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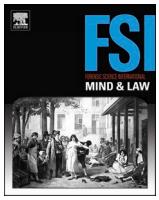

Original Research

# What can expert witnesses reliably say about memory in the courtroom?

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ABSTRACT

Psychologists are sometimes asked to provide their expert opinion in court on whether memories of victims, witnesses, or suspects are reliable or not. In this article, we will discuss what expert witnesses can reliably say about memory in the legal arena. We argue that before research on memory can be discussed in legal cases, this research should ideally meet the following three conditions: replicability, generalizability, and practical relevance. Using a fictitious false memory case, we offer a guide to how psychologists should critically examine whether a particular segment of memory research is in line with these three conditions. We show that the area of false memory broadly fits these conditions but that for areas such as eyewitness identification and false confessions, there is limited discussion on which effect sizes are of interest in legal cases. We propose several recommendations that expert witnesses can use when they evaluate the validity of statements such as working with scenarios (e.g., statements are valid or not). Being transparent about the limits and strengths of memory research will assist triers of fact in their decision-making process.

What can psychologists testify about in the courtroom when it involves memory, such as the validity of eyewitness testimony[1]? This question has been at the forefront of recent historical sexual abuse cases such as the Harvey Weinstein and Jeffrey Epstein cases. Concerns have been raised about whether psychological science on memory is reliable enough to warrant expert testimony about it in court. Indeed, recently (memory) scholars have been discussing psychological studies on memory and whether they can be used in court. To give some examples, Ranganath (2022) wrote about memory research being "used to defend predators and overgeneralized relative to the broader literature on memories for abuse" and Cantlon (2022) stated that a particular study on false memory formation "isn't good evidence for false memories of rape, but it's being used to try to exonerate more than 300 people." Furthermore, Brewin (in press, p. XXX) argued that "[o]vergeneralizations by psychologists of the research evidence on memory and eyewitness testimony, such as "memory decays with time" or "memories are fluid and malleable," are beginning to appear in legal judgements".

There is a good reason for why expert witness testimony on memory plays a role in legal proceedings. In many criminal cases, jurors and judges need to rely primarily on testimony from witnesses, victims, and suspects. This prime reliance is due to the fact that in many criminal cases, there is limited forensic technical evidence to support any eyewitness accounts (Saint-Martin et al., 2007). Take for example sexual abuse. Oftentimes, such crimes happen in intimate and closed environments without the presence of other witnesses and without any objective evidence such as videos or photos to which eyewitness accounts can be compared (Bidrose & Goodman, 2000). Therefore, triers of fact occasionally seek the help of psychologists to evaluate the validity of memory-based testimony of witnesses, victims, and suspects.

The involvement of psychologists in the courtroom has a long tradition. Wigmore (1937), for example, argued that when psychologists are ready for the courtroom, the courts will be ready too. The central question is whether psychological science on memory is *really ready* to be used in the courtroom. In the current article, we will discuss whether psychological studies on memory are strong enough to be used in the courtroom and provide a guide and recommendations on what expert witness testimony should include when it comes to questions about memory. Such a guide is important as at present, there are virtually no specific guidelines when memory scientists work as expert witnesses in the legal arena (Otgaar et al., 2017; Vredeveldt et al., 2022). To properly

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[1] The term "validity" is used to refer to whether testimony refers to an event that was actually experienced. However, in legal contexts, the term "reliability" is frequently used.

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understand the relevance of such a guide, we will begin with a general discussion of expert witness testimony on memory-related questions.

## 1. Expert witness work on memory

Expert witnesses can have a somewhat different role depending on the legal system in which they provide expert testimony. Specifically, criminal law systems across the world can be divided as to whether they are inquisitorial or adversarial (De Ruiter & Kaser-Boyd, 2015). The Netherlands adopts the strictest inquisitorial system in the world while in the UK and US an adversarial approach is used. In the adversarial system, legal cases can be viewed as contests between equivalent parties: the defense and the prosecution (Van Koppen, 2007). Each party argues their case in a fairly equal role in front of the judge and frequently the jury. The adversarial model also means that the judge should have a neutral position, only intervening when necessary (e.g., when there are conflicts), and is a source of all issues related to law.

The inquisitorial system is quite different from the adversarial one. In the inquisitorial system, there is oftentimes no jury. Furthermore, in the Netherlands, a legal case is not about equivalence of parties, but about finding the truth (Van Koppen & Penrod, 2003). Judges in the inquisitorial system are professionals and in countries such as the Netherlands, receive specialized training. They not only have to attend law school but also receive an additional six years of specialized judicial training, including taking courses on psychology and law (Van Koppen, 2007). Moreover, in the inquisitorial system, the judge has an active role and leads the investigation. Furthermore, the prosecution needs to come up with an independent evaluation of the case which means that the prosecution in an inquisitorial system can suggest calling for an acquittal. Another difference is that the judge is primarily tasked with asking questions during a trial instead of the defense or prosecution.

Expert witnesses have a rather unique role in each of these systems. For example, they can be asked to provide general expert testimony about the functioning of memory. However, they can also be requested to apply their knowledge to a specific individual case (Cutler & Kovera, 2011). For example, in the adversarial system, it is not uncommon that the chief responsibility of an expert witness is to educate the judge and jury and provide general information about a certain key area (e.g., factors that might impact eyewitness identification), but can sometimes also be asked to provide specific information applied to an individual case. In the inquisitorial system, expert witnesses are often asked to provide a formal opinion about a case by reading the case files and using their expertise to address a certain issue in the case (e.g., the validity of testimony of a suspect).

Psychologists might sometimes be asked to provide expert testimony on issues related to memory. Many criminal cases hinge on testimony from witnesses, victims, and suspects. Testimonial evidence is heavily rooted in memory as what people report is greatly determined by what they remember about a certain experience (Koriat & Goldsmith, 1996). Because objective forensic evidence (e.g., a DNA sample) is frequently absent in criminal cases, factfinders need to base legal decisions primarily on their assessment of the validity of (memory-based) testimony. Because of the different actors involved (witnesses, victims, suspects) in the course of a legal trial, research has focused on the memory performance of these actors.

For example, for eyewitness memory, there is a rich body of literature on eyewitness identification and factors affecting eyewitness memory (Juncu & Fitzgerald, 2021; Wells & Olson, 2003). These studies have revealed facts concerning what the ideal line up size should be in order to increase true positive rates and reduce rates of false positives (Juncu & Fitzgerald, 2021). There is also evidence that in ideal situations, initial confidence is strongly related to an accurate identification (Wixted et al., 2015). Finally, we also know which different variables are (system variables) and are not under the control of the criminal justice system (estimator variables), knowledge which can help us assess the reliability of eyewitness memory (e.g., Pezdek et al., 2020). Collectively, this literature has resulted in specific guidelines for eyewitness identification procedures which can be used by police worldwide and by expert witnesses when discussing the validity and reliability of eyewitness identification in legal cases (Wells et al., 2020).

Concerning memory of victims, it is important to acknowledge that victims of a crime are also witnesses of a crime. Therefore, many issues related to victims' memory overlap with issues regarding eyewitness memory. Nonetheless, there are some topics that are mostly tied to memory of victims. One of them is how traumatic experiences are remembered (e.g., Goldfarb et al., 2022). This issue has been part of a bitter debate on whether traumatic memories can be unconsciously repressed (Loftus, 1994; Otgaar et al., 2019). This debate stemmed from cases in which patients who had no memory of abuse before entering therapy gradually recovered memories of abuse during therapy. Memory researchers argued that for some of these "recovered memories" there was a good likelihood that they were in fact false memories (i.e., memories for events that were not experienced) because of the use of suggestive therapeutic interventions (McNally, 2005).

Finally, for memory of suspects, considerable research has been devoted to the issue of innocent suspects falsely confessing to a crime (Gudjonsson & Pearse, 2011; Kassin, 2008; Scherr et al., 2020). Specifically, this work has revealed that guilt-presumptive interrogation tactics, including suggestive pressure, might elicit different types of false confessions (compliant, internalized; Kassin & Kiechel, 1996) and that false confessions might bias other types of forensic evidence (Kukucka & Kassin, 2014).

For all of these research lines, there are legal cases and case studies demonstrating these phenomena. For example, Wagenaar and Loftus (1990) discussed ten cases of possible faulty eyewitness identifications in which they worked as expert witnesses. Case studies have also been reported concerning false memory. For example, Garven et al. (1998) elaborated on suggestive interviewing techniques that were used in the McMartin Preschool case that likely led to the creation of children's false reports regarding sexual abuse. Furthermore, Gudjonsson and MacKeith (1990) described a case in which an innocent man falsely confessed to two murders during police interrogations.

That these psychological phenomena concerning memory are relevant in court is also exemplified by recent data from the Dutch legal database "rechtspraak.nl." When we searched for cases in which legal psychologists worked as an expert witness in the year 2021,[2] we found 13 cases. We observed the following. Nine referred to cases in which possible false confessions played a role and in four cases, expert witnesses were asked to look at the validity of testimony. In one case, the defense asked for an expert witness report on eyewitness identification, but this request was rejected by the court. Furthermore, data from the Innocence Project also show that memory-related phenomena play a central role in legal cases. Specifically, in 63% of wrongful convictions, eyewitness identifications were the leading cause and in 27%, false confessions were involved (https://innocenceproject.org/exonerations-data/; April 5, 2022).

Taken together, there are various areas in which psychologists can provide expert testimony on topics related to memory. These areas predominantly focus on memory performance of witnesses, victims, and suspects. However, expert witness reports on memory vary greatly

[2] We conducted this search on February 9, 2022 using the search term "rechtspsycholoog" (legal psychologist) and the following range of date: 1-1-2021 to 31-12-2021. We used this term because these are the psychologists who are asked to provide expert opinion on memory-related matters (e.g., false memories) in the Netherlands. Using this search led to 15 hits, but in two cases, it was reported that no legal psychologist was needed. Also, in 12 of the 13 cases a legal psychologist was truly involved as an expert witness.

between experts.[3] Specifically, several (case) studies have shown that expert witnesses who talk about memory use different methods to reach their conclusions. For example, Nierop and colleagues (2006) showed that expert witness reports in the Netherlands concerning the credibility of statements of abuse differ on many aspects such as the method used to assess credibility (see also Brackmann et al., 2016). Because of such disparity in expert witness reports, Vredeveldt and colleagues (in press) proposed several guidelines to minimize potential bias that might happen when expert witnesses write reports, including having an independent person critically review the report before sending it to party that hired the expert (e.g., attorney).

Also, and of relevance for the current manuscript, are (case) studies showing that psychologists' knowledge and use of memory research is often suboptimal when working in the courtroom. For example, Dodier et al. (2019) showed that French psychologists who sometimes provided expert evidence on eyewitness memory hold incorrect beliefs on memory, such as how traumatic memories are stored. Also, Zajac and colleagues (2013) reviewed expert testimony in child sexual abuse cases in New Zealand. They detected several misconceptions in these reports, such as the idea that detailed statements are indicative of accurate memories. Because of the great divergence among expert witness reports and the lack of knowledge that they sometimes possess concerning memory-related matters, a pressing concern is what expert witnesses can reliably say about these research lines concerning memory in the legal arena.

### 1.1. Replicability, generalizability, and practical relevance

To provide an answer to the issue about what expert witnesses can say in the courtroom about memory, our position is that memory science can only meaningfully contribute to the court when the conditions of replicability, generalizability, and practical relevance are minimally met. Our position is drawn from recent argumentation on what social sciences can contribute to the discussion on culpability (Tullett, 2022). Tullett argued that at a minimum, several conditions should be met before social sciences can offer a meaningful contribution to the issue of blameworthiness in court, such as replicability and generalizability. We will now describe the importance of replicability, generalizability, and practical relevance in expert witness work on memory.

First, findings in the area of memory science should have been replicated. That is, if expert witnesses talk about findings in the field of memory that have not been replicated, they are presenting a less-than-accurate picture about the state-of-affairs of a certain research domain. In general, the issue of replication is relevant in psychology because multi-site replication projects have, in general, shown low replication rates. Specifically, these replication attempts have revealed rather low replication rates ranging from 0% (Many Labs 5 in psychology; Ebersole et al., 2020) to 62% (Social Sciences Replication Project; Camerer et al., 2018; see also Tullett, 2022). Because of the rather low replication success, the current period in psychology is also called the credibility revolution or replication crisis (Vazire, 2018).

The problem of low replication rates is not exclusive to the areas of research in these replication attempts. Specifically, the issue of replicability is also of high relevance in the field of psychology and law (Chin & Zeiler, 2021). That is, fact finders frequently rely on expert witnesses to educate the court. If expert witnesses bolster their testimony with scientific work that failed to be replicated, fact finders might base their legal decision-making on an incomplete representation of a certain area in memory science. To provide a concrete example, imagine that an expert witness is asked to provide a report on how a type of drug can contaminate eyewitness testimony. The expert witness might base their decision on a single study showing that this particular drug might decrease the risk of false eyewitness testimony. However, another study has failed to observe this finding but this failure is not mentioned by the expert witness. Judges and jurors might then wrongfully decide that in a given case, eyewitness testimony was not compromised.

There can be myriad reasons for low replication rates, such as publication bias and low powered studies (Bakker et al., 2012, 2020; Ioannidis, 2005). Furthermore, researchers might have engaged in questionable research practices or *p*-hacking. For example, researchers might (unintentionally) have been involved in many different analytic strategies and only reported the significant ones. However, conducting a multitude of unplanned analyses might inflate false positive rates (Simmons et al., 2011). A remedy for such analytic flexibility is resorting to the practice of preregistration in which researchers, before data collection, report which hypotheses they have and the analyses they plan to execute (Nosek et al., 2019).

Concerning generalizability, it has been argued that many hypotheses and claims in psychology are verbal in nature (e.g., suggestion leads to false memory creation) while the translation from statistical analyses to these verbal claims is not always possible, something which has also been referred to as the generalizability crisis (Yarkoni, 2022; but see also Lakens et al., 2022). Specifically, verbal psychological constructs such as false memory oftentimes cannot be measured directly but *can* be measured using operationalizations of this construct. For example, researchers frequently examine the formation of false memories for words (Roediger & McDermott, 1995) and a rightful question is whether this memory error fully captures the construct of false memory in real life. Related to this is the observation from scholars that in the field of memory, certain memory tasks used in research say little about how witness, victims, and suspects remember traumatic experiences (e.g., Brewin, 2022; DePrince et al., 2004; but see also Otgaar et al., 2022). This argument has also been put forward when examining certain paradigms that have been used to experimentally elicit false confessions (e.g., Meissner et al., 2010). Furthermore, Kovera and Evelo (2021) noted that many eyewitness identification studies neglect the social context in which such identifications take place.

Furthermore, another pivotal development in terms of generalizability has been the acknowledgement that testing Western samples has dominated research in psychological science (Muthukrishna et al., 2020). This is also the case for applied memory research that has almost exclusively focused on recruiting samples from Western countries (see Hope et al., 2022). Why this is problematic is because different cultural backgrounds might affect the way people encode, store, and retrieve memories (Wang, 2021). To provide a concrete example, Anakwah et al. (2020) tested participants from collectivistic (sub-Saharan Africa) and individualistic cultures (Northern Europe) and showed them crime-related stimuli (e.g., picture of a theft). The most important result was that participants from individualistic cultures reported the most details. Results like these suggest that expert witnesses should pay attention to whether the literature they cite in their expert memory report used samples that are appropriate to the case at hand.

A final important condition is practical relevance. Expert witnesses can describe the practical relevance of research on memory by resorting to effect sizes. An effect size refers to a magnitude of certain phenomena that can be used to plan studies, interpret results, and quantify real world implications (Riesthuis et al., 2022). Concerning the latter, consider the following example. A memory researcher is interested whether emotionally-negative experiences increase the reporting of false details. Participants are randomly assigned to two groups. One group is presented with one hundred emotionally-negative pictures (e.g., pictures of a funeral) while the other group receives one hundred neutral pictures (e.g., pictures of fruit). Following this, participants are asked to recall which pictures they have seen. The researcher finds that participants receiving the negative pictures *incorrectly* recall -on average-two more pictures than participants who received the neutral pictures. An important question is whether this difference (i.e., two

[3] Although beyond the scope of the article, another important consideration is when someone can be seen as an expert in memory (see for example Zajac and colleagues (2013) on this issue).

pictures) is strong enough to make any practically-related statements such as when expert witnesses testify that the experience of a negative event may have increased the probability of false memories.

The question of whether certain effect sizes are practically meaningful and relevant is related to what is also called the smallest effect size of interest (SESOI; Lakens, 2014). The SESOI is the smallest effect that (1) researchers personally care about, (2) is theoretically interesting, or (3) is practically meaningful (Anvari & Lakens, 2021). There are several ways to establish the SESOI in any field of psychology. For example, anchor-based methods, such as the minimal clinically important difference, involve determining the smallest difference by which a patient subjectively notices improvement (or worsening; e.g., Jaeschke et al., 1989).

Another method involves surveying psychologists about what they view as the SESOI in their field. For example, Riesthuis and colleagues (2021) surveyed a number of memory researchers to obtain the SESOI for false memory research. Participants were presented with several scenarios containing the method and procedure of often used false memory methods, such as a study on how therapy can foment the creation of false memories. For each scenario, they were asked to come up with the SESOI for theoretical and practical ends. The authors found that that there was no clear agreement between memory researchers on the SESOI in false memory research. Nonetheless, they did find that memory researchers tended to provide small SESOIs or any statistically significant effect, especially for theoretical purposes. Taken together, our argument is that when expert witnesses talk about memory research in court it is imperative that they know whether the research being discussed is replicable, generalizable, and possesses practical relevance.

Related to the issue of practical relevance is what Tullett (2022) called inferential strength. This refers to whether scientific findings are sufficiently strong and clear enough for making inferences about specific individuals or cases (Tullett, 2022). One way in which courts in the US have decided on whether expert testimony can be applied to individual cases is to assess whether there is a "fit" between the expert testimony and the case at hand (Faigman et al., 2014). Specifically, the reasoning behind this is that it should be determined whether, for example, research proffered by expert witnesses is relevant to issues arising in an individual case. It must be noted, however, that the issue of "fit" is something that courts have to decide themselves. Nonetheless, expert witnesses might comment in their reports on whether certain study characteristics (e.g., the studied population) "fit" an individual case at hand.

## 2. A Guide for expert witnesses on the science of memory

We will now offer a guide to how psychologists could act as expert witnesses when they are asked about memory-related issues. We will apply this guide to a potential false memory case, although the general tenets of this guide can also be applied to cases on eyewitness identification and false confessions. The case is fictitious, but the outline of the case is very much in line with real false memory cases (e.g., Kaplan & Manicavasagar, 2001). The case at hand concerns a young woman who shows signs of anxiety and depression and starts to follow a course of treatment. Although the woman does not have any recollection of abuse, the therapist suggests that her symptoms could be the result of an unconscious repressed memory of sexual abuse. During several therapeutic sessions, the woman gradually recovers a memory of abuse, one that ostensibly happened in her childhood. Specifically, the woman starts to remember that she was repeatedly abused by her father when she was a child. Because of her memory regarding abuse, she files an official complaint to the police. The police start an official investigation and interview the father. The father denies all charges. The lawyer for the father consults a psychologist asking whether the suggestions offered by the therapist might have produced false memories of abuse.

### 2.1. A Guide on the Science of False Memory

What should an expert witness do when attempting to address the lawyer's request? First, the expert witness could examine whether there is any literature on suggestion and false memory formation and whether it has been replicated. Specifically, the expert witness could search for meta-analyses, reviews, or replication studies. To have a grasp of the replicability of these research lines, a psychologist could search on Web of Science with terms such as "meta-analysis" AND "false memory, or "review" AND "false memory", or "replication" AND "false memory." This search led to 218 hits (see https://osf.io/c4gpt/). When looking at these results, the expert witness could observe whether there are good grounds to assume that the phenomenon of false memory is robust. The results clearly show different meta-analyses, reviews, and replication attempts bolstering the idea that false memories can occur in experimental settings (e.g., Newbury & Monaghan, 2019; Scoboria et al., 2017; but see also Zwaan et al., 2018). Additionally, an expert witness could identify meta-analyses, reviews, or replications that are of particular interest for the case at hand. Recall that the case was about the possible influence of suggestion on the creation of false autobiographical memories of abuse.

When focusing on the search results, the mega-analysis regarding false memory formation by Scoboria and colleagues (2017) is especially relevant. The authors looked at previous studies in which false autobiographical memories were implanted. In those studies, across several interviews, participants are suggestively told that they experienced a false event during their childhood (e.g., Hyman et al., 1995; Loftus & Pickrell, 1995). In the mega-analysis, the authors looked at participants' memory reports of several former false memory implantation studies. They found that 30.4% of reports were coded as false memories. Furthermore, this percentage was even 46.1% when the suggestion involved details of relevance to the self, when participants had to imagine a false event, and when no photo in combination with the suggestion was used. To conclude, based on the search results, an expert witness now has evidence to show that work on false memories is well-replicated and that different reviews and meta-analyses support this assertion.

A second strategy that the expert witness could use is to investigate the generalizability of false memory studies. This could be accomplished by searching for literature discussing the generalizability of false memory research. A Web of Science search with the following terms: "generalizability" AND "false memory", "generalizability" AND "false memory", "generalization" AND "false memory", and "generalisation" AND "false memory" yielded 23 hits. When inspecting these hits, some articles have critically evaluated the generalizability of false memory. For example, some articles referred to studies in which false memories of details are induced. A canonical example of a procedure to elicit false memories of details is the Deese/Roediger-McDermott paradigm (Deese, 1959; Roediger & McDermott, 1995). In this paradigm, participants are presented with lists of associatively-related words (e.g., nap, night, bed, cushion, moon, etc.) that converge on a non-presented word called the critical lure (i.e., sleep). Participants often misremember the critical lure as having been presented together with the other related words (Roediger & McDermott, 1995).

Concerning generalizability, scholars have warned about extrapolating from results tapping into false memories of words to real life cases concerning false autobiographical memories (e.g., DePrince, 2004; Pezdek & Lam, 2007). For example, Pezdek and Lam (2007, p.2) stated that "[c]ognitive psychologists interested in conducting research relevant to assessing the authenticity of memories for child sexual abuse should consider the generalizability of their research to the planting of entirely new events in memory." However, when talking about the implantation of new events in memory using suggestion, Scoboria et al. (2017, p. 160) noted that false memory implantation studies use relatively mild suggestive pressure and that "with stronger techniques combining the factors we investigated, more people may be led to create

false memories of negative experiences." That false memories of negative experiences can be evoked relates to what Otgaar et al. (2022, p. 18) argued in that "negative events that have been implanted share certain similarities with sexual abuse such as that the events can be painful (e.g., rectal enema, mousetrap), shameful (e.g., rectal enema), and emotionally arousing (e.g., hospitalisation)." In closing, although false autobiographical memories implanted in laboratory conditions are a stretch from false autobiographical memories of abuse induced in therapeutic conditions, lab-induced false memories do share several essential characteristics with therapy-induced false memories of abuse.

The last condition that an expert witness should concentrate on is practical relevance. For example, we have reasoned that looking at effect sizes in published memory research and establishing a smallest effect size of interest would be important strategies to be used by expert witnesses. That is, although an abundance of memory research has demonstrated that suggestive influences can negatively impact memory, a basic but forthright question is whether these findings have any practical meaning. So, experiments conducted in this area will establish certain effect sizes and the question is whether such effect sizes bear any relevance in actual legal cases. This question can only be answered if as a field, we agree to some extent on which effect sizes are of relevance in practical settings. For example, research shows that suggestion does lead to false memory creation (e.g., Loftus, 2005) and the question is what the consequence of such findings can be for, for example, interviewing settings.

Specifically, this question is related to what the smallest effect size of interest is in these memory experiments (see Lakens et al., 2018). Our argument is that memory experiments should contain elements that can generate effects of interest for the (legal) field. If we consider what the smallest effect size of interest is for (applied) memory research, our argument is that even when suggestive influences lead to increases or decreases of only one (falsely) remembered detail, this might be of high value to the legal field. Moreover, it is important to emphasize that one remembered or forgotten detail could potentially lead to severe consequences in the legal arena. For example, an eyewitness of a crime who falsely remembers that an innocent bystander was the culprit might make a false accusation. Taken together, establishing which effects are of interest concerning the impact of suggestive influences on memory might lead to stronger experiments to demonstrate such effects. That is, if memory researchers are planning new studies and want to conduct an a priori power analysis, they have to estimate which effect size is needed to establish an effect of interest.

Applying this reasoning to the case of possible therapy-induced false memories, the following argument can be made. Research has shown that the creation of false autobiographical memories is successful in about 30% of participants (Scoboria et al., 2017). If memory researchers tend to accept even smaller effects, then this percentage can certainly be used to make the claim that suggestive interventions can do serious harm. Moreover, even if this percentage would be smaller (e.g., 15%), then memory researchers have argued that such a percentage still possesses practical relevance (see also Brewin & Andrews, 2017; Nash et al., 2017).

To recap, we have offered a simple guide on what expert witnesses can do when they are asked a question concerning the possible occurrence of false memories in a given case. Specifically, we have argued that expert witnesses should look at whether a certain memory phenomenon (e.g., false memory) is replicable, generalizable, and possesses practical relevance. Our analysis shows that this memory phenomenon possesses these qualities. Nonetheless, there might be legal cases in which the possibility of false memories requires a more cautious approach. For example, an expert witness who is asked about false memories emerging in different cultural backgrounds would have to admit that cross-cultural experimentation on false memory susceptibility is limited (Otgaar & Wang, 2021).

### 2.2. A Guide on the Science of Eyewitness Identification and False Confession

This guide can, of course, also be applied when expert witness testimony concerns other issues such as eyewitness identification and false confessions. When we inspected these topics on replicability using Web of Science (see also https://osf.io/c4gpt/),[4] 143 hits were observed for eyewitness identification and 26 hits for false confessions. When we took a closer look at the articles, we identified reviews on the post-identification feedback effect in eyewitness identification (Steblay et al., 2014) or a meta-analysis on experimentally-induced false confessions (Stewart et al., 2018). Also, concerning generalizability, we found 6 hits for eyewitness identification and 2 hits for false confessions.[5] When concentrating on these results, we saw discussions on generalizing from experimental studies on eyewitness identification and false confessions to real cases (e.g., Bekerian, 1993; Klaver et al., 2008).

Taken together, the search results suggest that there is research related to replicability and discussions are ongoing concerning generalizability when focusing on eyewitness identification and false confessions. Expert witnesses could use such results to bolster their claims in their expert testimony. We also investigated whether any papers exist concerning the practical relevance or the smallest effect size of interest in these two domains. However, no literature was detected that covered these topics. This omission implies that psychologists might make their claims in court stronger when paying more attention to the practical relevance of their research.

## 3. How to apply this Guide in expert witness work on memory

We now offer several recommendations on the application of this guide for memory experts working as expert witnesses in court. First, if expert witnesses need to write a report or provide oral testimony concerning a certain topic (e.g., false memory), our advice is to make clear whether or not any cited literature meets the conditions of replicability, generalizability, and practical relevance. Mentioning this will likely put more confidence in an expert witness report or testimony than when it is unclear whether any cited literature is strong enough to be used in expert witness work. Even if it would not instil greater confidence, it is our contention that in areas such as the courtroom in which psychological science can have a notable impact on legal decision-making and hence, people's lives, it is good practice to be transparent about the scientific status of cited literature.

Of course, because psychologists working as expert witnesses in the courtroom are experts in a certain domain (e.g., memory), they might be well aware of whether phenomena (e.g., false memory) are replicable, generalizable, and have practical relevance. However, the court does not possess this knowledge and we argue that expert witnesses should be as transparent as possible in the courtroom as to whether certain memory phenomena meet these conditions. Furthermore, although psychologists are experts in a certain domain, they will likely not know the entire (memory) field. This is important to realize as psychologists working as expert witnesses might receive a question from a lawyer or the court for which they do not know whether the science on memory has addressed it (e.g., "Will drugs amplify innocents' willingness to falsely confess to a

[4] The following search terms were used: "meta-analysis" AND "eyewitness identification", "review" AND "eyewitness identification", "replication" AND "eyewitness identification", "meta-analysis" AND "false confession", "review" AND "false confession", "replication" AND "false confession".

[5] We used the following search terms: "generalizability" AND "eyewitness identification", "generalizability" AND "identification", "generalization" AND "eyewitness identification", and "generalization" AND "eyewitness identification", and "generalizability" AND "false confessions", "generalizability" AND "false confession", "generalization" AND "false confession", and "generalization" AND "false confession".

crime?"). In such situations, we believe it is particularly important that the limitations of an expert's knowledge be transparent to the court and that such questions be addressed only to those with the relevant expertise. Those with such expertise will be able to identify the work that has been conducted in that area and whether this work is replicable, generalizable, and possesses practical relevance.

Second and relatedly, our first point does *not* mean that if a certain memory phenomenon does not meet these three conditions it should not be used at all in expert witness testimony. A clear example of this issue has been demonstrated by McCloskey and Egeth (1983) and Loftus (1983). McCloskely and Egeth asserted at that time that many factors potentially affecting eyewitness memory of realistic events were not well documented by research and hence, should not be discussed in expert witness testimony. However, Loftus (1983, 1986) replied that when talking about eyewitness memory, psychologists can draw from a large pool of research in cognitive, perceptual, and social psychology. Loftus argued that although at that time, few studies existed on eyewitness memory of realistic events, studies did exist in which basic parameters concerning memory had been examined, such as retention intervals of simple memories. Loftus reasoned that such work can still be used in expert witness work. Our argument is that if, for example, limited research exists on a certain topic, this research could be discussed in expert witness work. However, it is vital that expert witnesses acknowledge in their testimony the limits of this work, including that it is unclear how reliable the finding is or whether it can be generalized to the case at hand. We argue that it is better to be transparent about the limits of research than to oversell it.

For example, there is limited research on how certain types of drugs might affect the validity of eyewitness memory, but there is basic research on how drugs impact basic memory processes (Kloft et al., 2021). An expert witness who would be asked to answer the question whether antipsychotic drugs might increase the susceptibility to false *autobiographical* memories would have to say that at present, there are only two studies concerning the relation between antipsychotics and false memories (Guarniri et al., 2016, 2017). Although both studies evinced an increase of false memories due to antipsychotics, the methodologies involved memories for *words* and not *autobiographical* memories. These studies can still be cited in the expert witness testimony albeit that it is important to concede that there are limitations with generalizing this finding to cases on false autobiographical memories.

Third, we strongly suggest that when psychologists are involved in expert witness work, they should use this guide in the most unbiased way possible. One way to accomplish is by using a scenario approach when expert witness work is conducted on the validity of testimony (Crombag & Wagenaar, 2000; Otgaar et al., 2017; Rassin, 2014; Rassin; Eskin, 1991). The idea of using scenarios is based on the scientific concept of falsification (Popper, 1963). Specifically, in many cases, questions are raised concerning the validity of testimony of an alleged victim of abuse. In our opinion, an expert witness should then basically work with two scenarios: the testimony is valid or it is not valid (e.g., that testimony is based on false memories, it is deceptive, etc). When reading the case files, expert witnesses should look for elements that support these different scenarios.

For example, an expert witness might encounter a well-conducted police interview with the alleged victim using open-ended questions which facilitates the retrieval of accurate memories. This element would support a scenario that the testimony is valid. When discussing these elements, an expert witness might discuss the literature on interviewing and retrieval of memories using the aforementioned conditions (replicability, generalizability, and practical relevance). The same would apply when an expert witness would identify elements (e.g., the alleged victim received suggestive therapeutic interventions) in a case that would be in line with an alternative scenario (i.e., the testimony is invalid). Here too, an expert witness should discuss the scientific status of the literature on suggestion and false memories. Using such scenarios could guard against expert witnesses unduly focusing on one side of an argument, assisting them in looking for evidence consistent with both sides of the argument (Otgaar et al., 2017). Relatedly, researchers have suggested that using such a scenario approach might reduce biases in expert witness work such as confirmation bias or allegiance (i.e., biased towards the side that hires an expert; Otgaar et al., 2017).

Our guide can be especially useful for memory experts working in legal cases. However, expert witnesses are hired by parties such as lawyers and these parties might have a vested interest in asking specific experts that might provide testimony advantageous for them. This might result in experts becoming "hired guns," being potentially biased towards the side that retains them (e.g., Edens et al., 2012; Murrie et al., 2013). Therefore, because experts should provide an objective and independent assessment of a given case, our guide might even protect them from parties attempting to bias experts for their own advantage.

## 4. Concluding remarks

Over the past years, there has been a surge of high-profile cases featuring alleged victims coming forward with sexual abuse allegations (see also Miller et al., 2022). For example, in 2018, Christine Blasey Ford stated that she was abused by the then Supreme Court Justice nominee Brett Kavanaugh. A major conundrum in these cases is the question of whether statements by alleged victims are valid or whether they might have been contaminated by all kinds of factors (e.g., passage of time, suggestive conversations with others, police interviews). To assess this question, expert witnesses are frequently asked to speak or report about the functioning of memory in such cases.

Although discussions about the role of psychological expert witnesses in court have been longstanding (e.g., McCary, 1956; Loftus, 1986; Schofield, 1956), such discussions have recently become especially pertinent because of expert witnesses playing a prominent role in high profile cases regarding the authenticity of claims of alleged abuse. For some of these cases, these discussions did not only enter the academic arena, but were also noticeable on other platforms such as social media (Cantlon, 2022). Because of these discussions, concerns have been raised about what expert witnesses can reliably say about memory in the courtroom.

The principal aim of the current article is to discuss whether research on memory is reliable enough to be used in the legal arena and provide a guide and recommendations on what expert witness testimony should include regarding questions concerning memory. At present, memory experts do not have any specific guidance concerning their expert witness testimony on memory. We argue that ideally, memory research should meet the conditions of replicability, generalizability, and practical relevance before it can be applied in legal cases. Using a fictitious case on therapy-induced false memories, we have shown that much of the research in this area is replicable, generalizable, and possesses practical relevance. This is important as it strongly suggests that expert witnesses can confidently use this body of research for their expert witness work. Although discussions have started concerning the extent to which the science on memory can contribute to specific legal cases (e.g., Riesthuis et al., 2021), we simultaneously noticed that these discussions are limited. For example, only in the area of false memory, the relevance of establishing smallest effect sizes of interest has been stressed and which is especially significant for applying memory science to legal cases. Discussions on topics such how generalizable studies on memory are towards legal cases, and what can exactly be inferred in these studies, is needed to make sure that the science on memory can meaningfully contribute to the courtroom.

To conclude, we have shown which conditions are vital for the science of memory to play an important role in the courtroom. We clearly demonstrate what expert witnesses should do when working on memory-related issues in the courtroom. This is important as legal-decision making should be based on science that is replicable, generalizable, and contains practical relevance. Considering the fact that the validity of memory-based testimony plays a major role in many criminal

(and commercial) trials, making sure that expert witnesses acknowledge the strengths and limits of their work can help in protecting the innocent and sentencing the guilty.

## Declaration of competing interest

The authors declare to have no conflicts of interest.

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