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Eyewitness Memory: A Plea for a Detailed Study of Social Influence at Encoding

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ABSTRACT: The evaluation of eyewitness memories has benefited greatly from basic memory research, which has shown that suggestive information or misinformation presented by a social source after an event can create substantial memory biases in participants' memory, or even completely fabricated false memories. However, possible social influence occurring already at the stage of encoding (during the event) has so far been widely neglected. In basic research, meanwhile, several studies address this issue specifically with regard to incidental encoding of information (non-intentional encoding "along the way", as it also occurs in eyewitness memories). The studies demonstrate that the social context at encoding influences how stimuli are encoded, and in one case even supports the occurrence of rich and detailed false memories. There are still many differences between the laboratory studies performed so far and any conceivable real-life scenarios of eyewitness situations. However, based on the results, it seems highly promising to evaluate the actual relevance of these initial findings for forensic science by modifying the paradigms to better reflect social encoding contexts that more closely resemble typical real-life eyewitness situations.

Keywords: Eyewitness memory; Social influence; Joint encoding; Shared attention

1. Introduction

The evaluation of eyewitness memories is important in the forensic context. In many trials, eyewitness testimony is the only evidence a judge can rely on to reconstruct the details of an event in the context of a crime. Therefore, basic research investigating the mechanisms of human memory is highly relevant to forensic applications. Indeed, psychological research performed mostly in the second half of the last century has demonstrated that human memory is highly susceptible to social influence [1]. In particular, psychological experiments showed that suggestive information or misinformation presented by a credible social source (mostly the researchers themselves or their confederates) can result in substantial memory biases in participants' memory. To take one of the most famous examples, Loftus & Palmer [2] reported that participants who had viewed a film of a car accident later judged the speed of the car higher when the researcher asked the question "About how fast were the cars going when they smashed into each other?" than when the same question contained the formulation "hit" instead of "smashed". In extreme cases of so-called "implanted memories", later research even showed that participants can be led by repeated suggestive interviewing to have their own memories of autobiographical events that actually never took place, including even memory for own criminal acts [3,4]. In the forensic context, the results of such research have led to

the value of eyewitness memories as forensic evidence being questioned [5]. This critical view of eyewitness memories is supported by analyses that reveal that more than 70% of convictions overturned by later DNA evidence involved eyewitness misidentifications, most made with high confidence [6].

Based on this evidence, the enormous value of results from basic research on social influence on memory for forensic applications is now widely acknowledged. However, the benefit of such research to forensic science may be even higher than it is currently recognized. This is because the focus of discussions has so far been strongly confined only to social effects that occur after encoding. In memory research, it is important to distinguish between encoding of information and later retrieval of information [7]. Applied to the forensic context of eyewitness memories, encoding refers to the observation of an event, possibly related to a crime, by an eyewitness, while relevant retrieval phases occur during subsequent police interviews and as eyewitness testimony during court hearings. Research on post-event (mis)information can inherently reveal only social effects that influence retrieval, not encoding. Meanwhile, however, another line of psychological memory research has developed within the last two decades that also addresses the role of social factors in memory encoding, specifically the role of shared attention during stimulus encoding on subsequent memory performance. In the following, I will first summarize the results of relevant existing studies and then discuss these findings, specifically drawing conclusions regarding their applicability to the forensic domain of eyewitness testimony. (I am considering only studies in which the information of interest was incidentally encoded, *i.e.*, without explicit instruction to encode that information, because such non-intentional encoding, as occurring in naturalistic observation, is characteristic of real-life cases of eyewitness memory. Research on active cooperation between people in intentional encoding of learning material, called "collaborative encoding" [8], will therefore not be considered). Although there are only relatively few and quite diverse relevant studies on this topic so far, the available findings do indicate that social factors can actually also influence memory encoding.

2. Overview of Existing Studies on Social Encoding Effects

Initial studies on the issue were not specifically interested in memory formation but, more generally, in the cognitive or behavioral consequences of shared attention [9–11]. Although using completely different tasks, these studies had in common that more than one participant was involved in task performance in all the experiments, creating a basic setting of shared attention. Relevant in the present context are those parts of these studies that include a measure of memory performance for the commonly perceived stimuli, so that the participants' previous common-task performance represents a phase of joint encoding. Shteynberg [9] performed a series of experiments on the phenomenon of "social tuning", showing that people allocate enhanced cognitive resources to stimuli they believe are being attended to simultaneously by a similar partner. Although the partners were physically separated (sitting at different computers in different rooms), social tuning was observed across experiments, and in one of the experiments (Exp. 2), it manifested as more accurate and faster recognition memory for words simultaneously observed by a similar partner. (Perceived similarity of the partner was introduced by the experimental manipulation of information on whether the partner had—allegedly—chosen the same or a different avatar at the beginning of the session. The effect did not occur for partners believed to have chosen a different avatar). In another approach, Richardson et al. [10] used images as stimuli (with each stimulus composed of one negative, one positive, and two neutral images), which were presented to two participants who were sitting at different screens in different corners of the same room. Although primarily interested in eye-gaze patterns, the authors also measured recognition memory in one of the experiments (Exp. 2). Like Shteynberg [9], they found faster recognition for commonly perceived stimuli particularly for the negative images (although nothing is known about perceived partner similarity here). Accuracy, however, was not affected in this case, possibly due to a ceiling effect (overall 85% correct recognition). Notably, both Shteynberg [9] and Richardson et al. [10] introduced control conditions showing that the effects of social context do not occur when participants were informed that

they were not seeing the same stimuli with the partner at the same time. Thus, simultaneousness of perception is critical for the social effects to occur.

In a study by He et al. [11], pairs of participants sat side by side at the same computer, looking at the same screen. Simultaneousness of perception was therefore self-evident and did not require any formal information by the experimenter. Each of the two participants was assigned one of three image categories that were used in the experiment (fruit, animals, music instruments). Each trial started with an image from one of the categories, followed by a visual research task involving that image. Participants were asked to perform the visual research task whenever a trial started with an image from their category. In addition to this stimulus-based social context, also a person-based social context was created. Specifically, three experimental groups were compared in this study (which was performed in the UK), one consisting of pairs of Caucasian strangers, one consisting of Caucasian friends, and one consisting of pairs of Chinese participants living in the UK. This factor was introduced as an indicator of similarity/ingroup perception, analogously to the avatar manipulation in Shteynberg's [9] study. Importantly, in the end of the experiment, each participant performed a final surprise memory test (free recall) for all stimuli that had been presented. Both stimulus-based and person-based social context affected this recall performance (without a statistical interaction between the two factors): Regarding the person-based social context, Caucasian friends recalled the words overall better than the other two groups, and regarding stimulus-based social context, stimuli from the partner-assigned category were better remembered than stimuli from the non-assigned category. (In addition, memory performance for the self-assigned category was better than for the two other stimulus categories, but this effect is not incidental because participants had to focus on these stimuli and had, in this case, even been explicitly instructed in the beginning to memorize these stimuli for the visual research task).

Eskenazi et al. [12] used a similar approach, but developed an experimental joint action design that focused on the effects of stimulus-based social context on memory encoding. Participants were always pairs of strangers, without consideration of possible differences in ethnicity (although probably in most cases constituting pairs of Caucasians). In contrast to He et al.'s [11] study, the critical stimuli were words rather than images, but they also belonged to three different semantic categories (here: animals, fruit/vegetables, household objects) that were, from each participant's perspective, assigned to oneself, to the partner, or to nobody. Participants did not have to memorize stimuli of their category for a subsequent visual search task (because there was no such task here), but—as a simple implementation of joint action—they were instructed to press an assigned button whenever a word from their own category appeared. In one session (joint condition), participants performed the task sitting next to the partner at the same computer, as in He et al. [11], in another session (with balanced order), they did the same task in the absence of the partner (control condition "alone", not implemented in He et al. [11]). Critically, each participant in the end performed an individual surprise free recall test for all the words that had been presented during the categorization task (regardless of word category). Results were consistent with the findings from He et al. [11] in that partner-assigned words were better remembered than non-assigned words, although both word categories had been equally irrelevant to the own task during previous word categorization. (Words from the self-assigned category were again better remembered than the other two word categories). In addition, only for words from the partner-assigned category, memory performance was better in the "joint" than in the "alone" encoding condition.

Wagner et al. [13] extended the same experimental design to scrutinize whether the effect was inherently social in nature. Theoretically, enhanced attention to and, in consequence, increased memory encoding of partner-assigned compared with non-assigned stimuli could simply result from additional perceptual cues only associated with partner-assigned stimuli. This is because participants worked at the same computer keyboard during joint encoding. Under these conditions, each participant can visually and auditorily perceive the partner's key presses that occur in response to words from the partner's category, which is not the case for non-assigned words (and likewise not for partner-assigned words in the "alone" control

condition). However, Wagner et al.'s [13] results excluded this possible non-social theoretical explanation. In one of the experimental groups, the two partners performed the joint task within the same room, but at separate computers and keyboards, and were prevented from seeing and hearing each other by visual partitions installed between the computers and by soundproof headphones that each of them wore during task performance. The effect was still present under these conditions of physical and perceptual separation, although it was attenuated in comparison with a group with participants working side by side at the same computer (without headphones), as in Eskenazi et al.'s [12] original experiment. Thus, perceptual cues generated by the partner alone cannot explain the effect. However, psychologically perceived closeness between partners (in this case, varied through actual physical closeness) seems to play a role in determining the extent of the effect, because the effect was attenuated with partners who were physically separated. This role of the degree of psychological distance was further supported by the fact that in a third condition, with even further enhanced distance (participants performing the joint task at different computers not within the same room, but even in different rooms), it was additionally attenuated and did not reach statistical significance anymore. This fits with Shteynberg's [9] finding that social memory enhancement depended on perceived similarity between partners, which represents another way of inducing a feeling of reduced psychological distance [14].

Further extending this research, Wagner et al. [15] investigated whether joint encoding could also support the occurrence of *false* memories under certain conditions. Remarkably, this was actually the case. In their study, Wagner et al. [15] combined the joint encoding paradigm from Eskenazi et al. [12] with the so-called Deese-Roediger-McDermott (DRM) paradigm [16,17], in which false memories are typically generated through semantic association. Specifically, participants in the DRM paradigm are presented with lists of words, where each list consisted of words that were semantically related to a specific target word, while this target word itself (the "critical lure") is not presented, e.g., the list "night", "dark", "coal", *etc*. for the non-presented target word "black". In a later memory test, many participants typically falsely remember that the target word has been presented. According to the joint encoding paradigm from Eskenazi et al. [12], Wagner et al. [15] created three categories of such lists, so that each participant was faced with lists assigned to oneself, to the partner, or to nobody. Critically, the rate of false memories for non-presented target words was enhanced for partner-assigned lists in comparison to non-assigned lists. Notably, this effect was still observable even when only particularly vivid and rich memory experiences were considered in the analyses.

3. Discussion and Tentative Outline of a Research Agenda with Regard to Forensic Science

Although the number of studies on incidental joint encoding effects is still limited, the available findings show that the social context at encoding influences how stimuli are encoded. On the whole, the results allow the conclusion that humans, as "hypersocial" animals [18], seem to devote attention not only to stimuli that are directly relevant to themselves but also to those relevant to a partner in joint encoding situations, with the effect that this socially determined relevance has some impact on which details of the event can later be remembered (at least if the partner is perceived as psychologically close to oneself; see Smith & Mackie [19], for a detailed theoretical model). This general conclusion is already important with respect to forensic science, because there are often several eyewitnesses observing a critical event together at the same time. In addition, the laboratory findings reported above are also relevant because the experimental designs do not include communication or active interaction between the involved partners, which is representative of many real-life eyewitness situations, where communication between eyewitnesses, if occurring at all, typically begins only after a critical event (e.g., a car accident) has already happened. Importantly, the results from Wagner et al. [15] further show that—despite the lack of communication or active interaction—the effects do not have to be necessarily very subtle. The social encoding situation in that study was sufficient to support the occurrence of even rich and detailed false memories, *i.e.*, memories that are not only

actually incorrect but at the same time likely to be judged as more reliable than memories described as vague or blurry.

Nevertheless, there are still many differences between the laboratory studies performed so far and any conceivable real-life scenarios of eyewitness situations (not least due to the particularities of the experimental settings, task stimuli, and task instructions in these studies). Thus, the evaluation of the actual relevance of these initial findings for forensic science must await further investigation, ideally in a systematic research program. In a first step, the ecological validity of the joint encoding effects that have already been established as described should be directly verified in more realistic settings. For example, in typical real security check situations for entrance admission, male safety guards are instructed to screen male persons, while female safety guards are instructed to screen female persons (being aware of each others' task focus). Thus, when a male and a female guard work together, each will draw the attention of persons in their assigned category to select them, even before any actual physical security procedure takes place. It should be tested if this constellation has effects on the security guards' memory performance when they are later individually asked for details related to the persons they encountered, depending on the perceived category to which the persons belong. Any other example of task sharing with specializations in the individual attentional focus due to pre-defined task assignments (which probably occurs mostly in occupational contexts) would fit here as well to perform such initial investigations. As in basic research, the role of perceived psychological closeness between the actors should be considered as a possible determinant of memory effects in these applied studies.

However, apart from methodological problems associated with such studies, it is also worth noting that situations with pre-defined task assignments for involved persons are not prototypical of most real-world eyewitness scenarios. Therefore, a second important step in a possible future research agenda would be to extend the existing paradigms from basic research in order to test social encoding effects that are less restricted by specific circumstances of task instructions and stimulus selection, but instead focus on consequences of the naturally occurring (not explicitly instructed) flow of socially guided attention on how details of perceived events are encoded. For this purpose, it would be useful to conduct studies with staged criminal events ("mock crimes") [20] to systematically investigate how the social relatedness among members of a group of observers influences subsequent individual memories of the event's details in the individual observers. As a possible starting point, a simple, realistic scenario, such as a short pickpocket event, could be presented to single observers *vs*. pairs of observers who are friends or strangers to each other, with subsequent memory tests (free recall, cued recall, recognition memory) for different central and peripheral details of the scene. Subsequently, more complex designs could be developed to address further research questions. One particularly relevant issue in the forensic domain would be the role of emotionality of the event because eyewitnesses typically become emotionally aroused when open violence is present in observed real-life scenes. While the effects of emotion and stress on eyewitnesses' memory *per se* have already been extensively studied in forensic science with respect to individual eyewitnesses [21–23], little is known so far about how such effects are affected by the social context during encoding. Another important research question refers to the role of group size, because there are frequently more than two eyewitnesses in real-life situations. Within the forensic literature, this issue has already been addressed in the context of post-event co-witness effects (memory biases resulting from communication between different witnesses after the observation of an event [24]), but not for effects at encoding. Furthermore, in an extended research agenda, not only the role of positive (close) but also negative (antagonistic) social connections should be investigated, not only regarding the relationship between eyewitnesses but also between eyewitnesses and persons in the observed scene (given that victims of a crime are often at the same time eyewitnesses). Methodologically, it might also be useful to go beyond direct memory measures by including also indirect measures with possible diagnostic value, such as confidence ratings and response latency.

If forensically relevant social encoding effects can be confirmed, many additional research questions are conceivable, for example: Apart from psychological closeness, do other moderators such as individual differences play a role as well, as is the case with susceptibility to post-event misinformation [1,25], e.g., individual differences in personality traits, age, or cognitive abilities? Are there methods to overcome possible social encoding biases in the later retrieval phase during interviewing, e.g., by applying certain techniques of cognitive interviewing [26]? There is barely a limit to the potential questions of interest that can be imagined. Hence, the suggestions I have presented here should be regarded only as a rough and preliminary sketch for a possible research program in forensic science. In the course of implementing such a research program (or with additional future findings from basic research), other ideas for the most relevant next research questions and methods might emerge. What I am principally arguing in this paper is that there is already enough empirical evidence from basic research to conclude that memory encoding can be critically affected by the specific social context in which it takes place. It would therefore be worthwhile to scrutinize the extent of useful applicability of these findings in the forensic domain. Just as research on the shaping of memory retrieval by social influence exerted through post-event interventions has had a very beneficial impact on the evaluation of eyewitness evidence, a detailed and systematic research program on social influence at encoding could turn out to be highly fruitful for applications in the forensic domain as well.

Ethics Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Not applicable.

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Declaration of Competing Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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