

REGISTERED REPORT STAGE 2

Reinforced self-affirmation as a method for reducing eyewitness memory conformity: An experimental examination using a modified MORI technique

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Abstract

The manuscript describes an experimental investigation of a technique that might reduce memory conformity: the reinforced self-affirmation procedure (RSA). While previous studies have already demonstrated the RSA's effectiveness in reducing other memory distortions (e.g., the misinformation effect and interrogative suggestibility), this has not been tested in the context of the co-witness memory conformity effect. To this end, we utilized the well-known MORI technique to study co-witness memory conformity under well-controlled experimental conditions. While viewing different versions of the same movie, pairs of participants were sat beside each other, believing that they were viewing the same version. Next, they answered figures collaboratively, which guided them to discuss conflicting details. Finally, participants individually took a recognition test, but in the experimental condition this was preceded by the RSA procedure, which was expected to be an effective way of eliminating the effect of memory conformity. Unexpectedly, this assumption was not confirmed. This result is further discussed.

KEYWORDS

co-witness suggestibility effect, eyewitness memory, memory conformity, post-event conversation, reinforced self-affirmation

1 | INTRODUCTION

Intensive research on the reliability of eyewitness testimony is conducted mostly because it often seems to be fundamental (Graham, 2003) and persuasive (Vollen & Eggers, 2005) evidence that allows the circumstances of a crime to be proved; therefore, it is reasonable to ask how reliable eyewitness testimony is. For example, Huff et al. (1996) suggested that the most common reason for the

criminal conviction of innocent people was, in fact, false and unreliable eyewitness testimonies. Many studies have also shown that even witnesses convinced of their memories may simply fail to describe crime events accurately (e.g., Brewer & Wells, 2011; Luna & Martin-Luengo, 2012). This should not be surprising given that eyewitness testimony depends on the sometimes-imperfect human ability to remember, maintain and retrieve information relating to crime scenes (e.g., Wonsowicz, 2012). In addition, crimes are also frequently

witnessed by two or more people, and co-witnesses of a crime often discuss the event shortly afterwards (e.g., Paterson & Kemp, 2006a; Skagerberg & Wright, 2008). For instance, Paterson and Kemp (2006a) demonstrated that around 86% of witnesses discussed the event with their co-witnesses. Thus, it may be argued that one plausible source of false eyewitness testimony might be the phenomenon known as *memory conformity*, namely the fact that co-witnesses integrate elements of each other's version of events into their own report of the shared experience (Wright et al., 2000). Indeed, many studies have shown that such discussions may easily distort people's memory (e.g., Garry et al., 2008; Kanematsu et al., 1996/2003; see Condon et al., 2015; Ito et al., 2019, for a comprehensive review).

Given the importance of the problem of distortions of witness testimony, the main aim of the present project is to explore the possibility of attenuating memory conformity by means of a technique called reinforced self-affirmation (RSA; Szpitalak, 2012). Apart from this, we aim to provide some insight into the possible mechanisms. We start by briefly describing the most important paradigms in memory conformity research, then we describe the existing methods of immunizing against it and present our approach to such immunization, its theoretical rationale and the method, that is, RSA.

There are several approaches to studying memory conformity. For example, in some studies (e.g., Paterson & Kemp, 2006b; Reysen, 2005), participants watched footage of a crime while being paired with a confederate who provided misinformation. Alternatively, in a study by Gabbert et al. (2003); also, in Garry et al. (2008); see Wright et al. (2009) for a review, participant pairs familiarized themselves with an event by watching a video on separate screens but (unbeknown to them) they each watched different versions of the footage. Thus, when the individuals studied the event on their own, they believed that the co-witness had watched exactly the same material. The materials, however, differed in some details. Subsequently, participants discussed the crime event (solving any disagreement by discussion) and completed an individual memory test concerning the dissimilar details. These types of studies demonstrated that people more commonly provide correct answers to questions which were not discussed with a partner, as compared to discussed issues that were related to critical elements. Importantly, the findings also suggest that people are prone to agreeing with information provided by a co-discussant who is perceived as a source of more accurate information (Wright et al., 2000). Finally, there is an approach to studying the co-witness suggestibility effect that uses the *Manipulation of overlapping rivalrous images* technique (henceforth called the MORI technique; Mori, 2003, 2007). Since this approach and replication of its effectiveness is the main focus of the present study, we further introduce it below.

The MORI technique allows for the projection of two different movies to two groups of viewers without them noticing the duality. Importantly, the two different versions are displayed on the same screen. Therefore, while participants appear to be watching the same event, the movies differ with regard to a set of critical details (e.g., the color of a cap). Half of the critical details are discussed, whereas the other half are not discussed; therefore, the undiscussed half is used as the control questions during the individual memory test. The percentage of correct answers given to questions about undiscussed details is then compared

with the percentage of correct answers to questions about details that have been misdirected, that is, misinformed during the discussion. The MORI technique uses two rear-projected video projectors. The displayed images are polarized, so one projector transmits light waves on the horizontal plane, whereas the other transmits light in the vertical plane. Participants wear polarized glasses which look like regular sunglasses but which actually block one of the possible versions of the movie. Importantly, while participants in other co-witness procedures may become suspicious about the manipulation (especially when they disagree on some details), the MORI technique seems to significantly reduce this possibility. For this reason, it may be argued that the MORI technique is one of the closest experimental approximations of everyday life situations in which people witness the same event and discuss it afterwards.

Several studies using the MORI technique have successfully provided solid evidence for the co-witness suggestibility effect (French et al., 2008, 2011; Garry et al., 2008; Kanematsu et al., 1996/2003; Mori & Kitabayashi, 2009; Mori & Mori, 2008; Mori & Takahashi, 2012; Tainaka et al., 2014). Importantly, this effect seems to be robust and common to many cultures (e.g., Ito et al., 2019). In general, the findings demonstrated that people more often provide correct answers to questions about details not discussed with a co-witness than to details that were discussed and misdirected. Finally, only a small percentage of people who agreed with their partner during the discussion did not conform to their partner during the individually performed memory test (Garry et al., 2008).

There is scarce existing research into immunizing against the memory conformity effect. Actually, only one method has been explored: warning that the co-witness may be wrong. In a series of studies by Paterson et al. (2011), it was found that warning a witness that a co-witness may be misleading they did not prevent co-witness conformity: neither when the witness was warned a week after the discussion, nor when the witness was warned immediately after the discussion. Similarly, Fernandes et al. (2020) found that extended warning (an "enlightenment") did not reduce memory conformity.

The warning, however, proved to be successful when participants were instructed to ignore and not report information gleaned from co-witnesses. In addition, Bodner et al. (2009) claimed that the warning significantly reduced the number of mistakes. Meade and Roediger (2002) also proved that these warnings might reduce but not completely eliminate the effect of memory conformity. Finally, co-witness suggestibility is also especially powerful when one does not have a clear memory or when a co-witness is perceived as a more reliable source of information (Wright et al., 2009).

In the present project, a different approach is proposed: it is hypothesized that enhancing subjects' self-confidence in the quality of their memories would make them rely less on the (mis)information provided by the co-witness and instead base their memory reports on their own recollections. We rationalize this hypothesis on the basis of the following: the possible mechanisms of memory conformity; the existing results concerning a phenomenon related to memory conformity, that is, the misinformation effect; and the existing results concerning a trait related to self-confidence, that is, self-esteem.

First of all, we justify our hypothesis by making some assumptions concerning the possible mechanisms of memory conformity. The

exact mechanisms remain to be determined, but some ideas about them do exist. Wright et al. (2009) discussed three processes that may cause the memory conformity effect: (a) normative impact, which is yielding to someone because of social rules; (b) informational influence, which is yielding to someone in the belief that they are right; and (c) false memories. We assumed that normative impact is unlikely, given the fact that the final memory test does not include any element of pressure: participants work on their own and do not compare their answers with anybody, therefore, the cost of disagreeing is zero. As for false memories, they are possible on the basis of the reasoning and data presented by Wright et al. (2009). In this case, we do not expect that boosting one's self-confidence in the quality of one's own memory would make a memory report less contingent on false information provided by a co-witness. In contrast, a participant who is convinced that their memory is good may be especially prone to reporting its content, including false information.

Our hypothesis is related to informative impact, in the case of which a participant weighs the relative likelihood of the other person being correct versus her/himself being correct (Wright et al., 2009). This of course relates only to participants who are aware of the discrepancies between the original film and the content of the answers provided by the co-witness. In other words, we are speaking about participants who correctly monitor both the source of the information and its content. Such participants may choose one of two options: answer in accordance with what they themselves remember about the film (this would be the correct answer), or base their answer on what their partner said (which happens to be the wrong answer). We assume that participants who choose to give answers that are consistent with what their partner said instead of giving answers that are consistent with their own memory about the film do so due to lack of confidence in the quality of their memories. We finally assume that, in the case of such participants, enhancing their confidence in their own memory would diminish their tendency to give answers consistent with what their partner said and increase their tendency to give correct answers based on their own memory. Using the distinction explored by French et al. (2011), we may say that enhancing self-perceived credibility relative to the credibility of the partner would diminish memory conformity. Obviously, if this prediction is not confirmed, then at least one of our assumptions listed above is false.

The results of similar research into the memory misinformation effect form the second basis for the hypothesis that increasing self-confidence in the quality of one's own memory would reduce memory conformity. In the memory misinformation effect paradigm (seminal research: Loftus et al., 1978), participants watch some original material, such as a series of slides or a video clip. After some time, they are presented with some post-event material, for example a description of a video that in the experimental group contains some details that are incongruent with the content of the video. After another time delay, the participants give a memory report about the original video clip. In research using various versions and modifications of this basic paradigm, it is now well established that misled subjects include the misinformation in their memory reports more often than non-misled control participants do (for a review, see Loftus, 2005). This paradigm is similar to memory conformity as it includes all its three core

elements: there is a presentation of some original information (in the MORI technique, a video clip), then misinformation is presented (in the form of erroneous memory reports provided by the partner in the pair) and there is a final memory test about the video.

In fact, some authors noted that the mechanisms of the misinformation effect and of co-witness memory conformity may be similar (Garry et al., 2008). Whether other similar mechanisms underlie memory conformity and the misinformation effect is, of course, a question that only empirical research can answer. Currently, some authors concede that they may be similar (Garry et al., 2008). Some even merged memory conformity and the misinformation effect in the title of their paper (Wright et al., 2000, "Memory conformity: Exploring misinformation effects when presented by another person"). Szpitalak et al. (2015) compared three ways of delivering misinformation: impersonal, a typed summary of the original material (most often used in research on the misinformation effect); para-social, a hand-written summary, seemingly created and signed by another participant; and social, delivered by the confederate. Using the Bayesian method, Szpitalak et al. (2015) found no differences in the number of answers consistent with misinformation delivered via each of these three methods. Similarly, neither Meade and Roediger (2002) nor Blank et al. (2013) found a significant difference between social and para-social conditions. In contrast, Gabbert et al. (2003) found a stronger misinformation effect in the group with the confederate than with the typed and signed protocol. In sum, in terms of the magnitude of yielding to false information, it seems that the differences between memory conformity and the misinformation effect are not substantial. Of course, similarity of effect sizes does not necessarily imply the equivalence of mechanisms.

The third reason to expect that enhancing self-confidence may help to reduce memory conformity is the fact that people with low self-esteem seem particularly prone to misinformation in both the memory conformity (Tainaka et al., 2014) and the misinformation paradigm (Saunders, 2012). Of course, self-esteem and self-confidence are not identical phenomena, but they are related and empirically correlated (e.g., Coudeville et al., 2011).

Finally, it may also be plausible that enhancing self-confidence plays some role even in the case of normative impact. We mentioned above that normative impact is unlikely in the case of the standard memory conformity procedure because while doing the final memory test the participants work on their own and do not compare their answers with anybody; therefore, there is no social pressure and no costs of disagreeing. However, it is not entirely impossible that normative influence plays a role during collaborative remembering: giving answers consistent with what the partner said may be caused by social mechanisms. It is possible that these wrong answers make their way to the memory of a given participant who later gives a wrong answer. Enhanced self-confidence should diminish the tendency to agree with answers in the collaborative phase, thus reducing memory conformity.

The method for enhancing self-confidence used in the present research is RSA. This method includes two elements for boosting self-confidence: self-affirmation and positive feedback. The concept of self-affirmation was elaborated by Steele and Liu (1983), who postulated that it is a means of protection against cognitive dissonance and that it boosts self-confidence. The positive impact of self-affirmation on self-

confidence has also been confirmed experimentally (Petruzzello & Corbin, 1988; Sherman & Cohen, 2006; Takai, 2011). Also, the idea that positive feedback (the second element of RSA) boosts self-confidence was based on existing research (e.g., Adler, 1990; Brabender & Boardman, 1977; McCarthy, 1986; Morocco, 1978; Petruzzello & Corbin, 1988).

In the existing research, RSA has been repeatedly proven to reduce the classic memory misinformation effect (Szpitalak, 2012; Szpitalak & Polczyk, 2013, 2015, 2019a, 2019b). In two experiments (Szpitalak & Polczyk, 2016), it was also shown to reduce interrogative suggestibility, another paradigm relating to memory suggestibility (Gudjonsson, 1997). Interrogative suggestibility consists in including in one's answers information stemming from suggestive leading questions (this is called "Yield") and in the tendency to change answers after being given negative feedback relating to the quality of testimony, which is called "Shift" (Gudjonsson, 1997). Shift was effectively reduced in both experiments (Szpitalak & Polczyk, 2016), whereas Yield was diminished in only one of them (Szpitalak & Polczyk, 2016). In one experiment, it was confirmed that RSA was effective mainly in the case of participants who were aware of the discrepancies between the original and the post-event materials (Szpitalak & Polczyk, 2015, Experiment 2). This, in a way, is a promising result for similar research on memory conformity. (The detailed procedure of the RSA is presented below in the Method.)

Apart from analyses concerning the replication of the memory conformity effect and the efficacy of RSA, a mediation analysis is planned in order to verify one of the main assumptions of the planned study, which states that RSA affects results on the final memory test via increased self-confidence. Thus, self-confidence is expected to be a significant mediator of the impact of RSA on the final memory test.

Also, a moderation effect is hypothesized that relates to general susceptibility to social influence: in a group of very compliant people, self-confidence would be less effective. The generalized tendency to rely on the opinions of others may overcome the benefits of situationally increased self-confidence. In contrast, people who do not have a tendency to yield to the influence of others may take more advantage of enhanced self-confidence. Therefore, a moderation effect was hypothesized: the impact of RSA on memory conformity should be moderated by the general tendency to yield to social influence, i.e., the higher this tendency, the less the reduction of memory conformity caused by RSA. Finally, we expected that RSA would increase the confidence in answers given in the final memory test.

In all analyses, RSA took place after the participants discussed the movie, which is important from the "ecological" point of view. In reality, virtually no method that aims to improve testimony can be applied before the witness has been exposed to possible misinformation from various sources. In practice, any method that immunizes against misinformation may only be applied just before the interrogation. Therefore, in the present study, RSA is placed after the "misinformation" phase and before the final memory test.

In sum, the following hypotheses are tested as part of the present project: (a) the memory conformity effect will be replicated; (b) RSA will increase confidence in the answers given in the final memory test; (c) RSA will reduce the memory conformity effect; (d) self-confidence

about the quality of memory will mediate the impact of RSA on memory conformity; (e) susceptibility to social influence will moderate the impact of RSA on memory conformity.

2 | METHOD

The Scientific Research Ethics Committee at the Institute of Psychology of Jagiellonian University approved (no. KE/03/122018) the usage of the MORI technique (2018). Written consent for participation was obtained prior to data collection.

2.1 | Power and sample analysis

The sample size was estimated for the three most important effects of the present study: (a) replication of the memory conformity effect; (b) the efficacy of the RSA procedure in reducing memory conformity; and (c) the mediation effect, RSA > confidence > memory conformity. The analysis of the first two points was performed by means of G*Power software (Faul et al., 2007); the third was based on the results of a simulation study by Fritz and Mac Kinnon (2007).

As for the replication of the memory conformity effect, the expected effect size of 1.92 (Hedges' *g*) was based on the existing results for a Polish sample in research in which the same procedure was used as that planned in the proposed study (Ito et al., 2019). This is a very large effect size; when comparing two independent samples (assuming a power of 80% at alpha level = 0.05), the required sample size is about $N = 12$. Actually, the power would be even higher as the memory conformity analysis is based on a paired design. Thus, it should be easy to detect the memory conformity effect if it exists.

There are no available data related to the efficacy of the RSA in the context of memory conformity. The analysis was therefore based on the typical effect sizes (Cohen *d*) that are usually considered small, medium and large: 0.2, 0.5, and 0.8, respectively (Cohen, 1988). The required sample sizes for 80% power for the one-tailed test are 620, 102, and 42, respectively. A sample size of about 100 participants was assumed sufficient to detect a medium-sized effect.

The power calculation for the efficacy of RSA involves an interaction between a repeated-measures factor (comparison of the proportion of correct answers to non-discussed and misdirected items, see below) and a between-subjects factor (the groups with and without RSA). Brysbaert (2019) recommended a sample of 130 participants to assure a power of 80% in the case of a medium-sized effect.

As for the mediation, Fritz and Mac Kinnon (2007) provided information about the sample sizes needed for 80% power for various tests of mediation for four effect sizes concerning the predictor > mediator and mediator > dependent paths: 0.14, 0.26, 0.39, and 0.59. For the present study, the percentile bootstrap test for the mediation was applied, which can be performed by means of PROCESS 3 software (Hayes, 2018). In the worst case, when both paths are smallest, the required sample size is 558. For an effect size of 0.26 for both paths, a required sample size of 162 is more realistic; for an effect size of 0.39, 78 participants are required.

The sample size for the moderation effect was estimated by means of G*Power software (Faul et al., 2007). For a small, medium and large increase of R^2 due to interaction, the required sample sizes were 395, 55, and 25, respectively.

The final decision was that a sample size of about 130 participants was assumed to be necessary to detect effects of roughly medium size.

2.2 | Participants

In sum, 174 participants were tested; however, due to the preregistered criteria, 48 had to be excluded because they were not exposed at all to misleading details from a co-witness, and/or remembered less than 10 words, and/or did not write about their successes in the RSA. This resulted in a final sample of 126 subjects: 59 in the experimental group with RSA, 67 in the control group. There were 87 women and 39 men in the sample; their mean age was 22.9 years ($SD = 4.3$, range: 17–47 years).

2.3 | Materials

2.3.1 | Manipulation of overlapping rivalrous images (MORI)

The experiment employed a modified procedure based on the study by Garry et al. (2008), which was the first experiment using the MORI technique outside of Japan that demonstrated the co-witness suggestibility effect; unless otherwise specified, we strictly followed the original design. Briefly, participants watched the video created by Takarangi et al. (2006), as was also used by Garry et al. (2008). The movie of the crime lasts 6 min and 34 s and does not contain any sound. There are two versions of the same clip, which are identical except for eight critical details. For instance, Eric wears a cap that is red in one version and black in the other. All materials relating to the MORI technique are available on the Ito et al. (2019) OSF page.¹ Importantly, the MORI technique has already been successfully translated into Polish (Ito et al., 2019).

Both versions of the video were projected onto the back of a translucent projection screen made of a 5-mm-thick pane of plain ground glass (45 × 60 cm). We used two LED projectors (TAXAN, KG-PL021X) mounted on a stand, one above the other, with one tilted slightly upward and the other slightly downward, so that the two images overlapped on the screen. The images were about 30 × 40 cm in size on the screen, located at a distance of approximately 170 cm from participants. Polarizing filters were attached in front of the lens of each projector, one placed vertically and the other horizontally. For each pair of participants, one set of glasses allowed the wearer to view the vertically polarized image while blocking the horizontally polarized one, and the other set of glasses did the opposite.

A comment on the terms used throughout this manuscript is needed. As mentioned, movies differ in eight details. Four of them are

non-discussed, that is, participants are not asked about them during the discussion and another four are discussed, that is, participants are asked about them during the discussion. Moreover, participants answers on discussed items can be classified as misdirected or non-misdirected (Cadavid & Luna, 2021). If a participant is exposed to a given misinformation (i.e., during the discussion another participant tells their correct answer), then their answer is misdirected. In contrast, if a participant is not exposed to a given misinformation (i.e., during the discussion another participant does not tell their correct answer), then their answer is non-misdirected. In addition, Ito et al. (2019) extended this concept and divides misdirected items into disputed (in which both participants for a given discussed item tells their correct answer thus mutual misinformation has occurs) and non-disputed items (in which just one participant from a pair tells their correct answer for a given discussed item thus unilateral misinformation has occurs). The concept of the disputed and non-disputed items is described in detail in Section 3.6. (see also Figure 1).

2.4 | Reinforced self-affirmation (RSA)

RSA is a procedure designed to enhance self-confidence, especially self-confidence relating to memory (Szpitalak, 2012; Szpitalak & Polczyk, 2013, 2015). It consists of two parts: (a) the participants write about their greatest life successes; (b) participants receive positive feedback after a memory task that consists in remembering and recalling a list of words. In the control condition (without RSA manipulation), participants were instructed to describe their route from home to the study room and received no feedback after the memory task.

2.5 | Manipulation check for RSA

After RSA, a manipulation check was applied to determine its efficacy. It consisted of a 100-mm visual analogue scale with the instruction “Please mark with a vertical line on the following line how much you feel at this point that you remember the movie well.” This measure was also used in the planned mediation analysis to verify the mediation: RSA > confidence about memory > memory conformity.

2.6 | Measure of susceptibility to social influence (MSSI)

This is a 34-item tool designed to assess three possible responses to social influence pressure: independence (principled autonomy), conformity/compliance (social adaptability), and anti-conformity (social friction; Bobier, 2002; polish adaptation: Polczyk, 2007). The questions are answered on a five-point Likert scale: from “strongly disagree” to “strongly agree.” Cronbach's alphas for the three dimensions in the previous studies using tool were .80, .82, and .67, respectively (Polczyk, 2017).

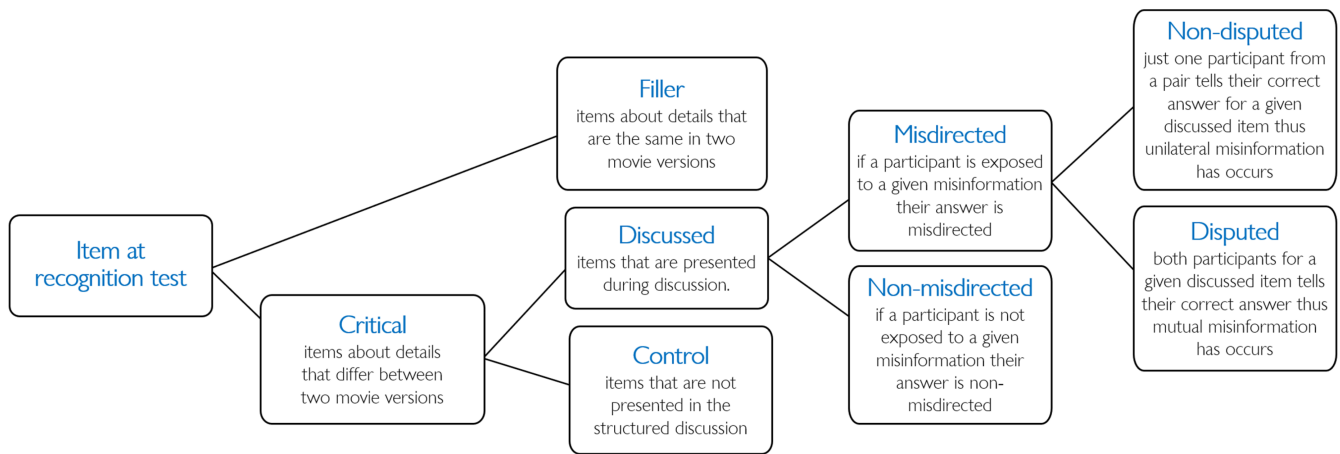
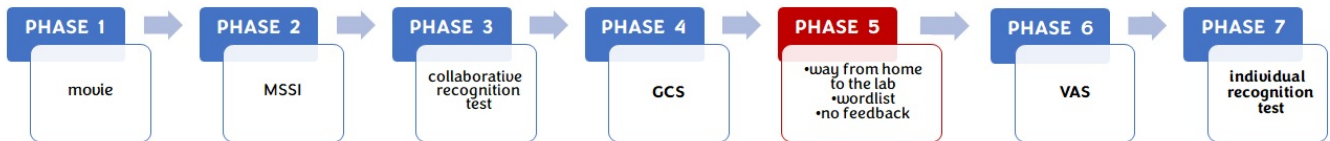
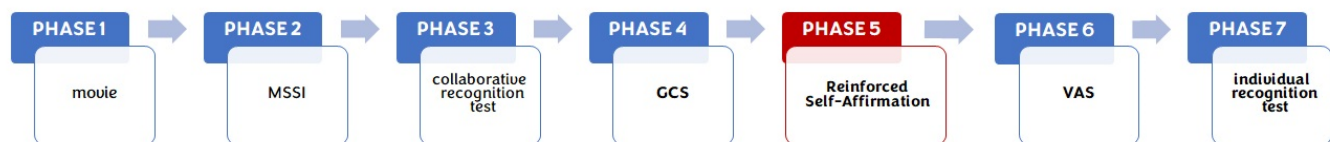


FIGURE 1 Types of items at the individual recognition test. Cadavid and Luna (2021), Figure 1 explains well the division of discussed items into misdirected and non-misdirected. Meanwhile, according to the concept of Ito et al. (2019), misdirected items can be divided into disputed and non-disputed.

Non-RSA condition



RSA condition



Notes:

non-RSA condition (control condition); RSA condition (reinforced self-affirmation manipulation condition)

MSSI – Measure of Susceptibility to Social Influence

GCS – Gudjonsson Compliance Scale

VAS (Visual-Analogue Scale) – manipulation check

FIGURE 2 An overview of the experimental procedure. Non-RSA condition (control condition); GCS, Gudjonsson Compliance Scale; MSSI, Measure of Susceptibility to Social Influence; RSA condition, reinforced self-affirmation manipulation condition; VAS, Visual-Analogue Scale—manipulation check.

2.6.1 | Gudjonsson Compliance Scale (GCS)

GCS (Gudjonsson, 1997; Polish adaptation: Wilk, 2004) was designed to measure compliance, defined as the tendency to conform to requests made by others, particularly people in authority, in order to please them or to avoid conflict and confrontation. It consists of 20 statements answered true or false; for example, “I give in easily when I am pressured.” The reliability of this tool in the previous study was .80 (Polczyk, 2017).

2.7 | Procedure

An overview of the procedure is shown in Figure 2. Participants were informed that the experiment was about the sensory perception of

people with different levels of visual acuity and that they had been assigned to the condition with 95% acuity. We used the following instructions (translated into Polish by a native speaker with good knowledge of English):

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. (Garry et al., 2008, p. 433).

Then, participants were randomly given horizontal or vertical polarizing glasses. Then, participants were 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 your glasses 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 experimental session consisted of seven phases. In Phase 1, participants watched the movie, which contained eight critical details, four of which were discussed later in the third phase (a full list of the critical details in the movie is available in Table A1). Subsequently (Phase 2), participants were asked to work on the MSS1 questionnaire for 10–15 min. In the third phase, which was audio-recorded, participants took part in a collaborative recognition test. They answered 12 questions displayed in a PowerPoint presentation on a laptop. The participants had 60 s to answer each question aloud. If the participants did not respond within 50 s, the experimenter asked for the answer one more time. If both participants in a pair did not agree with each other's answers, the researcher wrote down both answers. Out of 12 questions, four were related to dissimilar details, and eight were filler questions. For example, participants were asked about a beverage the movie character had drunk. Participant 1 saw a Coke, whereas the second one saw a Pepsi. This was one of four details discussed during this phase of the study. Next (Phase 4), participants were asked to complete the GCS questionnaire. This phase took about 7 min. In Phase 5, which lasted 8 min, participants in the experimental group were provided with RSA, which consisted of (a) recalling their greatest successes and (b) positive feedback concerning their performance in the memory task. At the same time, participant pairs in the control group were asked to describe their route from home to the study room and, after remembering and recalling a list of words, they did not receive any feedback. The instruction for the first part of the RSA procedure (which is recalling one's greatest successes) was as follows:

I will now give you a sheet of paper and would like you to write down all of the greatest life successes you have achieved.

At this time, participants in the non-RSA condition were told:

Now, I will give you a sheet of paper and would like you to describe your way from home to this study room.

In both conditions, this part took 4 min. Subsequently, all participants were asked to remember and recall a list of words. They received a list of 60 words. The page was put face down. They were told:

I will now give you a list of words. I would like you to try to remember as many words as you can. You will have 2 min for this. Turn over the page on my word. Is everything clear?

Now, turn over the page to start studying the list of words.

After 2 minutes, participants were told:

Time is up, turn over your pages.

Next, the participants were asked to recall as many words as they could remember in any order. The ones in the RSA condition received a sheet of paper with the numbers 1–60 printed on it (so they could see how many words they could remember), whereas the participants in non-RSA condition had a sheet without any numbers. This part took 2 min. The instruction for both groups was as follows:

Try to write down, in any order, as many words as you can remember.

After 2 min, the participants finished this part of the procedure. They received feedback that in the experimental group was “Thank you for taking part in this part of our study. The average amount of recalled words is 9.3”. This number was false in order to give positive feedback. In reality, this figure is about 1.5 *SD* lower than the real average that was noted in a previous study (Szpitalak & Polczyk, 2013). In the control group, the feedback was “Thank you for taking part in this part of the study”. If a participant recalled less than 10 words, then they were excluded from the analyses as the feedback was not positive for them in the experimental group. Participants who did not write about their life successes (this was checked after they had finished the task) were also excluded from the analyses. If a participant finished the task earlier, they were asked to wait for the next stage of the experiment.

Next (Phase 6), as a manipulation check of the effectiveness of the RSA, participants rated on a 100-mm Visual Analogue Scale (VAS) how confident they were that they remembered the movie well. Participants rated this by indicating a position along a continuous line between two endpoints. The distance from the marked position to the left point constituted the result. In Phase 7, participants were asked to complete an individual memory test consisting of 20 two-alternative forced-choice questions, eight of which contained critical details that were different in the movie for each participant from the pair. After each question, the participants indicated their subjective confidence in the answer on a scale from 0% (not at all confident, guessing) to 100% (absolutely confident).

Finally, at the end of the study, participants were asked a question concerning the purpose of the study. Nevertheless, none of the participants guessed the real aim of the study and no one was excluded from the analysis and replaced for this reason. Finally, the participants were debriefed about the true purpose of the study.

The experimenter also asked whether they noticed any anomalies during the video presentation in order to eventually exclude participants who reported anomalies to the extent that they were judged to have intuited the critical manipulation. However, no participant reported any problem. The experimental session took about 50–60 min.

3 | RESULTS

3.1 | Statistical analyses

The manipulation check concerning the efficacy of RSA was performed by means of a Student's *t*-test comparing groups with and without RSA regarding the results of the VAS scale measuring confidence in memory about the movie. Also, another Student's *t*-test was used to compare these groups in terms of the mean confidence in answers given on the critical questions on the final memory test (Hypothesis (b)).

Hypotheses (a) (the memory conformity effect will be replicated) and (c) (RSA will reduce the memory conformity effect) were analyzed by means of a mixed-design ANOVA regarding the final test accuracy score for the critical questions, with discussion (non-discussed vs. misdirected) as the within-subjects factor, and condition (RSA vs. non-RSA) as the between-subjects factor. Hypothesis (d) (self-confidence about the quality of memory will mediate the impact of RSA on memory conformity) was analyzed with PROCESS v.4.0 software (Hayes, 2018) by means of a percentile bootstrap test. Hypothesis (e) (susceptibility to social influence will moderate the impact of RSA on memory conformity) was also analyzed by means of PROCESS using the results from MMSI and GCS as continuous moderators.

3.2 | Manipulation check

We started with the manipulation check for RSA. We compared groups with and without RSA regarding the results on the VAS test for confidence in remembering the story. The means and standard errors in the RSA and control groups were 39.93 (2.37) and 41.21 (2.22), respectively. The groups did not differ ($t(124) = -0.39$, $p = 0.695$, $\eta_p^2 < 0.01$). This means that no evidence for the effectiveness of RSA was found. However, as it is possible that RSA did in fact enhance self-confidence but the VAS was unable to detect it; all subsequent analyses were performed as planned. Similarly, the difference between both groups in terms of the mean confidence on critical questions in the final memory test (hypothesis (b)) was not significant (means and SDs, respectively: 23.69 vs. 21.98; SDs: 4.96 vs. 5.13; $t(124) = 1.89$, $p = 0.061$, $\eta^2 = 0.03$).

3.3 | The co-witness suggestibility effect

Next, we examined the co-witness suggestibility effect, following Garry et al. (2008; also, Ito et al., 2019). Like Garry et al., we analyzed

the final test accuracy scores for the critical questions using analysis of variance (ANOVA). More precisely, we conducted a mixed-design ANOVA on the final test accuracy score for the critical questions, with discussion (non-discussed vs. misdirected) as the within-subjects factor, and RSA (present vs. absent) as the between-subjects factor. Both the main effect of RSA ($F_{(1, 124)} = 1.53$, $p = 0.247$, and $\eta_p^2 = 0.01$) and the RSA by discussion interaction ($F_{(1, 124)} = 0.01$, $p = 0.914$, and $\eta_p^2 < 0.01$) were insignificant. However, the main effect of discussion was significant, ($F_{(1, 124)} = 85.27$, $p < 0.001$, and $\eta_p^2 = 0.41$), with higher accuracy for non-discussed ($M = 0.53$, $SE = 0.02$) than for misdirected items ($M = 0.19$, $SE = 0.03$). This means that the existence of the memory conformity effect was replicated, but no evidence for the efficacy of RSA in reducing it was found (see also Figure 3).

3.4 | Mediation analyses

Despite the fact that RSA was not effective in boosting confidence in memory, as revealed by the manipulation check, we decided to perform the preregistered mediation. It concerned the hypothesis that RSA leads to increased self-confidence, which, in turn, reduces the inclination to conform to misinformation obtained from a co-witness. The individual score for memory conformity was computed as the difference between the proportion of correct answers regarding non-discussed and misdirected items. The effect of RSA on the mediator (memory confidence) was not significant ($B = 1.28$, 95% CI $[-5.14, 7.70]$). The direct effect of RSA on memory conformity was also not significant, ($B < 0.04$, 95% CI $[-0.10, 0.17]$), nor was the indirect

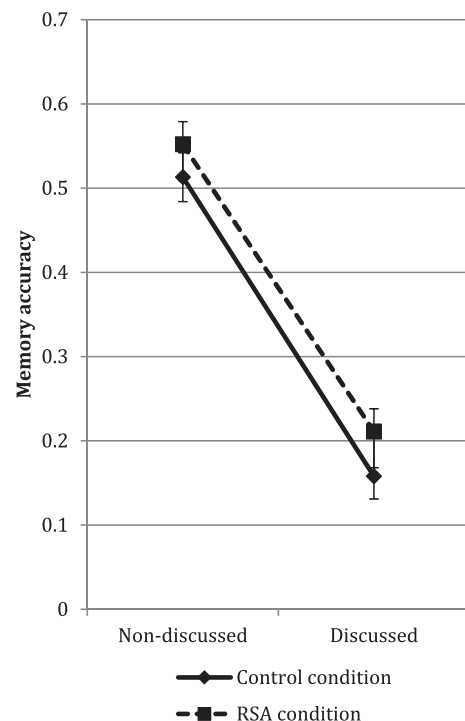


FIGURE 3 Means (standard errors) across experimental conditions.

TABLE 1 Results of moderation analyses.

Moderator	B	SE	95% CIs	
			-.01	.03
Principled autonomy	.01	.01		
Social adaptability	-.01	.01	-.03	.01
Social friction	-.02	.02	-.05	.0
GCS Total score	-.06	.02	-.06	.01

Note: Predictor: RSA; dependent variable: difference between misdirected and non-discussed items.

effect of RSA on memory conformity via memory confidence ($B < .01$, 95% CI $[-.02, .03]$). This suggests that the hypothesis concerning the mediation was not confirmed.

3.5 | Moderation analyses

Several aspects of yielding to influence using the Measure of Susceptibility to Social Influence (MSSI; Bobier, 2002) and the Gudjonsson Compliance Scale (GCS, Gudjonsson, 1997) were measured and used as moderators. Moderation analyses were performed in order to verify the assumption that the higher the social susceptibility and compliance, the lower the reduction of memory conformity resulting from RSA. Moderation analyses were performed on the dependent variable in the form of the difference between the correctness of non-discussed and misdirected items. As shown in Table 1, the analyses yielded non-significant results.

3.6 | Comparison between disputed (misdirected mutually) and non-disputed (misdirected unilaterally) items

As Ito et al. (2019) when scoring the individual recognition test on misdirected cases, we differentiated between “disputed” and “non-disputed” participants’ answers. More precisely, if a pair of participants disagreed with each other and gave different answers (but consistent with their own original information) during the discussion of a given item, their answers was classified as disputed (i.e. misdirected mutually). For instance, Participant X (PX) saw the version of the movie in which the cap was red, while Participant Y (py) saw the version in which the cap was black. When discussing the color of the cap, both gave the correct answer (PX said “red” and PY said “black”). Consequently, their answers was coded as “disputed” (misdirected mutually, that is, in which both PX’s and PY’s memory was misdirected). However, if Participant X gave the correct answer (PX said “red cap”) and Participant Y gave incorrect answer (i.e., PY said anything other than “black cap” or did not respond) their answers was classified as “non-disputed” (misdirected unilaterally) in which PX’s memory was non-misdirected, but PY’s memory was misdirected.

We compared mean accuracy on non-disputed (misdirected unilaterally) vs. disputed (misdirected mutually) cases. The former was calculated as the proportion of correctly answered items to all non-disputed items; the latter was the proportion of correct answers to disputed ones. The results were dramatic: accuracy on disputed items was 1.00 (100%), whereas on non-disputed items it was 0.09 (9%; $SD = 0.26$). The analysis of the statistical significance of this difference was somewhat difficult as it was only possible in the case of participants who disputed some items but not others. There were only 12 such participants, but the difference was still significant ($t(11) = -6.92$; $p < .001$).

In addition, we compared mean accuracy on non-disputed (misdirected unilaterally) items between groups with and without RSA. The mean accuracy was twice that of the group with RSA (means, respectively: 0.12 vs. 0.06; SD s: 0.28 and 0.23). Interpretation of this is difficult, however, as this difference was not significant ($t(115) = -1.24$, $p = .217$). A similar comparison in the case of disputed (misdirected mutually) items was not possible as all such items were answered correctly.

4 | DISCUSSION

The overriding goal of the present study was to investigate the co-witness suggestibility effect. More specifically, we aimed to (1) replicate the existence of this effect; (2) determine, whether a technique called RSA lowers vulnerability to this effect, and if so, (3) determine whether RSA works via increasing self-confidence related to memory; and (4) determine whether the efficacy of RSA is moderated by susceptibility to influence and compliance.

First of all, we successfully replicated the findings of Garry et al. (2008) and Ito et al. (2019): we found higher accuracy in the final memory test for non-discussed control items than for misdirected items. The replication of the memory conformity effect is yet another indicator that misinformation reaching the witness, no matter what form it has, can have harmful effects on the accuracy of witness testimony. It is now well established that errors in human testimony are the leading cause of mistakes made by courts and are involved in about 75% of DNA exoneration cases (Garrett, 2011). The present results are another indicator that discussing an event with co-witnesses can have harmful effects on testimonies.

The second main aim of the study was an experimental investigation of the RSA procedure, which may reduce the co-witness suggestibility effect. The effectiveness of this method was not demonstrated. This result is rather startling as RSA turned out to be effective in reducing other memory distortions, e.g., the misinformation effect (Szpitalak, 2012; Szpitalak et al., 2015; Szpitalak & Polczyk, 2013, 2015, 2016, 2019a, 2019b, 2021), interrogative suggestibility (Szpitalak & Polczyk, 2020) and susceptibility to social influence (Szpitalak & Polczyk, 2013).

In order to interpret this result it is important to start with the fact that RSA in the present research did not significantly increase the

participants' memory confidence, as demonstrated by the manipulation check, the analysis concerning the confidence of answers to the critical questions, and the mediation analysis. This is surprising, as in all other studies various kinds of RSA proved to be effective in the light of respective manipulation checks. Szpitalak & Polczyk (2019a, 2019b, 2020, 2021) reported in sum 10 experiments in which manipulation checks for RSA were performed. In three of them, VAS concerning the subjective confidence in the one's memory was applied as the manipulation checks, as it was in the present study (in the remaining ones, another questionnaire concerning memory confidence was applied). In all three cases (as well as in comparisons using the questionnaire), manipulation checks demonstrated the effectiveness of RSA in increasing memory confidence, in striking contrast to the present research.

The first possible interpretation of the ineffectiveness of RSA in increasing memory confidence may be related to the fact that the degree of self-memory doubt may be greater in the case of the MORI procedure than in the case of the classic misinformation effect paradigm. It should be stressed that both in the classic paradigm and in the MORI procedure, RSA is applied after misinformation has been introduced. However, this introduction was different in the present research than in the aforementioned studies. More specifically, in the present experiment, misinformation was introduced in a discussion between two participants, whereas the other studies (Szpitalak, 2022; Szpitalak & Polczyk, 2019a, 2019b, 2020, 2021) used the classic misinformation paradigm in which participants read a description of the original material that contained misinformation (in one experiment interrogative suggestibility was analyzed, Szpitalak & Polczyk, 2020). It is possible that RSA operates differently in these two paradigms. Firstly, it is possible that obtaining information which is inconsistent with the state of the one's own memory from a partner in a social interaction causes a stronger doubt in this memory than reading an anonymous text containing information inconsistent with one's own recollections. If this was the case, then RSA simply had a harder task after the participants' discussion than after anonymous delivery of misinformation.

Another important difference between the classic misinformation paradigm and the MORI procedure is the fact that in the latter the participant is active—they engage in discussion with the partner. In the case of disputed items (misdirected mutually), there is an actual confrontation of opinions. Such confrontations may create more uncertainty than the classic procedure. In sum, it is possible that the baseline memory confidence existing after the participants' discussion may have been too low for the RSA to significantly increase it.

The interpretation assuming that the ineffectiveness of RSA in increasing memory confidence was due to lower baseline confidence (resulting from the properties of the MORI technique) can be validated to some extent, by comparing mean confidence in the present experiment with that in previous research, using the classic misinformation paradigm and applying VAS as the measure of this confidence. We performed such comparison, by means of a small metaanalysis synthesizing results concerning VAS from three previous experiments (Szpitalak & Polczyk, 2019b, 2020) against those from the present

study, using respective means, standard deviations, and numbers of observations. The result was striking: in previous experiments, mean confidence as declared on the VAS was 63.29 (SE: 2.45, 95% CI [58.48, 68.10]) while in the present study it was 40.58 (SE: 1.62, 95% CI [37.41, 43.75]). Clearly, in the present study the participants were much less confident in their memories than in the studies applying the classic misinformation paradigm. It is possible that RSA is not effective in the case of so low baseline memory confidence.

The above reasoning may explain ineffectiveness of RSA in reducing memory conformity by the fact that RSA did not manage to increase memory confidence. However, a second line of interpreting is possible as well. Namely, it is possible that RSA did in fact increase memory confidence, but VAS failed to detect it. It should be stressed that a lack of an effect in an experiment does not prove nonexistence of this effect. An effect may exist, and an experiment may fail to detect it for various reasons. Assuming conditionally and of course tentatively that the group in which the RSA was applied did in fact had higher memory confidence than the control one, one may speculate why higher confidence did not result in lower vulnerability to misinformation in the present experiment, in contrast to previous research.

The first reason for the failure to demonstrate the efficacy of RSA in the present study may simply be the fact that the RSA effect proved to be rather small. This was consistent with the results of research exploring RSA in the context of the classic memory misinformation paradigm, where the effect sizes connected with it were usually modest, ranging from $\eta^2 = 0.02$ (Szpitalak, 2012, Experiment 4) to $\eta^2 = 0.19$ (Szpitalak, 2012, Experiment 7). In fact, in the present study the observed power needed to detect the RSA effect was only about 5% for a sample size of 124 participants. Such a sample assured a power of 80% for detecting an interaction of a medium-size effect (Brybaert, 2019), but it turned out that in the present study the effect was much smaller.

The second possible reason for not being able to observe the efficacy of RSA (assuming tentatively that RSA did increase memory confidence) is the fact that it should probably be effective primarily among people aware of the discrepancies between the original film and the content of the answers provided by the co-witness. This is because increased inclination to base the one's responses on the one's own memory requires memory of the original information. As elaborated in the introduction, this should be the case because if a person does not realize that the information provided by the co-witness contradicts their own memory, then increased confidence in the one's own memory should not matter at all. A person only has a chance to rely on their own memories as a result of increased memory-related self-confidence if they believe that they saw something different from what the co-witness is saying. As mentioned in the Introduction, some studies' results showed that RSA was more effective among participants aware of discrepancies than among those who were unaware of them (Szpitalak & Polczyk, 2015, Experiment 2). It is therefore possible that in the present study there were not enough participants who were aware of the discrepancies between the film and the information provided by the co-witness. This in turn makes it possible that the

misinformation provided by a co-witness caused a person to have a mistaken memory record concerning the original information.

The third goal of this study was to explore possible moderators of the influence of RSA on memory confidence, especially those relating to susceptibility to social influence. Such analyses still make sense even if the main effect of RSA is not significant because it is possible that the influence of RSA is only significant at some values of the moderators, while at other values it is not (or it is significant but reversed). Therefore, four specific moderators were analyzed: three subscales from the MSSl (Bobier, 2002), namely principled autonomy, social adaptability, and social friction; and compliance as measured by GCS (Gudjonsson, 1997). In sum, no convincing results corroborating the hypotheses about moderations have been found. The main cause for this may again be the fact that the postulated moderators related to participants who were aware of the discrepancies between the original film and information from the co-witness. Without such awareness, susceptibility to influence may matter less. If a given person thinks that they saw something but the co-witness says something different, then traits relating to susceptibility to influence may be important. If, however, information from the co-witness just fills some gaps in memory, then susceptibility to social influence may be of less importance.

In the additional analyses, it was found that in the case of disputed (misdirected mutually) items the accuracy of answers was 100%, while for non-disputed (misdirected unilaterally) items it was much lower. There are several possible explanations for such an enormous difference in the correctness. A lack of dispute may indicate that a participant did not remember the original information and, with the help of the other participant's statement, filled this memory gap with misinformation, thus usually resulting in a wrong answer. It may also be that although the participant remembered the original information, they were not confident in it, so an informational impact occurred, also usually resulting in a wrong answer. On the other hand, the dispute may mean that both participants remembered the original information well and were so confident in it that they not only said it aloud during the discussion but also used it in the individual memory test. However, based on the present results, it is not possible to unequivocally confirm these explanations. Interestingly, however, with non-disputed (misdirected unilaterally) items, the mean accuracy was twice as high in the group with RSA than without it. This would suggest that even if a participant did not engage in a dispute, they trusted their own memory more. However, as the difference was not statistically significant, such an interpretation is only speculative. Unfortunately, an analysis comparing groups with and without RSA as regards results on misdirected mutually and unilaterally answers was not possible as all disputed items were answered correctly.

4.1 | Possible limitations and directions for the future research

When considering the results of the present study, some limitations and possible improvements should be taken into account. Firstly, it

may be argued that the procedure did not provide information on the mechanisms of the studied phenomenon, namely why a given person succumbs to misinformation from an interlocutor. More precisely, as there may be several possible yet not mutually exclusive mechanisms underlying memory conformity, future studies should verify the assumption that this effect may be caused by at least two main mechanism types: (1) memory-related mechanisms and (2) non-memory related mechanisms. While the former consists in the fact that misinformation causes a person to have a mistaken memory record concerning the original information, the latter relates to a situation in which a person has a correct memory concerning both the original information and the misinformation (i.e., they are aware of the discrepancies between them) but they respond in line with the misinformation. Such a situation has only rarely been analyzed in the context of other memory distortions (Blank, 1998; Mastroberardino & Marucci, 2013; Polczyk, 2007, 2017); in general, and importantly, there are no studies concerning this situation in the context of memory conformity. Additionally, the previous studies did not consider the fact that the effectiveness of different methods of reducing the memory conformity effect may depend on the different types of mechanisms that cause this effect. It should also be highlighted that identification of this mechanism, besides being theoretically significant, may contribute to the development of effective methods for reducing memory conformity as different techniques are likely to be effective for memory-related and non-memory-related mechanisms (Polczyk, 2007). We are currently exploring some of these possibilities in follow-up studies (see Kękuś et al., 2021), and we believe that this research may provide interesting insights into the cognitive mechanisms of memory conformity.

Finally, it should be stressed again that the sample size in the present research was probably too small to prove the efficacy of RSA, given that the effect sizes associated with it have usually been small in previous research. One may ask whether it is worth investigating RSA if its effects are small at the best. We strongly believe it is worth continuing such research. There are very few methods of attenuating the impact of misinformation on witness testimony, and, as elaborated previously, errors in witness testimony are the leading cause of errors made by courts, including in very serious cases. If just one innocent person could be saved from many years of prison as a result of such research, it seems worth doing. Future research would require larger sample sizes in order to investigate the real efficacy of RSA.

5 | CONCLUSIONS

Real-world judicial practice and the studies mentioned in the introduction show that the witnesses' testimonies are not always the most accurate source of evidence. The present study aimed to examine one possible technique that may reduce memory conformity: the RSA procedure. While previous studies have already demonstrated RSA's effectiveness in reducing other memory distortions (e.g., the misinformation effect or interrogative suggestibility; Gudjonsson, 1997;

Szpitalak & Polczyk, 2016), this has not been tested in the context of the co-witness memory conformity effect. To fulfill this goal, we utilized the well-known MORI technique to study co-witness memory conformity under well-controlled experimental conditions. Although we expected that RSA would be an effective method of eliminating the effect of memory conformity, this assumption, unexpectedly, was not confirmed. Reinforcing one's own confidence did not reduce the memory conformity effect. As we argue, the most likely mechanism underlying this phenomenon may be memory-related processes where misinformation impairs memory records concerning the original information. This possibility still needs to be carefully addressed in future studies on the memory conformity effect.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

All relevant data are in the paper and its supporting information files.

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ENDNOTE

¹ All materials relating to MORI technique of Ito et al. (2019): <https://osf.io/j5f82/>

Photos of experimental settings used in the present experiment: https://osf.io/zktpa/?view_only=97938744f2c140f7bcf2bc75ef97b76c

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APPENDIX A

TABLE A1 Types of critical details included in movie.

Type of detail	Person A	Person B
<i>Company logo</i>	RJ's	AJ's
<i>Bed</i>	Made bed	Unmade bed
<i>Soft drink</i>	Coke	Pepsi
<i>Mug</i>	White mug	Green mug
<i>Cap</i>	Black cap	Red cap
<i>Magazine</i>	Time	Newsweek
<i>Time</i>	Clock	Watch
<i>Picture</i>	Pisa	Eiffel