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## Warning against warnings: Alerted subjects may perform worse. Misinformation, involvement and warning as determinants of witness testimony\*\*\*

*The article presents experiments exploring the memory misinformation effect. Subjects heard a recording and afterwards read a description of it, which included, in the misled group, some details inconsistent with the recording; finally they answered questions about the recording. The aim of the research was to replicate the tainted truth effect, consisting in poor memory functioning of non-misled warned subjects and to check whether a subject's involvement in the issue moderates this effect. Highly involved subjects were more resistant to the misinformation effect than those lowly involved. In the case of highly involved participants, warning was effective in reducing the misinformation effect, but it also caused more errors in the case of non-misled subjects. Thus, warning witnesses about nonexisting discrepancies between what they saw/heard and what they were told, might lead to less accurate testimony.*

**Keywords:** misinformation - memory - warning - involvement - eyewitness testimony - tainted truth

Human memory is reconstructive in its nature (Bartlett, 1932/1995; Hunter, 1957). This means that memory gaps are filled with conclusions resulting from various memory strategies and constructive processes, leading to a meaningful unified recollection. The gaps may be filled with information matching the true fragments of the memory, stemming for example from suitable cognitive schemata (e.g. Markus, 1977; Wojciszke, 1986), stereotypes (e.g. Kunda & Spencer, 2003), prejudice (e.g. Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997), attitudes (e.g. Hymes, 1986) or personal involvement in the issue (Rogers, Kuiper & Kirker, 1977).

One of the most striking examples of the reconstructive nature of memory is the misinformation effect, in which participants' recollection of an event is less accurate when misinformation about its details is dispersed before questioning about the event (seminal experiments: Loftus, Miller & Burns, 1978). In a typical experiment, participants first view a film or a sequence of slides, then read a description of it which, in the experimental group, contains some incorrect details. Afterwards, they answer questions about the film or slides. Usually, the performance of the misled experimental group is poorer than that of the non-misled control group.

In this article we wanted to explore two factors as possible mediators of the misinformation effect: a warning against misinformation, and personal involvement in the issue towards which the misinformation is directed, as well as the combination of both.

In the case of personal involvement, we were unable to locate any articles relating this factor to the mnemonic misinformation effect. However, there exists much research on the relationships between general memory and involvement, which usually indicates that high personal involvement promotes better memory functioning (e.g. Bellezza, 1984; Greenwald, 1981; Wallen, 1942). For Rogers et al. (1977) the self functions as a superordinate schema, deeply involved in the processing, interpretation, and memory of personal information. Rogers et al. even suggest that self-reference provides a basis for even deeper processing than a semantic one.

Apsler and Sears (1968), whose methodology was adapted in our research, argue that humans will involve themselves in an issue if they think it has consequences for their lives. In the context of eyewitness testimony, a "self-relation" may be defined as "...the extent to which the circumstances of an event, its reality, its resemblance to the experiences of the subject and the similarity to the

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victim as regards e.g. age, gender or social status, make the event important to the subject and incline him/her to think that he/she might be a victim of a similar event” (Styśko, 2004, p. 248). Generally, such involvement should promote memory.

Taking all this together, we hypothesized that the benefits of memory stemming from involvement would also be valid in the context of the misinformation effect, that is, involved subjects should be more resistant to misinformation than non-involved. This should be so, because high involvement results in better memory of the initial event, which in turn is positively correlated with better accuracy and greater resistance to misinformation. Such hypothesis is supported by the results of many experiments showing that subjects are more accurate if the critical misled item is central and very visible, whereas peripheral items that are difficult to detect are vulnerable to misinformation (e.g. Dalton & Daneman, 2006; Loftus, 1979; Wright & Stroud, 1998). These results are usually interpreted as an argument for the thesis that information which is well remembered is difficult to mislead, whereas information poorly or not at all remembered is easy to mislead. Centrality vs. periphery is yet one factor that may influence the memory, another is involvement. Therefore, involvement should lessen vulnerability to misinformation and promote accuracy.

As for warnings, most research done so far indicates that these usually reduce a subjects’ vulnerability to misinformation (Blank, 1998; Echterhoff, Hirst & Hussy, 2005; Greene, Flynn & Loftus, 1982), although some shows that warnings may be inefficient (e.g. Neuschatz, Payne, Lampinen & Toggia, 2001; Zaragoza & Lane, 1994). The degree to which warnings are effective varies considerably and depends, for example, on the ability to monitor the source of information (Lindsay & Johnson, 1989), or the discriminability of sources of information (Lindsay, 1990). Also, noticing of discrepancies between the original information and the misinformation by participants increases the efficacy of warnings (Christiaansen & Ochalek, 1983; Polczyk, 2007).

In the research presented in this article we wanted to check whether the efficacy of a warning depended on the subjects’ involvement in the issue. We hypothesized that in the case of highly involved misled participants, the efficacy of the warning would be less. This should be so, because high involvement results in low vulnerability to misinformation (according to the hypothesis stated above), and thus there is no effect against which the warning can protect. Floor effects simply occur.

The third and most important hypothesis verified in the presented research concerns the efficacy of warning in the case of non-misled subjects, and is connected with a very interesting approach to researching the effects of warnings, suggested by Echterhoff, Groll and Hirst (2007). They warned their subjects about nonexistent discrepancies

between the original event and the postevent information and checked whether such a warning negatively influences the memory performance concerning the original event. Echterhoff et al. assumed that warnings may result in a tendency to overcorrect responses, making them less accurate, even in the case of non-misled subjects.

An inspiration for this point of view was provided by Martin (1986) who showed that when people are aware that they are being subjected to an unwanted influence, they tend to “correct” for it by, for example, discounting the threatening information. Because the distinction between dangerous and safe information is usually not easily made, the subject may reject all the information provided to him/her. According to Echterhoff et al. (2007), a similar mechanism may arise as a consequence of warning subjects/witnesses against misinformation. “Eyewitnesses who attempt to avoid the intrusion of postevent information into their event memory may reject event items that were – correctly! – reported by the co-witness” (p. 369). In the misinformation paradigm, such “overcorrection” could occur when a subject’s attempts to correct for potential errors result in increased rejection of correct information presented either in the original event, or in the postevent information. This effect is called “the tainted truth effect” because – as the authors maintain – “this type of overcorrection diminishes memory reports for “true” event items” (p. 369).

In our research, we wanted first of all to simply replicate the tainted truth effect, because we were not aware of any existing replications. More importantly, we wanted to check whether the tainted truth effect is moderated by involvement. Echterhoff et al. (2007) claim that the tainted truth effect is relevant mainly in the case of information that is difficult to remember. According to this, it should be more pronounced in the group of lowly involved participants, because such participants tend to remember less from the original event.

To sum up, the aim of this research was to verify six hypotheses:

- (1) The usual misinformation effect should be replicated;
- (2) High involvement in the original event results in lower susceptibility to misinformation;
- (3) Warnings improve the performance of misled participants;
- (4) Warnings deteriorate the performance of non-misled participants;
- (5) High involvement results in lower efficacy of warning for misled participants, compared to low involvement;
- (6) Deterioration of the memory of the original event caused by warnings against nonexistent discrepancies, is more pronounced when involvement is low.

To verify these hypotheses two experiments were conducted. In the first experiment, all the above-mentioned

hypotheses were verified. The second study checked whether participants did remember the original event; the rationale for such an analysis is given in the introduction to the second experiment.

## Experiment I

### Method

#### Participants

A sample of 349 participants took part in this study (234 female, 112 male, gender unknown for 3 subjects); mean age was 16.28 (SD = 0.60). No gratification for participating in the experiment was given.

#### Materials

1. A “radio debate” produced for the experiment by four amateur and one professional radio presenter, duration 6 minutes and 30 seconds. The script concerned an educational reform, seemingly planned for Polish universities. A similar topic was used by Apsler and Sears (1968); it was applied in other research as well (e.g. Petty, Cacioppo & Goldman, 1981). The debate was moderated by a radio presenter, who was talking to four students about the planned reform.

2. Written description of the debate – in the experimental group, it contained misinformation: six details differed from the recording, seven others were new. In the control group the text did not contain any changes or additions.

3. A short, five-item test – for measuring attitudes towards the planned reform, and consisting of the following questions: “Do you think the general final exam should be obligatory in all universities in Poland?”; “Do you agree with the idea of a general final exam?”; “Is such an exam useful?”; “If you were given a choice, would you take such an exam?”; “If you were the rector of a university, would you introduce such an exam?”. All questions were answered on a 9-point Likert-like scale.

4. Memory test, consisting of 20 items – 13 items related to the misinformation, seven others were fillers. The participants had to rate each item on a two-point scale: “true” (i.e. consistent with the debate) or “not true”, and to indicate on a 7-point Likert-like scale their subjective confidence in their choices.

#### Procedure

The experiment was conducted in two high schools. The experimenter introduced herself as a scientist from Jagiellonian University, performing research for the National Council for Higher Education, concerning a planned reform of Polish universities. She explained that the reform consisted in the introduction of a general final exam covering all the courses taken during five years of

the studies, as a necessary prerequisite for graduating. Half of the subjects were told that they would be affected by the reform, as it would start within two years. The second group learned that the proposal “had a planned target date of 2018”. In this way, groups of high and low involvement were created. Afterwards, the subjects listened to the recording about the reform. In order to make the procedure more plausible, the subjects were asked to give written opinions on the reform. After 15 minutes, all the subjects read a description of the recording; for half of the subjects it included 13 misleading details, relating accordingly to 13 items in the final memory test. Afterwards, half of the subjects were warned that the text could contain information inconsistent with the recording, and that they should only rely on the recording while answering questions about the reform. The warning was phrased as follows: “While answering the questions you should rely only on what you remember from the recording. The text you’ve just read contained a few details that were inconsistent with the recording. Therefore when answering the questions, use only the information from the recording”. The second group did not receive any warning. Immediately afterwards a memory test based on the recording was administered. Thus, the design was: 2 misinformation (present or absent)  $\times$  2 issue involvement (high or low)  $\times$  2 warning (present or absent).

### Results

An analysis of variance was performed to examine all possible main and interaction effects. The main effects of misinformation, involvement, and warning were statistically significant: misled subjects performed worse ( $F_{[1, 341]} = 66.46$ ;  $p < .01$ ;  $\eta^2 = .16$ ), thus confirming the first hypothesis. Involved subjects performed generally better than non-involved ones ( $F_{[1, 341]} = 5.07$ ;  $p = .03$ ;  $\eta^2 = .01$ ); hence, the second hypothesis was also confirmed. Interestingly, involved subjects were better than non-involved ones regardless of the presence or absence of misinformation, as indicated by the non-significant interaction between the involvement and misinformation ( $F_{[1, 341]} = 1.41$ ;  $p = .24$ ;  $\eta^2 < .01$ ). To further assess the role of involvement in the case of “neutral”, non-misled memory, we compared results on the critical items between highly involved non-misled and lowly involved non-misled subjects. The former outperformed the latter ( $F_{[1, 341]} = 14.08$ ;  $p < .01$ ; partial  $\eta^2 = .04$ ). Additionally, we checked whether high- and low-involvement groups differed on filler questions, which can also be added up to form a memory index. In this analysis, involvement also improved memory ( $F_{[1, 347]} = 6.35$ ;  $p = .01$ ;  $\eta^2 < .02$ ).

Warned subjects fared better than those not warned ( $F_{[1, 341]} = 9.27$ ;  $p < .01$ ;  $\eta^2 = .03$ ). More interestingly, the

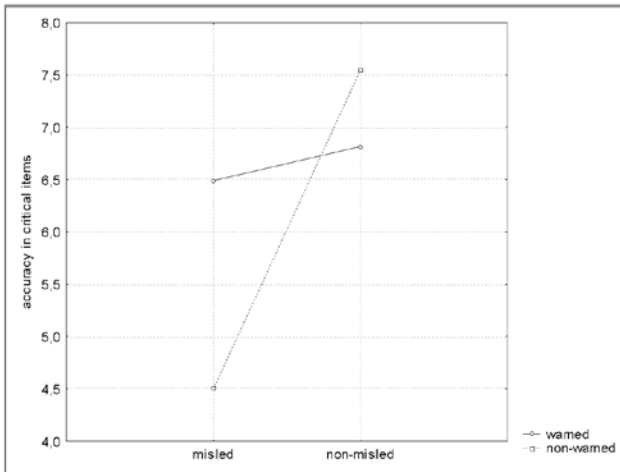


Figure 1. Mean accuracy on critical items as a function of interaction of misinformation and warning.

interaction between the warning and the misinformation was significant ( $F_{[1, 341]} = 43.23$ ;  $p < .01$ ;  $\eta^2 = .11$ ); this is presented in Figure 1 above.

As can be seen, in the case of misled subjects, warning significantly improved performance ( $F_{[1, 341]} = 43.41$ ;  $p < .01$ ; partial  $\eta^2 = .11$ ), thus confirming the third hypothesis stating that warning reduces vulnerability to the misinformation effect. In light of the planned comparisons, the difference between non-misled warned and non-warned subjects was significant ( $F_{[1, 341]} = 6.67$ ;  $p = .01$ ; partial  $\eta^2 = .02$ ): non-misled warned subjects performed worse than non-warned non-misled subjects. Thus, the fourth hypothesis stating that warning results in worsening of “normal” memory performance was confirmed.

In the next analysis we explored the interaction among three factors: misinformation, warning, and involvement. This allows checking of whether the interaction between misinformation and warning, described above, is moderated by involvement. The three-way interaction was statistically significant ( $F_{[1, 341]} = 36.09$ ;  $p < .01$ ;  $\eta^2 = .10$ ), and is presented in Figure 2 above.

As can be seen, the effects of warning are quite different in high- and low-involvement conditions. In the case of highly involved participants, the warning improved the performance of misled subjects ( $F_{[1, 341]} = 51.96$ ;  $p < .01$ ; partial  $\eta^2 = .13$ ). However, in the case of the low involvement group, the warning was clearly less efficient – its effect was only marginally significant ( $F_{[1, 341]} = 3.38$ ;  $p = .07$ ; partial  $\eta^2 < .01$ ). Thus, the results seem to contradict the fifth hypothesis, stating that warning is less effective in highly involved groups.

It is also clear that the effect of “tainted truth” shown in Figure 2 – that is, the harmful consequences of warning in the case of non-misled subjects – only occurred in the high-involvement group. In this group, warned non-misled subjects committed more errors than did non-warned non-misled subjects ( $F_{[1, 341]} = 23.95$ ;  $p < .01$ ; partial  $\eta^2 =$

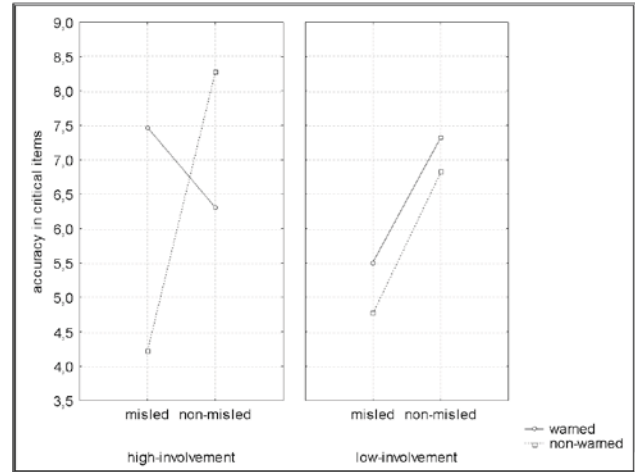


Figure 2. Mean accuracy on critical items as a function of interaction of misinformation, warning and involvement.

.07). However, in the case of low-involvement subjects the warning did not produce any statistically significant differences in the case of non-misled subjects ( $F_{[1, 341]} = 1.63$ ;  $p = .20$ ; partial  $\eta^2 < .01$ ). Looking at the same data the other way we can see that in the case of the high involvement group, warned misled subjects were more accurate on critical items than warned non-misled subjects ( $F_{[1, 341]} = 6.69$ ;  $p = .01$ ; partial  $\eta^2 = .02$ ), which is the usual effect of a warning observed in most experiments. However, in the low-involvement group the effect of warning was reversed: misled subjects were less accurate than non-misled subjects ( $F_{[1, 341]} = 21.56$ ;  $p < .01$ ; partial  $\eta^2 = .06$ ). In other words, the warning “protected” subjects against misinformation in the high-involvement condition, not in the low-involvement one. Hence, the sixth hypothesis stating that deterioration of the memory of the original event caused by warning against nonexistent discrepancies is more pronounced when involvement is low, was not confirmed – in fact, the results show quite the opposite.

Another striking effect of this analysis is the significant difference between high and low involvement conditions in the groups of warned misled subjects: subjects in the low involvement group were more susceptible to misinformation than in the high involvement group ( $F_{[1, 341]} = 20.65$ ;  $p < .01$ ; partial  $\eta^2 < .06$ ).

For exploratory reasons, we also checked the interaction between warning and involvement; it was insignificant ( $F_{[1, 341]} < 0.01$ ;  $p = .98$ ;  $\eta^2 < .01$ ).

In summary, the results indicate that the harmful effects of warning against nonexistent discrepancies only occurred in the case of high involvement. Moreover, the warning reduced the misinformation effect only in the high involvement condition.

Respondents’ subjective confidence in their memory accuracy was analysed in the same way as memory performance was. Warning reduced the subjective confidence of participants ( $F_{[1, 327]} = 5.03$ ;  $p = .03$ ;  $\eta^2 =$



.02). The remaining main effects: misinformation and involvement, were non-significant ( $F_{[1, 327]} = 2.20$ ;  $p = .14$ ;  $\eta^2 < .01$  and  $F_{[1, 327]} = 2.43$ ;  $p = .12$ ;  $\eta^2 = .01$ , respectively). Non-significant effects were also obtained for all possible interactions: misinformation and involvement: ( $F_{[1, 327]} = 2.42$ ;  $p = .12$ ;  $\eta^2 < .01$ ), misinformation and warning ( $F_{[1, 327]} = 2.85$ ;  $p = .09$ ;  $\eta^2 < .01$ ), involvement and warning ( $F_{[1, 327]} = 0.25$ ;  $p = .62$ ;  $\eta^2 < .01$ ) or misinformation, involvement and warning ( $F_{[1, 327]} = 0.05$ ;  $p = .82$ ;  $\eta^2 < .01$ ).

## Discussion

In Experiment I the usual misinformation effect was replicated (for a review, see for example, Ayers & Reder, 1998; Wright & Loftus, 1998; Zaragoza, Belli & Payment, 2006). This confirms how memory is vulnerable to inconsistent postevent information and should be a warning for forensic practitioners. In addition, susceptibility to misinformation was influenced by participants' involvement: those who were involved in the issue, were more resistant to misinformation. Thus, the first hypothesis was confirmed. The interpretation of this result is somewhat complicated by the fact that the predominance of involved subjects was significant both in the misled and non-misled groups. In other words, involved participants performed more correctly on the critical items regardless of the presence or absence of misinformation. Nevertheless, this result suggests that involvement may reduce susceptibility to misinformation.

Assuming that high involvement indeed protects against misinformation, the question arises of, by what specific mechanisms does this take place? For example, it is possible that highly involved subjects might have been very interested in the issue presented in the original material, so they were concentrated on the recording and thus able to remember more details than lowly involved participants. This could have made highly involved subjects less vulnerable to misinformation. Lowly involved participants might have listened to the recording less carefully, so their memory of the original event was weaker. Such an interpretation is consistent with existing findings (e.g. Loftus, 1979) suggesting that the better the memory of the original event, the greater the resistance to relevant misinformation. It is also possible that lowly involved subjects, who followed the original event less carefully, filled their memory gaps with the misinformation from the postevent material.

The warning against the discrepancies between the original and postevent material reduced vulnerability to misinformation in the misled group. More interestingly, and contrary to our hypothesis, this effect seemed only to occur in the case of persons misled and highly involved in the matter. In the case of lowly involved misled group, performance was poor regardless of the presence or absence of warning. This may indicate that the lowly involved

participants did not care for the results, regardless of the warning. Another possible explanation for this effect may be connected with the amount of information remembered from the original event by lowly involved subjects. If one does not remember the original material, the warning against misinformation can not help much. In contrast, highly involved misled participants remembered the original event better and thus were able to take advantage of the warning, because it provided a good justification for perceived discrepancies between the original event and the postevent material.

The tainted truth effect, first described by Echterhoff et al. (2007) was replicated in our study: non-misled warned subjects performed worse than non-misled non-warned ones. This is the only replication of this effect of which we are aware. Thus, the hypothesis stating that warning may cause subjects to refrain from reporting correct information was confirmed.

In our research we also explored the impact of personal involvement on the tainted truth effect. It turned out that contrary to the third hypothesis stating that the tainted truth effect is greater in the case of lowly involved subjects, the tainted truth effect was observed in the highly involved group only. In the case of the low involvement group, the warning did not deteriorate the results of non-misled subjects. Thus, it is possible that subjects who did not care for the issue presented in this experiment also did not care for the warning, and therefore no overcorrection took place. It is even possible that non-involved subjects did not remember the original event very well, nor did they remember its description. In this case overcorrecting was difficult because a necessary prerequisite for this action is remembering the correct postevent information.

In contrast, the tainted truth effect was quite apparent in the highly involved group. It is possible that highly involved participants, being more interested in the issue, read the description of the original event very carefully, and were unable to detect any discrepancies between it and the original event (because there were not any). Following Grice's (1975) suggestion that people normally assume the cooperative principle in human communication, we can suppose that subjects did not suspect that the experimenter was trying to "deceive" them, and they might have disavowed a lot of information from the postevent material. Hence, the level of performance in the memory test in this group became lower.

The only significant result concerning subjective confidence in the results was connected with the warning: it reduced confidence (regardless of other factors: misinformation and involvement). This may be surprising because warning is, technically speaking, simply information that the postevent text may be inconsistent with the original event. Those of the subjects who noticed these discrepancies should not be less confident because the warning provides

an explanation for the inconsistencies. The results were quite opposite, which suggests that the majority of the subjects were not aware of the inconsistencies. In this case, warning confused the subjects, because they could not detect the discrepancies between the original event and the postevent material.

To clarify more precisely the mechanisms of the effects observed in Experiment I, we checked whether the subjects did remember the information presented in the original event. It is not impossible that high memory performance in the control groups where description was totally congruent with the recording was caused not by remembering the original event, but rather by recollecting information read in the postevent material. Such a mechanism could have influenced the memory performance in other groups as well. To verify how much of the original information could be remembered by the participants, we then conducted Experiment II, in which subjects did not receive any postevent description of the recording.

## Experiment II

### Method

#### Participants

Sixty high-school students took part in this study (43 females, 17 males). Mean age was 16.05 ( $SD = 0.29$ ). As in the previous experiments, no gratification for participating in the experiment was given.

#### Materials

In Experiment II, the same materials applied in Experiment I were used, except that no description of the recording was provided to the subjects.

#### Procedure

The procedure of the study was almost the same as in Experiment I, but no warning manipulation was applied. Subjects also did not read any texts on the recording. The only independent variable in Experiment I was high vs. low involvement.

### Results

To clarify whether reading the postevent description consistent with the original event positively influenced memory performance in Experiment I, the outcomes from relevant groups from Experiment I were compared with those from this experiment, and thus the procedure was rather a quasi-experiment. A two-way ANOVA was performed with two factors: presence vs. absence of the postevent text, and high vs. low involvement and performance on

the critical items as the dependent variable. The only statistically significant effect was that of involvement – high involvement groups performed better ( $F_{[1, 154]} = 35.46$ ;  $p < .01$ ;  $\eta^2 < .19$ ). The main effect of the presence/absence of the postevent text was non-significant ( $F_{[1, 154]} = 2.74$ ;  $p = .10$ ;  $\eta^2 < .02$ ), nor was the interaction between involvement and the presence/absence of postevent text ( $F_{[1, 154]} = 0.23$ ;  $p = .63$ ;  $\eta^2 < .08$ ).

The same analysis was performed in the case of subjective confidence in memory accuracy, with the following results: higher confidence in the group in which the postevent information was presented ( $F_{[1, 154]} = 17.51$ ;  $p < .01$ ;  $\eta^2 = .10$ ). As was observed in Experiment I, the main effect of high vs. low involvement was non-significant ( $F_{[1, 154]} = 2.54$ ;  $p = .11$ ;  $\eta^2 < .02$ ), as was the interaction of the involvement level and the presence/absence of the postevent information ( $F_{[1, 154]} = 0.10$ ;  $p = .75$ ;  $\eta^2 < .01$ ).

In summary, the results of Experiment II suggest that memory performance on the critical items was not influenced by the presence of the postevent information.

### Discussion

The main purpose of Experiment II was to verify whether the results obtained by control subjects' memory performance were affected by reading a text containing information consistent with the original event. Such a text might have refreshed the controls' memory or even filled their memory gaps. To verify this, results of control subjects from Experiment I were compared to a new group of subjects, who did not read any postevent text at all. The difference between control groups was non-significant, nor was the interaction between the involvement and the "presence vs. absence of postevent text" factor. Thus, it follows that reading the consistent postevent information did not influence the memory of control subjects in Experiment I. Of course, inferring nonexistence from an insignificant effect is risky, but the statistical power in this analysis was quite high: with about 30 cases per cell the power to detect even a moderate effect size, e.g. eta-squared of .06, which corresponds to Cohen's  $f$  of .25 and Pearson's  $r$  of .25, "explaining" about 6% of variance was approximately 90% Cohen (1988). The power to detect any bigger effect is of course even greater. Thus, it can be stated that there was a great probability of detecting any nontrivial effect. Since it was not detected, we can state that subjects reading and not reading the postevent text indeed do not differ in their memory performance.

This result is important, because if the consistent postevent narrative improved the memory of control subjects, the results of Experiment I would become uninterpretable and inconclusive. First of all, if reading the postevent material improved the memory of controls, the difference between controls and misled subjects could

no longer be unambiguously attributed to the effects of misinformation - the misled group might have performed worse not because the misinformation deteriorated its results, but rather because the postevent material improved the memory of controls. As this was not the case, the results concerning the misinformation effect seem to be valid.

In Experiment II, involvement influenced memory performance – highly involved persons performed better than those lowly involved, thus replicating the results from Experiment I.

Confidence was higher in the case of subjects who received consistent subsequent information. This is intuitively understandable, as the text did not contain any discrepancies.

### General discussion

In general, the results of our experiments suggest that personal involvement is an important factor, capable of impacting the memory's functioning, and mediating or moderating the impact of various other variables on the mechanisms of the misinformation effect. First of all, high involvement alone improved memory functioning, thus confirming prior findings (e.g. Allport, 1943; Bellezza, 1984; Greenwald & Pratkanis, 1984; Rogers et al. 1977). To be precise, in our research, involvement was defined and operationalized in the way suggested by Apsler and Sears (1968), that is, we assumed that high involvement occurs when the person believes that the matter at hand has consequences for his/her life. Such involvement seems to improve memory. This is intuitively understandable – from the perspective of adaptation paying more attention to a stimulus which might be important for one's life functioning, engaging in its careful processing, encoding and keeping it in memory is understandable. The effect of involvement was statistically significant in Experiments I and II.

Secondly, the highly involved and lowly involved groups differed as regards the effects of warning in the misled group – it reduced vulnerability to misinformation in the former but not in the latter. According to Christiaansen and Ochalek (1983), a necessary prerequisite for a warning to be effective is encoding of the original event – such an encoding might have been poor in the case of non-involved subjects. Moreover, Polczyk (2007) stated that the warning is only effective when subjects are able to detect discrepancies between the original event and the postevent material, which means that subjects must not only encode and remember the original event, but also encode and remember the misinformation. If they do not see such discrepancies, warning can not reduce the misinformation effect, because subjects simply do not know what information from the postevent material they should beware of. For example,

let us assume that according to the original event students could pass the final exam once a year, and according to the postevent material such an exam could be passed twice. If a subject is aware of this inconsistency, the warning provides immediate justification for it and the subject no longer has any reason to rely on the misinformation. If however a subject remembered the original information but did not notice the relevant misinformation, there would not be any misinformation effect at all and therefore the warning could not reduce it. Finally, if the subject did not notice the original information but noticed the misinformation, he/she can not be aware what is false in the postevent material and the efficacy of warning would be poor. In fact, in such a situation the warning can only be effective if the subject rejects all information from the postevent material. It appears then, that a warning would be most effective in the case of subjects remembering both the original and the postevent information. The number of such subjects might be lower in the group of non-involved subjects.

Non-misled participants performed worse, when they were warned, compared to non-misled non-warned ones. This is probably the most important result of the studies presented in this article and has obvious consequences for forensic psychology. On one hand, it is well accepted that instructing eyewitnesses that they should rely on their own memories only and reject information stemming from other sources is generally beneficial for the quality of testimonies (e.g. Chambers & Zaragoza, 2001). However, in the light of the results presented in this article, replicating those obtained by Echterhoff et al. (2007), it may be that in some circumstances such warnings may deteriorate the quality of eyewitness statements. If the person received correct postevent information about an incident to which he/she witnessed and was warned against any source of information different from the incident alone, he/she may reject this correct postevent information, and this may result in less correct testimony.

To be precise, in our research the tainted truth effect was shown only in the case of high involvement. Contrary to our expectations, such an effect was not observed in the lowly involved groups. It is possible that the existence of the tainted truth effect among highly involved participants is caused by their engagement in the reading of the postevent information. Unlike lowly involved subjects, those highly involved might have wanted to get as much information about the issue the reform presented as original material allowed. Thus, they read the description carefully, which might have caused enlarged access to the postevent information – the basis for the overcorrecting process.

A rather pessimistic conclusion follows: warning against (nonexistent perhaps) misinformation may be especially dangerous in the case of highly involved witnesses. In general, it appears that the warning against discrepancies between the original event and the postevent material should

have an extensive form. The witnesses should be told that they are asked to rely on their own memories only during interrogation, not on external sources like TV, Internet or other people, because these external sources may be wrong. However, the witnesses should also be told that if the information stemming from other sources is congruent with their own memories, they should not hesitate to use it during their testimony. Of course, such a warning is more complicated and may even be difficult to understand for some witnesses. However, in light of the results presented in this paper, such a warning may minimize the risk of tainted truth – the risk of the negative influence of the warning on non-misled witness reports.

## References

- Apsler, R. & Sears, D. O. (1968). Warning, personal involvement, and attitude change. *Journal of Personality and Social Psychology*, 9, 162-166.
- Ayers, M.S. & Reder, L.M. (1998). A theoretical review of the misinformation effect: Predictions from an activation-based memory model. *Psychonomic Bulletin and Review*, 5, 1-21.
- Bartlett, F. C. (1932/1995). *Remembering. A Study in Experimental and Social Psychology*. Cambridge: Cambridge University Press.
- Bellezza, F. S. (1984). The self as a mnemonic device: the role of internal cues. *Journal of Personality and Social Psychology*, 47, 506-516.
- Blank, H. (1998). Memory states and memory tasks: an integrative framework for eyewitness memory and suggestibility. *Memory*, 6, 481-529.
- Christiaansen, R. E. & Ochalek, K. (1983). Editing misleading information from memory: Evidence for the coexistence of original and postevent information. *Memory & Cognition*, 11, 467-475.
- Chambers, K. L. & Zaragoza, M. S. (2001). Intended and unintended effects of explicit warnings on eyewitness suggestibility: Evidence from source identification tests. *Memory & Cognition*, 29, 1120-1129.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*, 2nd Ed. Hillsdale, NJ: Erlbaum.
- Dalton, A.L. & Daneman, M. (2006). Social suggestibility to central and peripheral misinformation. *Memory*, 14, 486-501.
- Dovidio, J. F., Kawakami, K., Johnson, C., Johnson, B. & Howard, A. (1997). On the nature of prejudice: Automatic and controlled processes. *Journal of Experimental Social Psychology*, 33, 510-540.
- Echterhoff, G., Groll, S. & Hirst, W. (2007). Tainted truth: overcorrection for misinformation influence on eyewitness memory. *Social Cognition*, 25 (3), 367-409.
- Echterhoff, G., Hirst, W. & Hussy, W. (2005). How eyewitness resist misinformation: Social postwarnings and the monitoring of memory characteristics. *Memory & Cognition*, 33, 770-782.
- Greene, E., Flynn, M. B. & Loftus, E. F. (1982). Inducing resistance to misleading information. *Journal of Learning and Verbal Behavior*, 21, 207-219.
- Greenwald, A. G. (1981). Self and memory. *The Psychology of Learning and Motivation*, 15, 201-236.
- Greenwald, A. G., & Pratkanis, A. R. (1984). The self. In: R. S. Wyer & T. K. Srull (Eds.), *Handbook of social cognition* (pp. 129-178). Hillsdale, NJ: Erlbaum.
- Grice, (1975). Logic and conversation. In: P. Cole & J.L. Morgan (Eds.), *Syntax and semantics 3: Speech acts* (str. 41-58). New York: Academic Press.
- Hunter, I. M. A. (1957). *Memory: Facts and fallacies*. Penguin, Harmondsworth.
- Hymes, R. W. (1986). Political attitudes as social categories: A New Look at selective memory. *Journal of Personality and Social Psychology*, 51, 233-241.
- Kunda, Z. & Spencer, S. J. (2003). When do stereotypes come to mind and when do they color judgment? A goal-based theoretical framework for stereotype activation and application. *Psychological Bulletin*, 129 (4), 522-544.
- Lindsay, D. S. (1990). Misleading suggestions can impair eyewitnesses' ability to remember event details. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 16 (6), 1077-1083.
- Lindsay, D. S. & Johnson, M. K. (1989). The eyewitness suggestibility effect and memory for source. *Memory & Cognition*, 17 (3), 349-358.
- Loftus, E. F. (1979). Reactions to blatantly contradictory information. *Memory & Cognition*, 5, 368-374.
- Loftus, E. F., Miller, D. G. & Burns, H. J. (1978). Semantic integration of verbal information into a visual memory. *Journal of Experimental Psychology: Human Learning and Memory*, 4, 19-31.
- Markus, H. (1977). Self-schemata and processing information about the self. *Journal of Personality and Social Psychology*, 35, 63-78.
- Martin, L. L. (1986). Set/reset: Use and disuse of concepts in impression formation. *Journal of Personality and Social Psychology*, 51, 493-504.
- Neuschatz, J. S., Payne, D. G. Lampinen, J. M. i Togli, M. P. (2001). Assessing the effectiveness of warnings and the phenomenological characteristics of false memories. *Memory*, 9, 53-71.
- Polczyk, R. (2007). *Mechanizmy efektu dezinformacji w kontekście zeznań świadka naocznego [Misinformation effect mechanisms in the context of eyewitness testimony]*. Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego.
- Styśko, M. (2004). Rola negatywnych stereotypów w procesie obwiniania sprawców. In: M. Kofta (Eds.) *Myślenie stereotypowe i uprzedzenia. Mechanizmy poznawcze i afektywne [Stereotypical thinking and prejudices. Cognitive and affective mechanisms]*. (pp. 247-263). Warszawa: Wydawnictwo Instytutu Psychologii PAN.
- Wallen, R. (1942). Ego-involvement as a determinant of selective forgetting. *The Journal of Abnormal and Social Psychology*, 37 (1), 20-39.
- Wojciszke, B. (1986). *Teoria schematów społecznych. Struktura i funkcjonowanie jednostkowej wiedzy o otoczeniu społecznym [Social schema theory. Structure and functioning of personal knowledge about social environment]*. Wrocław-Warszawa-Kraków-Gdańsk-Łódź: Zakład Narodowy Imienia Ossolińskich, Wydawnictwo Polskiej Akademii Nauk.
- Wright, D. B. & Loftus, E. (1998). How misinformation alters memories. *Journal of Experimental Child Psychology*, 71, 155-164.
- Wright, D.B. & Stroud, J.N. (1998). Memory quality and misinformation for peripheral and central objects. *Legal and Criminological Psychology*, 3, 273-286.
- Zaragoza, M. S., Belli, R. S., & Payment, K. E. (2006). Misinformation effects and the suggestibility of eyewitness memory. In: M. Garry & H. Hayne (Eds.). *Do justice and let the sky fall: Elizabeth F. Loftus and her contributions to science, law, and academic freedom*, (pp. 35-63). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Zaragoza, M.S. & Lane, S.M. (1994). Source misattributions and the suggestibility of eyewitness memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 20, 934-945.