

Is your memory better than mine? Investigating the mechanisms and determinants of the memory conformity effect using a modified MORI technique

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All relevant data will be in the paper and its Supporting Information files.

Summary

The paper presents the memory conformity effect phenomenon, which assumes that information about the same event that a witness acquires from another witness (misinformation) is incorporated into the first witness' memory of the event (original information). The study has two goals: (1) to verify the existence of people with the memory conformity effect who are aware of discrepancy between original information and misinformation; (2) to determine why they choose misinformation despite the correctness of their own memories. In addition, we examine the relationship between susceptibility to social influence, compliance, suggestibility and memory conformity. Importantly, these relationships will be analyzed in interaction with awareness of discrepancy, which has not yet been examined in previous studies. More precisely, we will apply a new research approach to further investigate the causes of memory conformity. To this end, we will specifically analyze participants' awareness of discrepancies between the details of an observed event and the misinformation presented by another witness. In order to examine the memory conformity effect, we will use the MORI technique, which ensures high ecological validity. The two members of each pair of participants will sit next to each other and each will not be aware that the other watched a different version of the same event. Then, the participants will answer related questions and discuss the contradictory details. Subsequently, the subjects will complete an individual recognition test. Importantly, after the main part of the

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study (i.e., the MORI procedure), participants will be explicitly informed about the different versions of the event and they will be asked to complete awareness of discrepancy questionnaires. This will allow us to further examine the driving forces underlying the memory conformity effect. We expect the study's results to expand the knowledge on the mechanisms and determinants of the strength of the memory conformity effect and to contribute to the development of effective techniques that reduce the effect of this phenomenon.

Keywords:

memory conformity, co-witness suggestibility effect, eyewitness memory, memory awareness

1. Introduction

Unreliable testimony remains the leading cause of erroneous verdicts (Smith & Cutler, 2013). Many studies have shown that even witnesses who are convinced of the accuracy of their memories provide inaccurate information to law enforcement agencies (e.g. Lavis & Brewer, 2017; McCallum, Brewer & Weber, 2019; Wells & Olson, 2003). One of the many possible sources of erroneous testimony is the memory conformity effect (for a review, see Wells & Loftus, 2003), which occurs when a person witnesses a criminal event and then talks about it with another witness, thus affecting the memory account of the second witness (Wright, Self & Justice, 2000). For instance, a witness saw that a thief's coat was green but then heard from a co-witness that it was brown and subsequently testified according to the latter. A well-known example of the memory conformity effect was the murder of Swedish minister Anna Lindh in 2003 (Skagerberg & Wright, 2008). The witnesses were placed in one room, where they talked to each other about this incident. As a result, all gave a similar description of the perpetrator, although, as it turned out later, the real murderer did not match their descriptions. It has been reported that over 86% of people who witness a crime discuss the incident with other witnesses (Paterson & Kemp, 2006). In the context of memory conformity, this means that the incorrect information (misinformation) provided by another person makes a witness' testimony irrelevant (e.g. Garry, French, Kinzett, & Mori, 2008; Ito *et al.*, 2019; Monds, Howard, Paterson, & Kemp, 2019) and thus may contribute to a wrongful conviction or acquittal (Garrett, 2015).

The memory conformity effect can significantly distort an eyewitness' memory, therefore intensive research on this phenomenon is currently being conducted. In a typical experiment on memory conformity (e.g. Garry *et al.*, 2008; Ito *et al.*, 2019; Wright *et al.*, 2000), a pair of participants get acquainted with original material, which is usually a movie or series of slides depicting a criminal event. For each participant, the material differs in some details.

Subsequently, subjects discuss the event and thus provide each other with incorrect information regarding dissimilar details. Finally, each participant completes an individual recognition test concerning the original material. It was observed that the participants more often correctly answered questions about details that were not discussed with their interlocutor than questions regarding the discussed details. However, no research has yet verified the reasons for yielding to misinformation after the disclosure that each person saw a different event. This could give us a better understanding of the driving forces behind the memory conformity.

In general, studies on this phenomenon focus on three areas. In the first area of studies, the focus is on studying the mechanisms that lead to vulnerability/susceptibility to erroneous information provided by another witness. We will discuss this area in detail below. The second involves searching for the determinants of memory conformity. Among them, determinants such as gender (Eck & Thoftne, 2008; Hirokawa, Matsuno, Mori, & Ukita, 2006), age (e.g. Gabbert, Memon, Allan, & Wright, 2004), social anxiety (e.g. Wright, Memon, Skagerberg, & Gabbert, 2009), self-esteem (Tainaka, Miyoshi, & Mori, 2014), the number of co-witnesses (Mori & Mori, 2008), the relative credibility of co-witness pairs (French, Garry, & Mori, 2011) or various personal relationships between co-witnesses (French, , Garry, & Mori, 2008; Mori & Kitabayashi, 2009) are distinguished. Finally, the last line of research examines the methods of reducing and preventing memory conformity. This area of research is relatively new and therefore is still not yet well explored. For instance, the studies conducted so far have focused on warning against misinformation (Bodner, Musch, & Azad, 2009; Meade & Roediger, 2002) and cognitive interviews (Ginet, Chakroun, Colomb, & Verkamp, 2019).

There may be several possible mechanisms which can account for memory conformity. The explanations are not mutually exclusive; therefore, the proposed effects may operate

simultaneously. For instance, Wright *et al.* (2009) discussed three types of processes that may cause memory conformity: 1) *normative impact*, 2) *informational influence*, and 3) *false memories*. Normative impact results from the need for social acceptance and manifests itself in one person yielding to another due to social norms. Compliance with norms allows social rejection to be avoided, which is a motivation for external conformity, i.e. becoming similar to others despite undisclosed differences of opinion (Asch, 1956). In the case of normative impact, memory conformity occurs when the subject correctly remembers the original material but intentionally provides incorrect information in order to avoid conflict with the interlocutor (Oeberst & Seidemann, 2014). Therefore, this kind of impact occurs in the presence of others. Next, informational influence describes a situation in which an individual correctly remembers the original material but accepts information provided by others in order to be right (Wright, London, & Waechter, 2010). As a result, the witness provides the incorrect information obtained from the interlocutor only because they are convinced that this person is a source of more accurate information (Deutsch & Gerard, 1955; Sherif, 1936). Finally, while in the previous two types of processes the witness does actually correctly remember the event but for the reasons described above decides to change their memory reports, false memories involve actual changes and errors in memory per se. More precisely, the information obtained during a discussion changes the memory of the event; thus, an individual honestly believes what was heard from the interlocutor. False memories are therefore associated with assigning correct information to the wrong source or reporting incorrect information (Oeberst & Seidemann, 2014).

The classification proposed by Wright *et al.* (2009) categorizes the possible causes of memory conformity well; however, it overlooks an important aspect of memory conformity, namely analysis of the exact memory content that witnesses have at the time of giving their report about the observed event. More precisely, first of all, normative influence may arise as

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part of a discussion between witnesses, during which they may not reveal their own private opinions only in order to avoid conflict with the interlocutor. However, they still may have a correct and valid memory. Nevertheless, at the time of giving the final memory report, which as described earlier is a measure of memory conformity, there is no longer any normative impact because witnesses are almost always interviewed individually. Thus, when studying the possible mechanisms of memory conformity, the key issue is to examine not only the given answer but also the exact memory content of the person who is giving testimony. In this way, one can be sure that there are no discrepancies between the given memory report (i.e. what was said during the memory interview) and how a memory is remembered by a given person. Secondly, when examining informational influence, one must be sure that the witness correctly remembers both the content of the criminal event and what another witness actually said about this event. In this case, memory conformity may occur when a witness decides to testify in accordance with misinformation from a co-witness, in which case we should inquire about the plausible reasons why the witness complied with the misinformation. For instance, one of the key hypothesis in the present project assumes that memory conformity occurs due to a lack of confidence in one's own memory. Finally, when false memories are considered, one should also check and evaluate whether the misinformation changed the memory of the event or whether the witness did actually remember some detail from the event. Hence, in the present paper we propose a slightly different classification of memory conformity mechanisms which include and highlight the aforementioned aspects: memory-related and non-memory-related. Next, we briefly characterize this newly introduced categorization of plausible memory conformity mechanisms.

Memory-related mechanisms are based on the assumption that the original memory has been altered, distorted, or otherwise damaged as a result of the misinformation provided by the partner. Consequently, at the time of providing the memory report concerning the event,

the witness does not have an error-free and full memory record from which to give correct answers. Memory-related mechanisms include source-monitoring errors, understood as disturbances in the proper functioning of memory (e.g. Johnson, Hashtroudi, & Lindsay, 1993). This group also includes mechanisms that fill gaps in memory (i.e., when there is no contradictory memory to be overwritten simply because one does not remember an event at all, one treats the misinformation as truth and fills the gap in a missing memory; Zaragoza & McCloskey, 1985). Concerning the former, source-monitoring errors are based on misattribution of the information source. Concerning the latter, a memory gap may arise from not noticing a particular detail or forgetting a detail that was noticed. Both cases are a sign of inadequate memory functioning (Williamson Weber, & Robertson, 2013). On the other hand, non-memory mechanisms are engaged when evidence is given and a witness correctly remembers the event as well as the misinformation but for various reasons responds according to the latter. If the witness has the correct memory of a given detail from the event (which we call original information) and has also heard conflicting misinformation (e.g. correctly remembers that the car that caused the accident was maroon but also remembers that another witness said it was black), s/he is most likely aware of the discrepancy between these two pieces of information. Although there are no studies in this respect in the context of the memory conformity phenomenon, such a situation has been already analyzed in relation to similar memory-distortion phenomena, namely the misinformation effect (seminal research: Loftus, Miller, & Burns, 1978). This phenomenon is defined as witnesses' inclusion in testimonies of information that is inconsistent with the course of the event and that comes from sources other than the event. Importantly, the memory conformity effect may be considered a form of misinformation effect in which the misinformation is introduced in a social way (Williamson et al., 2013). Previous studies on the misinformation effect demonstrated that people may indeed be fully aware of discrepancy between original

information (i.e., what they actually remember) and the misinformation provided to them (Blank, 1998; Polczyk, 2007, 2017). Moreover, it has been shown that people aware of discrepancies may respond in different ways in the individual recognition test. Those who answer correctly, i.e., in accordance with the original information, are called “misinformation aware, resistant”, while people who respond in accordance with misinformation are “misinformation aware, compliant” (Polczyk, 2007, 2017). Thus, it turns out that the same state of memory may result in different testimonies.

Therefore, in the present study we argue that when studying eyewitness testimony, one should also take into account the reasons why a given individual still answers in accordance with misinformation even though they (1) have a correct memory of the original material; (2) have an equally correct memory of the misinformation, and, importantly; (3) are aware of discrepancies. In previous studies on the misinformation effect (Blank, 1998; Polczyk, 2017), after establishing that a person is aware of a discrepancy but chose the misinformation, the researchers asked witnesses why they behaved in such way. Among many other reasons, their lack of trust in their own memory was predominant, therefore this may be considered an important determinant of memory conformity.

Furthermore, as we have already mentioned, in addition to research that focuses on the mechanisms, one area of research on memory conformity concerns analysis of the determinants and predictors of the extent to which this effect may occur. More precisely, these studies concern the variables that may influence susceptibility to misinformation from another person. Since this line of research seems to be underrepresented, sparse and inconsistent (cf. Skagerberg, 2008), there is a need for more studies that are directly related to the possible determinants of this phenomenon. For instance, in the experiment conducted by Eck and Thoftne (2008), men significantly more often than women reported details that were suggested to them by their interlocutors. In other studies (Butts, Mixon, Mulekar, &

Bringmann, 1995; Schwarz, 2013), no gender differences in susceptibility to misinformation were found. The results of research on the relationship between age and yielding to memory conformity are also not consistent. For example, a study by Gabbert, Memon, & Allan (2003) showed no significant differences in accepting disinformation between younger (18–30 years) and older (60–80 years) adults. However, different results were obtained in a subsequent experiment (Gabbert et al., 2004) in which younger adults (17–33 years old) reported incorrect information suggested by the interlocutor significantly more often than older adults (58–80 years old). However, an unequivocally positive relationship between the level of social anxiety and susceptibility to memory conformity was demonstrated (Wright *et al.*, 2009; Wright *et al.*, 2010). Additionally, a positive correlation was found between yielding to the suggestions contained in the interrogator's questions and susceptibility to memory conformity (Thorley, 2013). Research on self-esteem in the context of the memory conformity effect has shown that people characterized by low self-esteem have a greater tendency to accept erroneous information provided by a partner than people characterized by high self-esteem (Tainaka, et al., 2014). However, the study conducted by Beekman (2018) did not show such a relationship.

In the present study, we argue that the inconsistencies between these previous pieces of research most likely result from failure to take into account the fact that behavioral acceptance of misinformation may occur for various reasons. In particular, correlates of yielding to misinformation due to memory distortions may differ from the correlates observed when the memory of an event is correct but the person still answers in accordance with the misinformation (Polczyk, 2007). As can be seen from the ongoing discussion, much more work is still needed to further examine the exact possible mechanisms of memory conformity while other factors (e.g. memory, non-memory) are strictly controlled.

1.1. The present study

In summary, previous research shows that the memory conformity effect poses a potential threat to the accuracy of witnesses' testimony. For this reason, research is needed to thoroughly analyze the mechanisms of this phenomenon. In our study we want to (1) investigate people with the memory conformity effect who are aware of the discrepancy between the original information and the misinformation; (2) identify why they chose the misinformation despite the correctness of their own memories. In addition, (3) in interaction with awareness of discrepancy, we will examine the relationship between susceptibility to social influence, compliance, suggestibility, and memory conformity.

Regarding the first objective, we plan to determine if there are people with the memory conformity effect who are aware of the discrepancy between the original information and the erroneous information provided by the interlocutor. In order to verify this, we will use a research method that for each participant and for each critical detail will identify whether the subject remembered the original material and what the interlocutor said about the detail. This method is based on techniques used in research on the misinformation effect (Blank, 1998; Polczyk, 2007, 2017) that have been adapted for the first time to the specific requirements of the memory conformity paradigm. Generally, the procedure adds a fourth step to the three stages typically used in memory conformity research (presentation of original material, introduction of misinformation, individual recognition test). In the fourth stage, which is a type of post-procedure interview that takes place after the memory conformity testing procedure, the subjects are thoroughly informed about the possibility of discrepancies between what was presented to them in the first and second stages. In our study, we will tell them that each person saw a different movie clip. Then, the participants will be given a test containing the same questions as in the individual recognition test, although this time they will be asked to indicate what in the question was included in the original material and what the interlocutor said. Thus, this method makes it possible to verify the subject's memory. If a

participant has the correct memory of the original information and the misinformation but in the recognition test they choose the latter, the subject will be classified as an “aware, compliant” person.

Second, our additional goal is to determine why people answer in accordance with the misinformation even though they (1) have a correct memory of the original material, (2) have an equally correct memory of the misinformation, and (3) are aware of discrepancies. Based on research conducted in the misinformation effect paradigm, it can be hypothesized that the main reason for being misinformed despite being aware of a discrepancy is distrust of one’s own memory. At the same time, we suspect that awareness of a discrepancy between the original information and the misinformation will reduce the memory conformity effect because at least some participants will trust their own memory and provide the original information. These participants will be called “aware, resistant”. On the other hand, in our research we expect that the main reason for succumbing to misinformation among participants unaware of discrepancies is lack of memory concerning the original information.

Finally, our study also applies a new research approach to the predictors of memory conformity. We plan to investigate the relationship between susceptibility to social influence, compliance, suggestibility and memory conformity in interaction with awareness of discrepancies between original information and misinformation. To this end, we formulated a hypothesis that the variables mentioned above will show a positive relationship with susceptibility to the memory conformity effect caused by non-memory mechanisms. This is because we expect that people who are unsure of their memory (compared to those who are more confident about their memory) will especially rely more on information obtained from other people due to their high level of susceptibility to social influence, compliance and suggestibility. Given the fact that memory conformity is based on normative and informative

influences, it is surprising that no previous studies have actually studied them. The present study aims to bridge this gap.

To fulfil these research goals, in the present study we utilized an innovative method, i.e. the MORI technique (*Manipulation of Overlapping Rivalrous Images technique*; Mori, 2003, 2007), which is used to study the memory conformity phenomenon. The MORI technique enables simultaneous projection of two versions of a film (in this case, a criminal event) on one screen. Briefly, a pair of participants put on special polarizing glasses, thanks to which each watches a different version of the movie. The course of events in both versions is identical except for a few details, e.g. a criminal wears a red vs. a black cap. The simultaneous projection of two versions on one screen is possible due to two video projectors: one of them transmits light waves in the vertical plane, while the other transmits in the horizontal plane, therefore the images are polarized. Polarizing glasses, which look like sunglasses, block one of the two possible versions of the movie. As a result, subjects who are sitting side by side and looking at the same screen are not aware that they are watching a different version of the same event. In the next step, half of the dissimilar details are discussed by the participants, while the other half are not discussed. During the discussion, the subjects introduce mutual misinformation. Finally, the participants complete an individual recognition test to compare the correctness of their answers to the questions about the discussed details (misinformation) against the correctness of their answers the questions about the non-discussed details.

The MORI technique is often applied in research into memory conformity (e.g. French et al., 2008, 2011; Garry et al., 2008; Hirokawa et al., 2006; Ito et al., 2019; Mori & Kitabayashi, 2009; Mori & Mori, 2008; Mori & Takahashi, 2012; Tainaka, et al., 2014) because, unlike other experimental procedures, it significantly reduces the risk that subjects will suspect manipulation, especially when they disagree on some details. Furthermore, the MORI technique brings laboratory conditions closer to real-life situations in which witnesses

talk about a crime and are then individually interviewed by the police. Moreover, a set of standardized materials allows other researchers to replicate the same experimental conditions at other research centers.

In summary, in the present study we test the following hypotheses: (1) there will be an effect of memory conformity; (2) there will be participants who give answers consistent with misinformation in spite of being aware of the discrepancies between the original and postevent materials; (3) the main reason for being misinformed despite being aware of a discrepancy is distrust of their own memory; (4) awareness of a discrepancy between the original information and the misinformation reduces the memory conformity effect; (5) memory conformity is associated with susceptibility to compliance, suggestibility, and social influence, and these relationships are moderated by awareness of discrepancies in such a way that they are statistically significant among people who are aware of discrepancies, and they are insignificant among people who are unaware of discrepancies; (6) the main reason for succumbing to misinformation among participants unaware of discrepancies is lack of memory concerning the original information.

2. Method

2.1 Power and sample size analysis

The required sample sizes for the main analyses were determined by means of G*Power software (Faul, Erdfelder, Lang, & Buchner, 2007). All sample size analyses were performed assuming a desired power of 80%. As elaborated below (Section 3.1), repeated-measures ANOVA, chi-square test, and moderation analysis will be used to analyze the core hypotheses.

As for the ANOVA that replicates the main memory conformity effect, the calculation of the required sample size may be based on existing results (Ito *et al.*, 2019). In research conducted by Ito *et al.*, (2019), the same procedure on a Polish sample was used as that

planned in the proposed study. Ito et al. (2019) obtained Hedges $g = 1.92$. This amounts to Cohen f of about 0.95; even assuming a low correlation between measures ($r = 0.1$), the required sample size equals 7 participants.

As for the chi-square test used for the 2×2 contingency tables, the required sample sizes for 80% power for small, medium, and large effect sizes (ϕ : 0.1, 0.3, 0.5, respectively) is 785, 88, and 32, respectively.

To determine the sample size necessary to detect a moderation effect, as the basis for calculations we used the R^2 increase due to the interaction term (i.e., the product of the predictor and the moderator). For small, medium, and large increases (expressed as f^2 of 0.02, 0.15, and 0.35, respectively), the required sample sizes are 385, 55, and 25, respectively.

On the basis of these considerations and the available resources, a sample size of 160 participants was assumed. This allows excellent power with which to detect the main memory conformity effect, and good power with which to detect medium-sized effects for the remaining analyses.

2.2 Participants

The sample size will be set at 160 people (80 pairs): 50% women and 50% men. The subjects enrolled in the study will be 18–35 years old; they will be invited to participate via advertisements in the media and the internet.

2.3 Materials

23.1 Manipulation of Overlapping Rivalrous Images (MORI)

The procedure for testing memory conformity will be based on the experiment presented by Garry et al. (2008), which was the first study outside Japan to replicate the memory conformity effect using the MORI technique. We will follow this procedure, and any modifications will be discussed in detail.

As in the study by Garry *et al.* (2008), the subjects will watch a silent film of duration 6 minutes and 34 seconds. It shows an electrician (“Eric”) who is repairing various household appliances whilst stealing a few other items. The two versions of this movie were created by Takarangi, Parker and Garry (2006); they are identical except for eight critical details (see Table 1): e.g., in the first version, Eric is trying on a black hat, but in the second version it is red. All materials used in the MORI technique are available on the OSF website¹. It should also be emphasized that the set of materials applied in the MORI technique has been successfully translated into Polish (Ito *et al.*, 2019).

The movie will be projected onto the back of a translucent projection screen. The screen measures 45 x 60 cm and is made of 5-mm-thick glass. The film will be projected using two LED projectors (TAXAN, KG-PL021X) mounted in such a way that the two images will overlap on the screen. The size of the images will be approximately 30 x 40 cm on the screen, which will be located approximately 170 cm from the subjects. Polarizing filters will be mounted in front of the lens of each projector: one will be oriented vertically and the other horizontally. In addition, each subject will receive polarizing glasses that will block one of the two possible versions of the film.

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Table 1. Types of critical details included in the movie.
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2.3.2 Awareness of discrepancies

First, the test which monitors the type and content of the source will be used in order to identify subjects who remember the content of both the original information and the misinformation and are thus aware of the discrepancies (Polczyk, 2007). The tool will contain

¹ Photos and movies of the experimental procedure are available at:
https://osf.io/ax7u3/?view_only=7845a72ad4534628b629ffbc939e001b

the questions from the final part of the individual recognition test, with the difference that under each question there will be two statements: “it was in the film” or “the interlocutor talked about it”. The subject will have to choose “yes”, “no”, or “I do not remember” for each of the statements. Moreover, next to each statement there will be a space in which the subject will enter their answer/opinion (whose source is the film and/or the interlocutor); this space can also be left blank.

Next, the discrepancy-processing test (Blank, 1998) will be used to study why participants submit to misinformation. The aim of this tool will be to gain information about the cognitive processes of participants who are trying to cope with perceived discrepancies between the original information and the misinformation. The participants will state what they thought were the reasons for the discrepancies and why they answered in a given way. This procedure is based on the ideas by Blank (1998).

2.3.3 Individual differences questionnaires

The Measure of Susceptibility to Social Influence (MSSI; Bobier, 2002; Polish adaptation: Polczyk, 2007) consists of 34 statements that evaluate the tendency to succumb to social influence. The tool consists of three dimensions: Autonomy, Social Adaptation and Social Resistance. The answer to each question is ranked on a scale of 1–5: 1 = I completely disagree; 5 = I completely agree. For the Polish adaptation, the values of Cronbach’s alpha for the three dimensions are 0.80, 0.82 and 0.67, respectively (Polczyk, 2017).

The Gudjonsson Compliance Scale (GCS; Gudjonsson, 1997; Polish adaptation: Wilk, 2004) is a self-report tool used to measure submissiveness, which is understood as behavior consistent with expectations when a person privately disagrees with the rightness of this expectation. The scale takes into account two components of submissiveness: the desire to please others and the tendency to avoid conflict and confrontation. The scale contains 20

statements to which the subject answers “yes” or “no”. The reliability of the Polish version of this tool is 0.80 (Polczyk, 2017).

The Inventory of Suggestibility (IS; González-Ordi and Miguel-Tobal, 1999; Polish adaptation: Pasek, unpublished) is a tool used to measure four aspects of suggestibility: the tendency to experience absorption of attention, submissiveness, emotional involvement and concentration. The inventory contains 22 questions answered on a scale from 0 = “almost never” to 4 = “almost always”. The reliability of each of the dimensions in the Polish research is 0.76, 0.78, 0.53 and 0.51, respectively (Polczyk, 2017).

2.4. Procedure

We present an overview of the procedure in Figure 1. In general, while it consists of several phases, they form two main study parts: (1) the MORI technique (consisting of phases 1–5), (2) Post-Mori part verifying awareness of discrepancy (consisting of phases 6–8).

As to the MORI technique, we will use the following instructions, which were taken from Garry *et al.* (2008, p. 433):

“We are interested in people’s sensory impressions at different levels of visual acuity. Visual acuity basically means how well you can see. So, for example, right now you all should have 100% visual acuity, either because your eyes work properly or because you have corrective glasses on. We want to know what happens to people’s sensory impressions when their visual acuity is degraded by different amounts. Today, you will both be in the 95% visual acuity condition. I will give you each a pair of 95% acuity glasses, which will degrade your vision slightly. If you already wear glasses, the acuity glasses should fit over the top”.

Then, participants will be given the polarized glasses, after which they will be told:

“I am going to show you a short movie of a tradesman called Eric working in a house. Please make sure you watch the movie through the glasses (no peeking over the top or around the side) and keep them on until I ask you to remove them. We find that people often see best

when they keep their head straight rather than tilted". (Garry *et al.*, 2008, p. 434; the instruction was translated into Polish by a native speaker).

The procedure will consist of eight phases. In phase 1, the subjects will watch the film. The recording will be identical for both persons in the pair, except for eight critical details, half of which will be discussed in phase 3. Then, the participants will work on a filler logic puzzle for 15 minutes. In phase 3, the subjects will complete the collaborative recognition test; this will consist of 12 questions, four of which will involve the critical details, and the remaining eight will be control questions. Each question and its five alternative answers will be displayed in a PowerPoint presentation for 60 seconds, during which the subjects will discuss the answers. If the participants disagree with each other, both responses will be documented. Importantly, the discussion audio will be recorded. Immediately after that, the subjects will be asked to complete the MSSI. This phase will last about 10–15 minutes.

In phase 5, the subjects will complete the individual recognition test containing questions about the content of the film; unlike in the study by Garry *et al.* (2008) and all previous studies, these questions will be open-ended, thus allowing reconstruction of not only recognition of memories. Moreover, these open-ended questions will give participants the opportunity to answer, "I don't know" or "I don't remember". The test will consist of 20 questions, eight of which will cover all the critical details contained in the film, regardless of whether they were subsequently discussed. Additionally, for each question the participants will have to rate the subjective certainty of their answer on a scale from 0% (complete uncertainty, guessing) to 100% (absolute certainty). This step completes the MORI technique that is followed by the second post-MORI part verifying the awareness of discrepancy. More precisely, in the six step, participants will complete the test which monitors the type and content of the source. This will be preceded by the following instruction:

“Some information you heard from each other during the discussion was not consistent with the content of the movie. This happened because the glasses you used during this study did not reduce your visual acuity but made you watch a slightly different version of the movie. In a moment, you will receive the same questions that you have already answered, but this time your task is to indicate whether, in your opinion, the information (1) was included in the film, (2) came from the interlocutor, (3) was contained in the film and came from the interlocutor, or (4) was neither included in the film nor came from the interlocutor”.

All four possible variants will be discussed in the examples. Moreover, it will be explained to the participants that if, in their opinion, the information was contained in the film, they should enter it in the film part of the questionnaire; if it came from the interlocutor, they should put the answer in the appropriate place. In the last (eighth) phase, the subjects will complete the GCS and IS for approximately 15–20 minutes.

Finally, the participants will be asked what they suspect the real purpose of the study is. If any of the participants correctly guess our hypotheses, they will be excluded from the analysis and replaced by another person in order to maintain the correct sample size. Finally, the participants will be debriefed. The duration of one experimental session will be approximately 70–80 minutes.

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Figure 1. An overview of the procedure. Please note, the MORI technique consists of Phases 1–5; verifying awareness of discrepancy consists of phases 6–8.

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3. Results

3.1 Analysis plan

The present study tests several hypotheses, which we describe in more detail below.

Hypothesis 1. There will be an effect of memory conformity.

Similar to Kękuś et al. (2020, p. 1203), we will inspect the memory conformity effect using the procedure of Garry et al. (2008, also, Ito et al., 2019). Analogously to Garry et al., we will examine the final test accuracy scores for the critical details with the use of analysis of variance (ANOVA). We will also observe the average final test accuracy on the filler, non-discussed, and discussed questions. More precisely speaking, while scoring the final test accuracy on the critical discussed questions, we will categorize participants' answers into "disputed" and "non-disputed" groups. For example, when one participant during the discussion phase reports a detail they saw in the movie and the second participant does not question it, we will mark this answer as "non-disputed". If each member of a pair gives an answer consistent with what they saw in their own version of the movie, the answer will be marked as "disputed". There is a difference between these two types of answers. Namely, in the first situation only one member of the pair answers a question, while the other person says nothing. In the second situation, both participants answer a question according to what they saw in the movie. This is why one member of some pairs will not be exposed to any details received by the co-witness during the collaboration phase (e.g., since the person might report the details they witnessed, and their co-witness may go along with these answers without discussing them). Consequently, we are able to differentiate between discussed critical items to which only one co-witness answered and those to which both co-witnesses gave various answers in the collaborative phases. This is similar to what Garry et al. (2008) did. For this purpose, we will record the audio of the collaboration phases. When coding the co-witnesses' answers as "non-disputed" and "disputed", we will use the coding sheet provided in Appendix 1; thus, we will be able to inspect the frequency of errors for honestly discussed critical items in the final test.

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Due to the fact that the discussed vs. non discussed items are the within-subjects variables, we will conduct a series of dependent t-tests to verify differences between discussed and non-discussed items. In total, we will perform four analyses, as the open-ended test allows types of answers to be scored: (1) correct, (2) consistent with the misinformation, (3) incorrect answers that are not related to the misinformation, and (4) “don’t know” answers.

Hypothesis 2. There will be participants who give answers consistent with misinformation in spite of being aware of the discrepancies between the original and postevent materials. This hypothesis just postulates that some fraction of participants who are aware of discrepancies will still give answers consistent with the misinformation. In similar research using the classical three-stage misinformation effect, Polczyk (2017) found that about 22% (Experiment 1) or 15% (Experiment 2) of participants who correctly detected a discrepancy gave an answer consistent with the misinformation. We assume that this hypothesis will be considered as confirmed if this fraction reaches about 15%.

Hypothesis 3. The main reason for being misinformed despite being aware of discrepancies is distrust of one’s own memory. The aforementioned discrepancy-processing test includes the three main reasons (doubting one’s own memory, a mistake by the interlocutor, a deliberate deception by the experimenter) plus a fourth one (i.e. other), for which a participant could answer in accordance with the misinformation despite possessing all the information needed to provide the correct answer. The hypothesis states that the reason that relates to lack of confidence (i.e., doubting own memory) will be the most common. This will be verified by means of a chi-square test for equality of proportions, with a null hypothesis stating that all four reasons happen equally often (i.e., 25%). Also, in a series of pairwise comparisons among the frequency of reasons, the reason that relates to lack of confidence should occur more often than any other. In all multiple comparisons, Holm (1979) correction of the p value will be applied.

Hypothesis 4. Awareness of discrepancy between original information and misinformation reduces the memory conformity effect. This hypothesis will be verified by comparing two groups: aware and not aware of discrepancies between the original material and the misinformation. Eight analyses will be performed because awareness of discrepancies may or may not appear in the case of each of the eight critical items. In each analysis, the proportion of answers consistent with misinformation will be compared between groups of participants who are aware or not aware of the discrepancies for a given item. Contingency tables and chi-square tests of independence will be applied. As in the case of Hypothesis 4, to control the alpha level for the multiple comparisons, the Holm procedure will be used (Holm, 1979).

Hypothesis 5. Memory conformity is associated with susceptibility to social influence, submissiveness, and suggestibility; these relationships are moderated by awareness of discrepancies in such a way that they are statistically significant among people aware of discrepancies, and they are insignificant among people unaware of discrepancies. This hypothesis basically involves a moderation analysis which will be performed with PROCESS software (Hayes, 2018). Bootstrap-generated confidence intervals will be used to determine whether there is a significant interaction effect.

Hypothesis 6. The main reason for succumbing to misinformation among participants unaware of discrepancies is lack of memory concerning the original information. To analyze this hypothesis, the answers provided by the participants in response to the open-ended question will be analyzed, classified, and counted. The numbers of answers in all categories will be compared by means of the chi-square test.

3.2 Exclusions

Participants will be excluded in the case of any technical problems during the experimental session. Moreover, subjects who are not exposed to any misinformation from their

interlocutor will be excluded from all analyses concerning the final recognition test's accuracy score of the critical questions.

3.3 Timeline for completion of the study

The study will be conducted in 2021–2022. If the Stage 1 review is accepted, the resubmission should be done no later than 2022.

4. Conclusions

The memory conformity effect poses a potential threat to the accuracy of witness testimony and thus the correctness of judicial decisions. The manuscript presents a new research approach to the verification of the causes of memory conformity; it is based on analysis of awareness of discrepancies between the details of an observed event and misinformation presented by another witness. We expect that the study results will expand the knowledge on the mechanisms of this phenomenon and the determinants of its size. We hope that the outcomes will contribute to the development of effective techniques to minimize the phenomenon of memory conformity, thus reducing the number of judicial mistakes.

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type of detail	version 1	version 2
company logo	RJ's	AJ's
bed	made bed	unmade bed
soft drink	Coke	Pepsi
mug	white mug	green mug
cap	black cap	red cap
magazine	Time	Newsweek
time	clock	watch
picture	Pisa	Eiffel

Table 1. Types of critical details included in the movie.



Figure 1. An overview of the procedure. Please note, the MORI technique consists of Phases 1–5; verifying awareness of discrepancy consists of phases 6–8.