narratives, along with the cohabitation of the witnesses, strengthens the hypothesis that exposure to post-event information may have altered their recollections.

These observations highlight the importance of implementing protocols that minimize exposure to contaminating information, especially in cases where witness testimony plays a pivotal role in legal outcomes.

IV. Discussion

This case illustrates how a cluster of system variables, repeated lineups, insufficient instructions, lack of fairness, high emotional distress, long retention intervals, and opportunities for cross-contamination, could undermine the reliability of eyewitness evidence and contribute to wrongful convictions. The subsequent acquittal of M.A.M. underscores the need to evaluate identification evidence through the lens of contemporary memory science.

Our analysis relied exclusively on official records and applied well-established principles from cognitive psychology and neuroscience to assess procedural risks rather than private mental states. This approach aligns with the aims of appellate review, which focus on the integrity of procedures and the probative value of the resulting evidence. Although originally framed as an amicus curiae brief, our focus was strictly on identifying scientifically

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[44] Alicia Nortje, Colin G Tredoux & Annelies Vredeveldt, "Eyewitness identification of multiple perpetrators" (2020) 33:2 South African J of Crim Justice 348 at 348-353.

[45] Alicia Nortje, Colin G Tredoux & Annelies Vredeveldt, "How many faces can we remember? Why these matters when assessing eyewitnesses" in Markus Bindemann & Ahmed M Megreya, eds, *Face Processing: Systems, Disorders and Cultural Differences* (Hauppauge, NY: Nova Science Publishers, 2017).

established risks, which may have emphasized vulnerabilities more than strengths. Nevertheless, the multiple deviations from evidence-based standards render our conclusions regarding identification reliability robust. Future expert reports could benefit from contrasting alternative hypotheses to further minimize bias.[46]

A further limitation is that, because the analysis was conducted within the legal record, we were inevitably exposed to contextual information beyond the identification procedures, such as additional testimonies. Research on forensic confirmation bias shows that such exposure can inadvertently influence expert interpretation by shaping expectations.[47] While our assessment remained focused on procedural aspects, complete insulation from case-related information was not possible. Future expert practice would benefit from protocols that restrict access to irrelevant contextual details, thereby minimizing potential bias. Importantly, Argentina operates under a federal system, meaning each of its 25 jurisdictions (the 23 provinces, the Autonomous City of Buenos Aires, and the federal jurisdiction) maintains its own criminal procedure regulations. This legal diversity directly affects the conduct of eyewitness identification procedures, causing substantial variations depending on where the crime is investigated. Despite these differing regulations, no jurisdiction has fully adopted the scientific standards recommended for conducting identification procedures. One clear example is the absence of a double-blind requirement, no legislation mandates that the individual conducting the lineup be unaware of the suspect's identity, a factor that can inadvertently introduce bias.

As we noted, lineup size regulations in Argentina vary by jurisdiction, with each code setting different requirements. Specifically, seven jurisdictions do not establish a minimum number of participants, thirteen require at least two fillers in addition to the suspect, five mandate three, and only one requires four. These standards fall short of international recommendations. Both experimental research and best-practice guidelines emphasize that lineups should include at least five fillers in addition to the suspect to maximize fairness and reduce the risk of false identifications.[48] The absence of such minimum standards in Argentina highlights how regulatory fragmentation can directly compromise the reliability of eyewitness evidence.

As for the video recording of the procedure, only two provinces (San Luis and Chubut) require that the process be filmed under penalty of nullity, meaning the procedure is valid only if recorded. The remaining jurisdictions impose no explicit obligation in this regard.

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[46] Annelie Vredeveldt, "Legal psychologists as experts: Guidelines for minimizing bias" (2024) 30:7 Psychology, Crim & L 705 at 705-722.

[47] Saul M Kassin, Itiel E Dror & Jeff Kukucka, "The forensic confirmation bias: Problems, perspectives, and proposed solutions" (2013) 2:1 J of Applied Research in Memory and Cognition 42 at 45-48; Steve D Charman, Melissa Kavetski & Dana Hirn Mueller, "Cognitive Bias in the Legal System: Police Officers Evaluate Ambiguous Evidence in a Belief-Consistent Manner" (2017) 6:2 J of Applied Research in Memory and Cognition 193 at 198-201.

[48] Gary L Wells et al, " Eyewitness Identification Procedures: Recommendations for Lineups and Photospreads" (1998) 22:6 L & Human Behavior 603 at 634-635; Nicola Marie Menne et al, "Measuring lineup fairness from eyewitness identification data using a multinomial processing tree model" (2023) 13:1 Scientific Reports 6290 at 2-4; Steven E Clark, Molly B Moreland & Scott D Gronlund, "Evolution of the empirical and theoretical foundations of eyewitness identification reform" (2014) 21:2 Psychonomic Bulletin & Rev 251 at 253-254.

Furthermore, photographic identification is regulated across all jurisdictions only as an exceptional measure, permissible when the suspect cannot be located or when the suspect's appearance has significantly changed between the time of the incident and the identification procedure.

The lack of uniform criteria among the jurisdictions directly impacts the administration of justice, as procedural safeguards vary from one region to another. Consequently, an identification procedure might be carried out in a manner more closely aligned with scientific guidelines in one province than in another, affecting both the fairness and the reliability of identifications.

In countries such as Argentina the systematic scrutiny of eyewitness identification within criminal procedure has only recently gained traction. Many procedural codes were drafted decades ago and have not kept pace with empirical advances on memory and identification; justice-system actors often lack specialized training in this domain. Closing this gap is essential if courts are to appraise eyewitness evidence with appropriate caution.

Empirical research has consistently demonstrated that judges, lawyers, and even expert witnesses often hold misconceptions about how memory operates, including the belief that recollections function like video recordings or that confidence directly predicts accuracy.[49] These misunderstandings can lead courts to overestimate the reliability of eyewitness testimony and underestimate the risks of contamination or distortion. Addressing this problem requires not only procedural reform but also systematic training of justice-system actors in cognitive psychology and neuroscience, ensuring that legal decisions align with contemporary scientific knowledge.

This case also exemplifies a concrete route by which scientific knowledge can reach judges and assist in correcting erroneous outcomes: the submission of rigorous, transparent, evidence-based analyses through amicus curiae and expert consultation within the record. While no single brief is determinative, the engagement between science and the courts here shows how research can inform appellate scrutiny and promote error correction.

Looking ahead, the findings in this case and the regulatory heterogeneity we identified support a coherent program of reform and training for Argentina and the wider Latin American region, aimed at preventing avoidable errors. Core safeguards should be codified in procedural law, such as double-blind administration; pre-lineup documentation of a witness's description and confidence; neutral instructions that the perpetrator may or may not be present; adequate numbers of fillers; prohibitions on repeating the same suspect across lineups absent necessity; and contemporaneous audiovisual recording with a preserved chain of custody. Showups should be treated as truly exceptional procedures, tightly circumscribed and documented under supervisory oversight. Continuing education on memory and identification should be embedded for prosecutors, public defenders, and judges, and integrated into professional curricula. Finally, research and justice partnerships can help design, implement, and audit evidence-based protocols. Embedding these changes in procedural codes and professional

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[49] Joyce W Lacy & Craig EL Stark, "The neuroscience of memory: implications for the courtroom" (2013) 14:9 Nature Reviews. Neuroscience 649 at 655-656; Mark L Howe & Lauren Knott, "The fallibility of memory in judicial processes: Lessons from the past and their modern consequences" (2015) 23:5 Memory 633 at 651-653; Pamela J Radcliffe & Lawrence Patihis, "Judges and lawyers' beliefs in repression and dissociative amnesia may imperil justice: further guidance required" (2024) 32:8 Memory 1083 at 1091-1096.

training would better align everyday practice with the state of the science and reduce the risk of wrongful convictions across the region.

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VII. Conflict of interest

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