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Olivier Dodier, Frédéric Tomas, Mélanie Payoux, Benjamin Elissalde. Professional Experience in Investigative Interviewing Does Not Guarantee Strong Knowledge about Memory. *Psychological Research on Urban Society*, 2019, 2 (1), pp.1. 10.7454/proust.v2i1.49 . hal-03359049

HAL Id: hal-03359049

<https://hal.science/hal-03359049>

Submitted on 22 May 2024

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4-30-2019

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Olivier Dodier

LAPSCO (UMR 6024), Université Clermont Auvergne, oliver.dodier@uca.fr

Frédéric Tomas

Laboratoire Parisien de Psychologie Sociale (EA4386), Université de Paris 8; Laboratoire Cognition Humaine et Artificielle (EA4004), Université de Paris 8, tomas.phd@gmail.com

Mélany Payoux

Laboratoire de Psychologie des Pays de la Loire (EA4638), melany.payoux@univ-nantes.fr

Benjamin Elissalde

Office Central pour la Répression des Violences aux Personnes, Direction Centrale de la Police Judiciaire, benjamin.elissalde@interieur.gouv.fr

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Recommended Citation

Dodier, Olivier; Tomas, Frédéric; Payoux, Mélany; and Elissalde, Benjamin (2019) "Professional Experience in Investigative Interviewing Does Not Guarantee Strong Knowledge about Memory," *Psychological Research on Urban Society*: Vol. 2: No. 1, Article 7.

DOI: 10.7454/proust.v2i1.49

Available at: <https://scholarhub.ui.ac.id/proust/vol2/iss1/7>

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Psychological Research
on Urban Society
2019, Vol. 2(1) 1-9
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DOI: [10.7454/proust.v2i1.49](https://doi.org/10.7454/proust.v2i1.49)
proust.ui.ac.id

Olivier Dodier¹, Frédéric Tomas^{2,3}, Mélyny Payoux⁴, and Benjamin Elissalde⁵

¹LAPSCO (UMR 6024), Université Clermont Auvergne, ²Laboratoire Parisien de Psychologie Sociale (EA4386), Université de Paris 8, ³Laboratoire Cognition Humaine et Artificielle (EA4004), Université de Paris 8, ⁴Laboratoire de Psychologie des Pays de la Loire (EA4638), Université de Nantes, ⁵Office Central pour la Répression des Violences aux Personnes, Direction Centrale de la Police Judiciaire

Received: January 14th, 2019
Revision Accepted: March 11th, 2019

Abstract

We examined the knowledge of law enforcement officers regarding memory by conducting two levels of analysis. First, we compared memory-related knowledge and erroneous beliefs of officers ($n = 200$) and lay people ($n = 403$) and found similar low scores of knowledge across both groups as well as a greater number of erroneous beliefs among law enforcement officers. Second, we compared knowledge and erroneous beliefs of officers who had undergone training in investigative interviewing ($n = 41$) with those of their untrained counterparts ($n = 159$). Similar low scores in knowledge and false beliefs were found. However, when comparing officers who reported conducting five or more interviews per month ($n = 82$) to officers who reported conducting zero interviews per month ($n = 43$), we found that the first group expressed more erroneous beliefs. The results are discussed in line with previous research, in particular, studies on investigative interview practices.

Keywords

Belief, eyewitness memory, investigative memory, law enforcement, memory

Memory is involved in a range of criminal offenses: sexual offenses, violence against the person, robbery, domestic burglary, vehicles offenses, etc. For each of these areas, eyewitness reports may be of great importance in order to solve cases. Statistics show that crime rates are generally higher in urban than in rural contexts (e.g., Office for National Statistics, 2018). Therefore, law enforcement agents are especially likely to rely on eyewitness memory reports in urban contexts, making eyewitness testimony a strong urban issue. Police officers tend to consider eyewitnesses as central to

criminal investigations (Kebbell & Milne, 1998). Errors in testimony are also one of the main causes of wrongful convictions (Innocence Project, 2015; Saks and Koehler, 2005). To avoid such dramatic outcomes, and because eyewitness testimonies represent a significant part of their daily practices, law professionals are generally advised to acquire the latest scientific knowledge on a variety of memory issues that may occur in criminal and judiciary contexts. For instance, police investigators are expected to be aware of the detrimental effects of leading and suggestive questions on the veracity of memory reports, or of co-witness situations. They may also be expected to have a basic knowledge of the differences between children's and adults' memory abilities and/or the effect of stress on memory, in order to take these parameters into account during investigative interviews. But do they have the

Corresponding Author:

Olivier Dodier

Université Clermont Auvergne, CNRS, LAPSCO, 34
Avenue Carnot, F-63000, Clermont-Ferrand, France

Tel: + 33 (0) 4 73 40 64 69

Email: oliver.dodier@uca.fr

required knowledge?

Research has shown that law enforcement officers have limited, if not poor knowledge of how memory works, suggesting that they are not familiar with factors—including their own practice—that may affect eyewitness testimonies (Benton, Ross, Bradshaw, Thomas, & Bradshaw, 2006; Chaplin & Shaw, 2015; Jiang & Luo, 2016; Kask, 2011; Wise, Safer, & Maro, 2011). Although one study found that law enforcement officers may have better knowledge than lay people (i.e., potential jurors; Benton et al., 2006), another observed similar knowledge and erroneous beliefs on various aspects of eyewitness memory between the two groups (Kask, 2011).

Because advanced investigative interview methods rely on strong empirical consensus on the science of memory (e.g., Fisher & Geiselman, 1992; Lamb, Hershkowitz, Orbach, & Esplin, 2008), training in how to interview people in the judicial context generally includes theoretical considerations on memory (e.g., Cyr & Lamb, 2009). However, it has been observed that the later training occurs in officers' careers, the more likely the officers will discard what they have recently learned in favor of their old (not necessarily recommended) methods (Powell, Hughes-Scholes, Smith, & Sharman, 2014). We, therefore decided to take several professional experience characteristics of law enforcement officers into account in our analyses. As far as we know, this is the first attempt to measure the investigators' knowledge and the extent of erroneous beliefs about memory, considering both their level of training (i.e., trained in testimonial collection methods vs. untrained) and their experience as investigative interviewers (five interviews or more per month vs. fewer than five interviews per month vs. zero interviews per month). Based on the study conducted by Benton et al. (2006), we expected that investigators would perform better (i.e., more correct and fewer incorrect answers) than lay people, although we predicted limited knowledge in both groups. We based our hypothesis on Benton et al. (2006) rather than Kask (2011) because Benton et al.'s method (i.e., comparison of aggregate scores) was closer to the method we used than the Kask's method (i.e., comparison item by item). We also expected that trained officers would have more

knowledge and fewer false beliefs than their non-trained counterparts. Finally, because, to our knowledge, no previous study took into account the years of experience and the frequency of interviews conducted by officers, no specific hypothesis was formulated in regard to this analysis. Therefore, it should be viewed as an initial exploratory step.

Method

Participants. The questionnaire was sent to 700 French police officers. From that, 246 investigators took part in the study. After a reminder two weeks later, 200 of them fully completed the questionnaire. Therefore, the response rate was 28.6%. Their mean age was 40.4 years old ($SD = 7.5$). Of the 198 who reported their gender, 65.2% were male ($n = 128$). They had served as a police officer for an average length of 16.6 years ($SD = 7.4$). In order to perform analyses as a function of years of experience, we computed a median split (median 17), and found that 47% ($n = 92$) of them had served as a police officer for fewer than 17 years, and 53% ($n = 104$) for 17 years or more. Regarding investigative interviews, 20.5% ($n = 41$) declared that they had followed one or more training programs in investigative interview techniques, including: child witness interviews (23.5%, $n = 20$), adult witness (18.8%, $n = 16$), juvenile suspects (7.1%, $n = 6$), adult suspects (29.4%, $n = 25$). No further information on the content of these training sessions was available. Among the officers, 43 reported conducting no interviews per month (21.6%), 74 reported that they usually conducted between 1 and 4 interviews per month (37.2%), and 82 usually conducted five interviews or more per month (41.2%). One officer did not volunteer this information. Seven investigation specialties were reported by 198 officers in the sample: 14.6% ($n = 29$) were generalist investigators, 18.2% ($n = 36$) were specialized in crime against people, 2.5% ($n = 5$) were specialized in counter-terrorism, 9.6% ($n = 19$) were specialized in child victim and suspect cases, 25.8% ($n = 51$) were specialized in organized crime, 24.2% ($n = 48$) were specialized in financial cases, and 5.1% ($n = 10$) were involved in various thematic areas (traffic penalties, administrative investigations, etc.).

Table 1. Memory topics and statements

Topics	Statements
1. Effect of post-event information	Eyewitness testimony about an event often reflects not only what a witness actually saw but also information obtained later on from other witnesses, the police, the media, etc. Response alternatives: Agree*-disagree-uncertain
2. Minor details	A witness's ability to recall minor details about a crime is a good indicator of the accuracy of the witness's identification of the perpetrator of the crime. Response alternatives: Agree-disagree*-uncertain
3. Impact of stress	Very high stress at the time of observation has a negative effect on the accuracy of testimony. Response alternatives: Agree*-disagree-uncertain
4. Attitudes and expectations	An eyewitness's perception and memory of an event may be affected by his or her attitude and expectations. Response alternatives: Agree*-disagree-uncertain
5. Weapon focus	The presence of a weapon can impair an eyewitness's ability to identify the perpetrator's face accurately. Response alternatives: Generally true*-generally false-uncertain
6. Forgetting curve	The rate of memory loss for an event is greatest right after the event and then levels off over time. Response alternatives: Generally true*-generally false-uncertain
7. Children's recall	When small children talk about events they have experienced, do you think they remember better, as well as, or worse than adults? Response alternatives: Better-as well as-worse*-uncertain
8. Infantile amnesia	Many people talk about memory from early childhood years. How far back in time do you believe people can remember? Response alternatives: From birth on-one year-two years-three years*-four years-five years-six years or older.
9. Recovered memories	Sometimes adults in psychotherapy remember traumatic events from early childhood, about which they previously had absolutely no recollection. Do you think such memories are real or false? Response alternatives: All are real-most are real-most are false*-all are false-uncertain
10. Dramatic events	Sometimes people become witnesses to dramatic events. Do you think the memory for such events is worse, as good as, or better compared to the memory for everyday events? Response alternatives: Better*-as good as-worse-uncertain
11. Repression of adult traumatic memories	Sometimes people who have committed murder claim to have no memory of the crime. Do you think such memories can be repressed and that the perpetrator believes they are telling the truth, or do you think they are lying? Response alternatives: They tell the truth-they are lying*-uncertain
12. Immediate acceptance of suggested information	A systematic positive answer to a suggestive question asked by a professional does not necessarily mean that the witness remembers the suggested information Response alternatives: Agree*-disagree-uncertain
13. Credibility vs. Reliability	If an eyewitness testimony is deemed as credible by an expert witness, it is therefore possible to assume that the testimony is reliable Response alternatives: Agree-disagree*-uncertain

Note. Asterisks indicate the response modalities considered correct according to current memory science.

The lay people sample ($n = 403$) was retrieved from Dodier and Payoux (2017). An internet link was distributed on social networks (i.e., Twitter and Facebook). The participants were all French, and their mean age was 33.4 years old ($SD = 10.9$). Of the 400 participants who declared their gender, 46.5% ($n = 186$) were male. Regarding the lay people sample's activities, 21.7% ($n = 87$) were students (including 32 participants studying psychology or psychiatry), 70.6% ($n = 283$) declared having a professional career, and 7.7% ($n = 31$) were unemployed. Note that two participants did not report their employment status.

The questionnaire. The questionnaire included 13 multiple-choice items related to eyewitness memory. They were based on Magnussen and Melinder (2012), Melinder and Magnussen (2015), and Dodier and Payoux (2017) for the French adaptation and the two last items. These three studies were based on the literature review by Magnussen et al. (2006) and covered many topics such as the misinformation effect, the weapon focus, the forgetting curve, infantile amnesia, and recovered memories (see Table 1 for detailed items and response modalities). Contrary to Dodier and Payoux (2017), an item

related to the trial phase of a case was removed because this phase is not relevant to French investigators' practice. We asked the investigators questions related to their experience in investigative interviews: their estimated mean number of interviews conducted per month ("I don't conduct interviews," "less than five per month," "five or more per month"), if they had followed any training in investigative interview techniques, and if yes, what type of interview (i.e., child witnesses, juvenile suspects, adult witnesses, adult suspects). Finally, socio-demographic questions were asked (i.e., age, gender, professional activity, investigation specialty of the officers, etc.).

Results

Preliminary analyses. The law enforcement and lay people samples differed in regard to gender composition, $\chi^2 = 18.482$, Cramer's $V = 0.176$, $p < .001$, and age, $\chi^2 = 110.722$, $p < .001$, Cramer's $V = 0.431$. However, neither the gender nor the age had any effect on the total knowledge score (respectively, female participants, $M = 6.41$; $SD = 0.27$; male participants, $M = 6.10$; $SD = 0.36$, $F(1, 594) = 0.550$, $p = .458$, $\eta^2_{\text{partial}} = .001$; < 30 years

Figure 1. Distribution of scores on the knowledge scale in the law enforcement and the lay

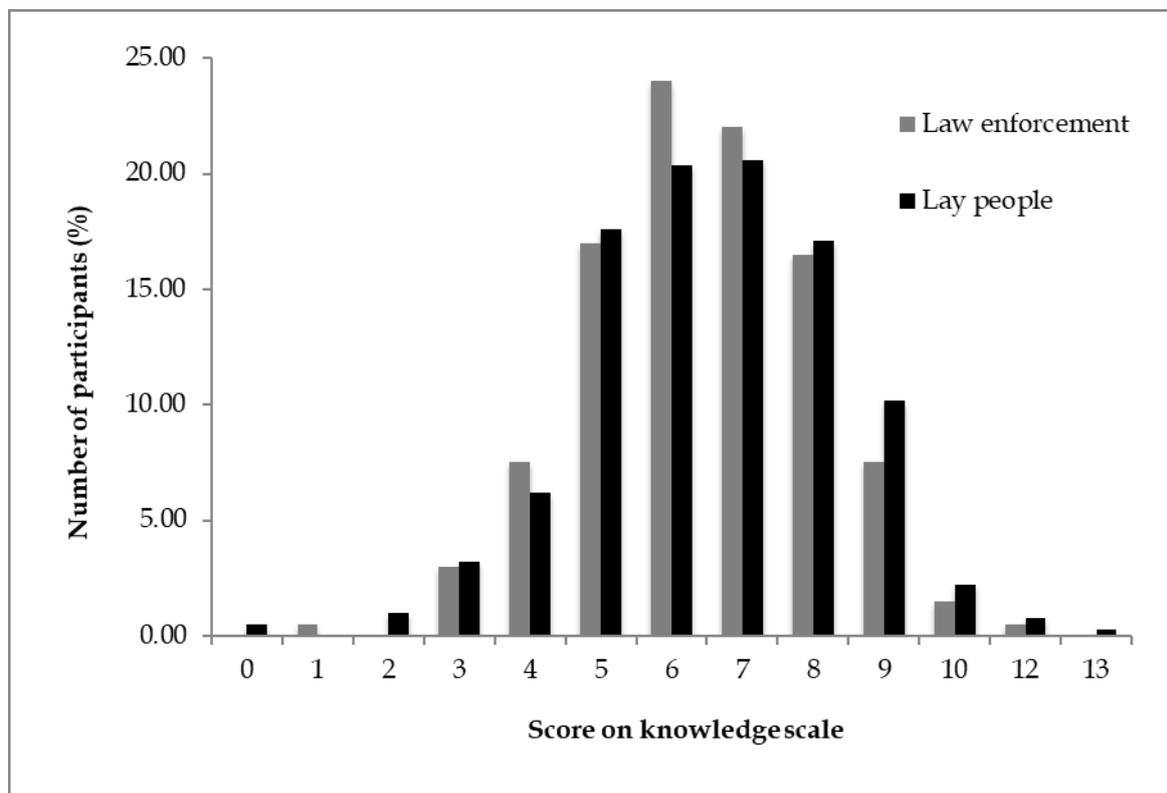


Table 2. Mean scores, standard deviations, and confidence intervals on correct and incorrect answers

	Correct answers			Incorrect answers		
	M	SD	CI 95%	M	SD	CI 95%
General public	6.53	1.79	[6.36, 6.71]	3.60	1.58	[3.45, 3.75]
Law enforcements	6.43	1.63	[6.20, 6.66]	3.89	1.48	[3.69, 4.09]
Trained	6.60	1.68	[6.09, 7.11]	3.55	1.41	[3.24, 3.86]
Untrained	6.39	1.63	[6.14, 6.64]	3.96	1.49	[3.73, 4.19]
0 interview per month	6.74	1.68	[6.24, 7.24]	3.47	1.65	[2.98, 3.96]
1-4 interviews per month	6.32	1.76	[5.92, 6.72]	3.81	1.32	[3.51, 4.11]
5 and > interviews per month	6.36	1.49	[6.04, 6.68]	4.15	1.48	[3.83, 4.47]
< 17 years of exp.	6.29	1.59	[5.96, 6.63]	3.97	1.43	[3.66, 4.27]
17 and > years of exp.	6.58	1.67	[6.26, 6.89]	3.80	1.54	[3.51, 4.09]

old, $M = 6.53$; $SD = 0.13$; 30-39 years old, $M = 6.54$; $SD = 0.12$; 40-49 years old, $M = 6.40$; $SD = 0.14$; 50-69 years old, $M = 6.48$; $SD = 0.23$; > 70 years old, $M = 5.25$; $SD = 1.07$; $F(4, 594) = 0.500$, $p = .736$, $\eta^2_{\text{partial}} = .003$), and on the erroneous belief score (respectively, female participants, $M = 3.52$; $SD = 0.23$; male participants, $M = 4.21$; $SD = 0.32$, $F(1, 594) = 3.114$, $p = .078$, $\eta^2_{\text{partial}} = .005$; < 30 years old, $M = 3.57$; $SD = 0.12$; 30-39 years old, $M = 3.79$; $SD = 0.11$; 40-49 years old, $M = 3.79$; $SD = 0.13$; 50-69 years old, $M = 3.43$; $SD = 0.20$; > 70 years old, $M = 4.75$; $SD = 0.94$; $F(4, 594) = 1.361$, $p = .246$, $\eta^2_{\text{partial}} = .009$).

Scores on the memory knowledge scale. Figure 1 shows the distributions of the scores of correct answers in the two samples. The average score of correct answers according to knowledge about the current science of memory was not statistically different for the law enforcement officers and lay people, $F(1, 601) = 0.427$, $p < .514$, $\eta^2_{\text{p}} = .001$ ($BF_{10} = 0.12$). Law enforcement officers expressed more erroneous beliefs than lay people, $F(1, 601) = 4.578$, $p = .033$, $\eta^2_{\text{p}} = .008$. However, a follow-up Bayesian ANOVA showed anecdotal support for the null hypothesis, $BF_{10} = 0.89$.

The subgroup of law enforcement officers who had followed training on how to interview suspects and/or witnesses did not outperform the subgroup of untrained law enforcement officers, $F(1, 195) = 0.444$, $p = .506$, $\eta^2_{\text{p}} = .002$ ($BF_{10} = 0.22$). Similarly, they did not express more false beliefs, $F(1, 195) = 0.941$, $p = .333$, $\eta^2_{\text{p}} = .005$ ($BF_{10} = 0.24$). No main effect of the years of experience was found on the total knowledge score, $F(1, 196) = 1.479$, $p = .225$, $\eta^2_{\text{p}} = .008$ ($BF_{10} =$

0.31) and the total erroneous belief score, $F(1, 196) = 0.632$, $p = .428$, $\eta^2_{\text{p}} = .003$ ($BF_{10} = 0.21$). No main effect of the number of interviews conducted per month was found on the total knowledge score, $F(2, 196) = 1.090$, $p = .338$, $\eta^2_{\text{p}} = .01$ ($BF_{10} = 0.18$). However, a main effect was found on the total erroneous belief score, $F(2, 196) = 3.163$, $p = .044$, $\eta^2_{\text{p}} = .03$ ($BF_{10} = 0.83$). Tukey's post hoc analyses showed that the officers who reported conducting five or more interviews per month expressed more erroneous beliefs than their colleagues who reported conducting no interviews, $t(196) = 2.471$, $p = .038$, Cohen's $d = 0.44$ ($BF_{10} = 2.29$). No other significant difference was found, with, $t(196) = 1.231$, $p = .435$, $d = 0.24$ ($BF_{10} = 0.41$), and $t(196) = 1.429$, $p = .327$, $d = 0.24$ ($BF_{10} = 0.48$). Finally, no significant interaction was found between the level of training and the number of interviews per month regarding the knowledge and erroneous belief scores, with respectively $F(3, 193) = 1.920$, $p = .128$, $\eta^2_{\text{p}} = .03$ ($BF_{10} = 0.01$), and $F(3, 193) = 0.839$, $p = .474$, $\eta^2_{\text{p}} = .01$ ($BF_{10} = 0.06$). All means, square deviations and confidence intervals for correct and incorrect answers are reported in Table 2 and in Table 3.

Discussion

Our findings on French law enforcement officers are consistent with the international literature, showing that they have limited knowledge about how memory works both in general and in criminal contexts (e.g., Benton et al., 2006; Juang & Luo, 2016; Kask, 2011; Wise et al., 2011). More precisely, despite the fact that memory is at the core of investigative interview situations and that its related knowledge is crucial, the law

Table 3. Mean scores and standard deviations on correct answer for each item of the questionnaire

	General public		Law enforcements						
	Overall		Trained	Untrained	0 interviews per month	1-4 interviews per month	5 and > interviews per month	< 17 years of exp.	17 and > years of exp.
1. Effect of post-event information	0.87 (0.34)	0.83 (0.37)	0.88 (0.33)	0.87 (0.34)	0.81 (0.39)	0.92 (0.27)	0.85 (0.36)	0.86 (0.35)	0.88 (0.32)
2. Minor details	0.23 (0.42)	0.45 (0.50)	0.28 (0.45)	0.21 (0.41)	0.26 (0.44)	0.18 (0.28)	0.24 (0.43)	0.24 (0.43)	0.20 (0.40)
3. Impact of stress	0.69 (0.46)	0.72 (0.45)	0.68 (0.47)	0.74 (0.44)	0.70 (0.47)	0.73 (0.45)	0.73 (0.45)	0.75 (0.44)	0.70 (0.46)
4. Attitudes and expectations	0.94 (0.25)	0.93 (0.27)	0.95 (0.22)	0.92 (0.28)	0.91 (0.29)	0.91 (0.29)	0.95 (0.22)	0.88 (0.33)	0.96 (0.19)
5. Weapon focus	0.65 (0.48)	0.69 (0.47)	0.65 (0.48)	0.69 (0.46)	0.65 (0.48)	0.69 (0.47)	0.70 (0.46)	0.66 (0.48)	0.70 (0.46)
6. Forgetting curve	0.40 (0.49)	0.55 (0.50)	0.55 (0.50)	0.55 (0.50)	0.67 (0.47)	0.51 (0.50)	0.51 (0.50)	0.55 (0.50)	0.55 (0.50)
7. Children's recall	0.22 (0.42)	0.27 (0.44)	0.25 (0.44)	0.22 (0.42)	0.26 (0.44)	0.20 (0.40)	0.23 (0.42)	0.19 (0.39)	0.27 (0.45)
8. Infantile amnesia	0.23 (0.42)	0.37 (0.48)	0.20 (0.41)	0.23 (0.42)	0.42 (0.50)	0.20 (0.40)	0.15 (0.36)	0.20 (0.40)	0.26 (0.44)
9. Recovered memories	0.08 (0.27)	0.16 (0.37)	0.18 (0.39)	0.06 (0.23)	0.09 (0.29)	0.07 (0.25)	0.09 (0.28)	0.04 (0.21)	0.11 (0.31)
10. Dramatic events	0.41 (0.49)	0.35 (0.48)	0.43 (0.50)	0.40 (0.49)	0.53 (0.50)	0.39 (0.49)	0.35 (0.48)	0.42 (0.50)	0.38 (0.49)
11. Repression of adult traumatic memories	0.32 (0.47)	0.10 (0.30)	0.25 (0.44)	0.34 (0.48)	0.28 (0.45)	0.38 (0.49)	0.29 (0.46)	0.34 (0.48)	0.32 (0.47)
12. Immediate acceptance of suggested information	0.88 (0.32)	0.87 (0.33)	0.88 (0.33)	0.89 (0.32)	0.88 (0.32)	0.84 (0.37)	0.93 (0.26)	0.89 (0.31)	0.88 (0.32)
13. Credibility vs. Reliability	0.32 (0.47)	0.45 (0.50)	0.43 (0.50)	0.29 (0.45)	0.28 (0.45)	0.31 (0.47)	0.34 (0.48)	0.27 (0.45)	0.37 (0.48)

enforcement officers in our study had the same level of knowledge and expressed more misconceptions than the lay people sample—note however the small effect size and the Bayes factor rather supportive of the null hypothesis in this case. Such ignorance of the nature of certain memory biases and adherence to false beliefs on how memory works under criminal circumstances may perhaps be one of the reasons why investigative interviews are generally conducted in an inappropriate manner (e.g., Launay & Py, 2015; Luther, Snook, Barron, & Lamb, 2014; Wolfman, Brown, & Jose, 2016).

The novelty of this research is that we have taken into account the law enforcement officers' experience, namely their training in interview methods, their years of experience, and the number of interviews they conduct per month. Since training on how to interview witnesses, victims, and suspects generally includes theoretical considerations of memory functioning, we hypothesized that trained participants should perform better than untrained ones. We found that being trained in interview methods does not seem to imply more knowledge or less erroneous beliefs about how memory works. Similarly, the years of experience did not influence the scores of knowledge and erroneous beliefs. However, although their knowledge score did not differ depending upon the number of interviews they conducted monthly, we found that law enforcement officers who reported conducting five interviews or more per month expressed more false beliefs than their counterparts who do not conduct interviews at all. Despite a small effect size and unequal sample sizes, this result is consistent with previous research showing that officers generally prefer to rely on 'common sense' when their practice is related to memory (Fisher & Schreiber, 2007; Wise et al., 2011). It is also worth to link this finding to those of Powell, Hughes-Scholes, Smith, and Sharman (2014). In their study, the most experienced investigators were more likely to move back to poor questioning practices after training in how to use open prompts, compared to less experienced colleagues. In other words, the later investigators are trained in how to conduct investigative interviews takes place in the career, the more likely they are to return to their bad habits. Therefore, our study might

contribute to the understanding of this phenomenon: If training does not improve investigators' knowledge on memory, the misconceptions of experienced investigators could be sufficiently entrenched to overcome the practical benefits of training.

Future research should explore the links between investigators' erroneous beliefs about memory, the investigators' reluctance to use good interview practices despite prior training, and the so-called boomerang effect. This effect takes place when a strategic message is conceived and conveyed to a particular audience, but the message backfires in an unintended manner (for a psycho-legal example, see Malamuth, Huppin, & Linz, 2018; for a general review, see Byrne & Hart, 2009). Research has shown that science communication was likely to cause a polarization of ideas rather than creating consensus (Hart & Nisbet, 2012). To our knowledge, no study has focused on the delivery of evidence-based information to law enforcement and how its presentation may actually reinforce police officers' erroneous beliefs. In this case, it would be interesting to examine if evidence-based, openly scientific information and training create a consensus among law enforcement forces, or on the contrary, polarizes groups with different professional experience.

It is worth noting that we were unable to ask participants for information about the date of their training, the content of these training sessions, and any updates to these sessions. It might then be interesting to replicate our study by taking these elements into consideration, as the similarity of such results with those of Powell et al. (2014) would then be strengthened.

To conclude, our findings are of interest for three reasons. First, they contribute to the international literature on the knowledge that law enforcement officers have about the functioning of memory. Second, although further studies are needed to better identify the nature of the links between false beliefs about memory and poor interview practices, our findings clarify the understanding of investigators' practices in terms of eyewitness testimonies. Third, such limited knowledge could undermine the quality of the witness testimonies gathered. Cooperation between officers and civilians has been shown to be

complex and sometimes tenuous when the witness or the victim comes from a highly sensitive urban area (Cook, 2008). The scarcity of civilians willing to be interviewed in actual cases only heightens the need for the achievement of best practice and deep knowledge of the memory processes at play.

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