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Mindfulness/mindlessness as a new factor influencing false memories: evidence from imagination inflation and modified premature cognitive commitment study

Two effects that can influence the creation of false memories were investigated. First, the classic effect of imagination inflation was investigated. Second, the effect of exposure to modified premature cognitive commitment procedure, in which subjects apply bias correction in order to be opposed to suggested information. 24 subjects were asked to perform, imagine or hear simple action statements. Then half of the subjects imagined performing some other actions. One week later half of the subjects were exposed to false information that they have the tendency to underestimate the quantity of many occurrences in everyday life. The surprising finding was that imagination inflation effect had not emerged. Nevertheless, the exposure to information about fictitious deficit led to bias correction and to source monitoring errors in which actions that had not been presented were recollected as having been imagined or heard.

Keywords: false memories, imagination inflation, source monitoring, premature cognitive commitment, bias correction, mindfulness/ mindlessness

Introduction

Imagination inflation and source monitoring errors

The basic problem undertaken in this paper is the question of factors which can increase the number of false memories. False memories are memory distortions in which subjects retrieve memories of events which in fact have never happened. These distortions are called *commissions*, contrary to *omissions* in which people fail to retrieve real memories (Schacter 2001; Niedźwieńska, 2004). One of the procedures which lead to the creation of false memories is *imagination inflation*. This effect means that imagining performance of an action can cause remembering that this action has taken place in reality (Loftus, 1997). There are two possible explanations of this phenomenon. First, it could be that imagining of an event makes it simply more familiar and cognitively available. Therefore, it leads to higher assessments in terms of probability of such events' occurrences in the past (Garry et al., 1996). This interpretation is consistent with Tversky and Kahneman's predictions (Tversky & Kahneman, 1973) and tells more about judgments than false memory formation. Second, there is a chance of more complex psychological mechanism being involved. If the act of imagination includes many

vivid perceptual features it could be misinterpreted as something that happened in reality. This misinterpretation is not conscious and intentional but is the effect of *source monitoring errors* (Johnson, Hashtroudi & Lindsay, 1993). According to the framework of source monitoring, recollections are attributions that are products of judgment processes. When a piece of information is retrieved subject must decide whether an event or an action happened in the external world and was perceptually derived or was generated by the subject himself/herself. This decision is called *reality monitoring*. Subject must also specify the exact source of information; he/she must make an *external source decision* ("Did I hear it from person A or person B?"; "Did I watch it on TV or read about it in the newspaper?") or an *internal source decision* ("Did I think about it or did I imagine that?"). The errors may occur at the stage of reality monitoring when the source of memory is attributed as external whereas, in fact, it was internal. If in this is case a source monitoring error is made, and it leads to the creation of false memories. Errors can show the reverse direction (the source was external but is attributed as internal) or they may occur at the later stage (when subject thinks that he/she watched something on TV whereas, in reality, he/she read about it in the newspaper).

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This framework is consistent with recent theories in which it is assumed that each information is encoded in terms of its content and its source (Reyna, 2000).

Mindfulness/mindlessness and premature cognitive commitment

In many experimental research studies factors which can increase the effect of imagination inflation were analyzed. It is well documented that more false memories emerge when there are more acts of imagining (Goff & Roediger, 1998), when these acts contain many perceptual features (Thomas, Bulevich & Loftus, 2003) and when there is a time retention between imagining and remembering (Goff & Roediger, 1998; Strózak, 2007). Are there any other, more general factors that can influence the creation of false memories? The proposition underlying present research focuses on the influence of two general states of mind in which people may be functioning, i.e. mindfulness and mindlessness. According to Langer (1989) mindfulness is the state of cognitive activation and conscious behavior, whereas mindlessness is the state of reduced attention and passive reactions. If it is stated that the process of retrieving information from memory is the process of source monitoring, we can assume that this monitoring might be mindful or mindless. Mindful source monitoring would be an active effort to retrieve the most precise source of information, while mindless source monitoring would be a superficial decision guided by a routine or a rule.

It seems credible to predict that more false memories would develop in the state of mindlessness, when source monitoring would be a passive process. Is there any possibility to activate such mindless information processing during a laboratory experiment? Chanowitz & Langer (1981) developed a procedure which leads to the phenomenon called *premature cognitive commitment*. According to them, “mindlessness may come about upon initial exposure to information” (p. 1052). There are two conditions which must be fulfilled. First, the information must be irrelevant to the subject and can not be critically examined. Therefore, all the assumptions underlying this information are accepted and form a “rigid” representation. Second, at the later stage the same information must become relevant. Then the subject would behave in a way which would be consistent with previously formed representation. This behavior might be very strict and difficult to change.

In the experiment conducted by Chanowitz & Langer subjects received information about a perceptual deficit and were told that this deficit was either rare or widespread in the population. It was assumed that the first group of subjects would treat this information as irrelevant to themselves and the second group – as relevant. Moreover, half of the subjects from each group were asked to think about the information whereas the other half

were not asked to do so. All subjects were then instructed to perform a perceptual task. Although their results were correct they were informed about inferior performance which indicated that they suffer from the perceptual deficit. On the subsequent perceptual task in which subjects had to find objects hidden in a drawing only one group obtained inferior results. These were the subjects who were initially told that the deficit is rare in the population and were not asked to think about it. The authors claim that this laboratory result has its reflection in reality. They give an example of elderly people, who may make natural errors of memory as indications of senility merely because some time ago in the past they had mindlessly accepted the information about such a connection.

Bias correction as a result of modified premature cognitive commitment procedure

The basic assumption underlying present research is that conducting modified premature cognitive commitment procedure might result in mindless source monitoring and, therefore, in an increase of the number of false memories. If subjects receive information about rare memory deficit (and treat this information as irrelevant to themselves) and later come to believe that in fact they suffer from that impairment, would they behave consistently with all the information about the nature of that deficit? Suppose that this deficit shows a tendency to overestimate the quantity of many occurrences from the past in everyday life. Would subjects show subsequent deficits and develop more false memories because they assess that more things have happened to them even if they do not remember them? There are at least two factors that must be taken into consideration. First, there is no support for the assumption that subjects would treat any information given to them in a psychological experiment as irrelevant to themselves. In experimental studies, according to Orne (1962), each subject actively participates in the procedure and treats the situation as a problem-solving task. Thus, it seems plausible that information about rare cognitive deficit would make subjects’ attention and thinking processes more focused and concentrated, contrary to Chanowitz & Langer’s predictions. Second, information about memory deficit and subsequent memory task is something quite different from information about perceptual deficit and perceptual task. Chanowitz & Langer used a challenging task (finding objects hidden in a drawing) which tested subjects’ abilities and perceptual skills (observation, attention). It seems that the effect in their study was in large part due to the weakening of those skills as a result of mindless acquisition of information (as it is also in the case when false belief in something, e.g. senility, results in real impairments in functioning, e.g. memory deficits among elderly people). It has to be strongly stated, however, that performing a memory task involves much more conscious control than performing

a perceptual task. Therefore, it cannot be expected that subjects would behave mindlessly during performing such a task, as it was during performing a perceptual task. On the contrary, due to the conscious control their responses would be the effects of mindful source monitoring. According to Johnson, Hashtroudi & Lindsay (1993, p. 4) "many source monitoring decisions are made rapidly and relatively nondeliberately (...) without any awareness of decision-making processes. Sometimes, however, source monitoring involves more strategic processes. Such decisions tend to be slower and more deliberate and involve retrieval of supporting memories, noting or discovering relations, and initiation of reasoning". It is highly plausible that in the present research the latter, controlled source monitoring processes would occur.

Is there any chance of increasing the effect of imagination inflation using the procedure proposed by Chanowitz & Langer? The answer comes from studies on attitudes and attitude change. It seems credible to make predictions concerning remembering upon literature from that field because acts of mindful source monitoring, as was stated above, might involve processes connected with attitude formation and attitude change (e.g. reasoning). According to Wegener and Petty's *Flexible Correction Model (FCM)* a person who thinks that he/she suffers from any deficit would pursue to overcome this deficit (Wegener & Petty, 1995). Such an effort is called *bias correction* and there are two conditions of its occurrence. First, a person must be aware of the factor which influences his/her behavior. Second, a person must be motivated and able to overcome it. It seems that both conditions are fulfilled in the procedure described above. There is only one thing that has to be changed, namely the information about the nature of memory deficit that would be given to subjects. If they are informed that they overestimate the quantity of many occurrences, they would be more cautious and would try to avoid mistakes in remembering, therefore producing fewer false memories. Yet, if the case is opposite and they are informed that they underestimate the quantity of many occurrences, they would put more effort to retrieve as much information as possible. In such a situation there is a chance that subjects would make statements indicating that something has happened even if they do not have any vivid recollections. These statements would be caused by the effort to overcome the fictitious deficit and would result in the creation of false memories.

Hypotheses

Three hypotheses were formulated. First, it was predicted that subjects imagining performing actions would develop more false memories than subjects making no imaginings (imagination inflation effect). Second, a greater number of false memories was expected among subjects exposed to modified premature cognitive commitment procedure.

Third, it was predicted that the greatest number of false memories would be obtained among subjects who both imagine performing actions and are exposed to modified premature cognitive commitment procedure.

Method

There were two independent variables: the number of imaginings made by subjects: zero or three (IV1) and the exposure to modified premature cognitive commitment procedure: the exposure and lack of it (IV2). Therefore, there were four experimental groups (2 X 2 ANOVA). There were three dependent variables, each referring to different aspect of false memories: the number of actions not presented to subjects and recollected as having been performed (DV1), the number of actions not presented to subjects and recollected as having been imagined (DV2) and the number of actions not presented to subjects and recollected as having been heard (DV3).

Subjects

Subjects were 24 undergraduates of The John Paul II Catholic University of Lublin (12 females and 12 males), ranging in age from 18 to 24, with a mean of 21. They received no course credit or money for their participation.

Apparatus

The material used in the experiment was derived from Goff & Roediger's study (1998). 68 items depicting simple actions were chosen. They were non-object items and did not require any object to perform (e.g. "Cross your fingers"). Among these items 48 were critical items and 20 were filler items. Critical items were randomly split into four categories depending on the task in session 1: actions to be heard and performed (category A), actions to be heard and imagined (B), actions to be heard (C) and actions not presented (D). Additionally, three items from each category were randomly chosen, which gave 12 items (category E). These items were devoted to serve as actions to be imagined during session 2.

Sheets of math problems (addition, subtraction and multiplication) were also provided for session 1 and scales to rate the vividness of imagined items for session 2. In session 3 the description of a fictitious deficit of recall, a list of 204 words and charts with fictitious interpretations of scores were used. For session 4 a recognition test and a source monitoring test with scales to rate the confidence of judgments were prepared.

Procedure

The experiment consisted of four sessions. All subjects participated in sessions 1 and 4. Half of the subjects (groups III and IV) participated in session 2 in which they imagined

some actions in order to obtain imagination inflation effect. Also half of the subjects (groups I and III) participated in session 3 in which they were exposed to modified premature cognitive commitment procedure.

Session 1.

Subjects were tested in two groups (12 subjects in each group). 36 critical items from categories A, B and C were read aloud by the experimenter. Subjects were asked to perform, imagine or hear each action. The items were read at a 15-second rate. After reading items which had to be merely heard, the experimenter asked subjects to do math problems (addition, subtraction and multiplication) on sheets. These math problems were given to prevent subjects from imagining or rehearsing the statements. Items were presented randomly, but it was restricted that no more than two items from each category might occur in a row. This session lasted approximately 30 minutes. After that, subjects completed unrelated questionnaire which served as a 10-minute break. Then, half of the subjects were dismissed and reminded of the next session. Another half of the subjects took part in session 2.

Session 2.

This session took place immediately after session 1. Subjects were tested in one group (12 subjects). In this session 12 items from category E were used. Subjects were asked to imagine performing each action in a precise and detailed way. Each action was imagined three times, so subjects imagined a total of 36 actions. It was restricted that before imagining the same action again there must be at least five different actions imagined. Subjects had 12 seconds for each item to be imagined. After every single act of imagination they assessed how vivid it was along a five-point scale (1 – “no vivid at all”; 5 – “perfectly vivid”). This assessment was meant to ensure that subjects would actually form an image every time. Though, assessment scores were not analyzed further and did not serve as a base to delete any single datum from statistical analysis. Session 2 lasted approximately 30 minutes. After imagining all the actions subjects were dismissed and reminded of the next session.

Session 3.

This session took place one week after session 2. Each subject was tested individually. The experimenter read aloud description of a fictitious deficit of recall which was rare and concerned only 10% of population. It was stated that people prone to this deficit tend to underestimate the quantity of many occurrences in everyday life. The description did not suggest that the deficit is a strong or dangerous disorder. On the contrary, quite innocuous nature of it was emphasized. After having read the description the experimenter asked subjects to participate in a short and

simple psychological test which could assess if someone is prone to the deficit described. Subjects were presented with a list containing 204 words. They had 15 seconds to look at the list and then they had to assess how many words beginning with the syllable “ma” were on that list. Subjects made their responses and then they were shown a chart which indicated that their results are typical for people prone to the deficit of recall. There were several charts prepared and the experimenter always showed the one in which the number of words stated by the subjects was interpreted as an “underestimation”. It seems impossible to assess correctly the number of words beginning with any syllable after looking for only 15 seconds at the list consisting of more than 200 words. Thus, it must be remembered that whole procedure in this session was meant to belie subjects. There was a risk that subjects would not be misled. During debriefing, however, all the subjects who participated in session 3 claimed that they were unsuspecting towards the experimenter and did regard all the information given to them as trustworthy. On the basis of such self-reports it seems justified to state that all subjects exposed to modified premature cognitive commitment procedure came to believe that they were prone to the deficit of recall. Session 3 lasted approximately 10 minutes.

Session 4.

This session took place immediately after session 3 (for groups I and III) or one week after session 1 (for group II) and session 2 (for group IV). Each subject was tested individually and was given a recognition test and a source monitoring test. 68 items (48 critical and 20 filler items) were presented randomly. Subjects were strongly reminded to answer on the basis of what they remember from session 1. Subjects who participated in session 2 were instructed that what they did in session 2 is irrelevant. Subjects had to answer two questions. First, “Did you hear the action during session 1?” and second, if the answer to the first question was “yes”, “Did you perform the action, imagine it or just listen to it?” Subjects made confidence assessments on each source monitoring judgment along a 7 – point scale (1 – “not sure at all”, 7 – “definitely sure”). Only scores reaching “5” or more on the scale were treated as positive responses indicating that a certain action was performed, imagined or heard. Session 4 lasted approximately 10 minutes, after that all the subjects were debriefed.

Results

Two-way analysis of variance was conducted on each dependent variable separately. There were no statistically significant differences in the number of actions not presented to subjects and recollected as having been performed (DV1). The analysis on DV2 (the number of actions

Table 1
Mean number and standard deviation of actions not presented to subjects and recollected as having been imagined (DV2) as a function of number of imaginings and the exposure to the modified premature cognitive commitment procedure.

Source monitoring errors	0 imaginings		3 imaginings	
	Exposure to the procedure Group I	Lack of exposure to the procedure Group II	Exposure to the procedure Group III	Lack of exposure to the procedure Group IV
M	5.17	1.33	3.67	3.17
SD	2.56	1.37	3.39	2.04

Table 2
Mean number and standard deviation of actions not presented to subjects and recollected as having been heard (DV3) as a function of number of imaginings and the exposure to the modified premature cognitive commitment procedure.

Source monitoring errors	0 imaginings		3 imaginings	
	Exposure to the procedure Group I	Lack of exposure to the procedure Group II	Exposure to the procedure Group III	Lack of exposure to the procedure Group IV
M	3.00	2.00	6.83	2.33
SD	4.15	0.63	3.49	1.63

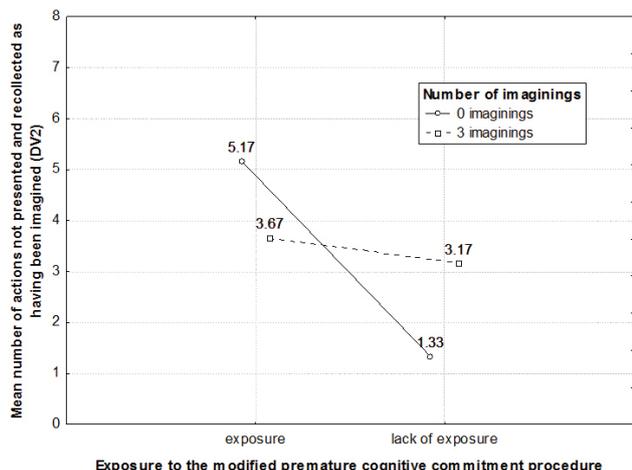


Figure 1. Mean number of actions not presented to subjects and recollected as having been imagined (DV2) in each group.

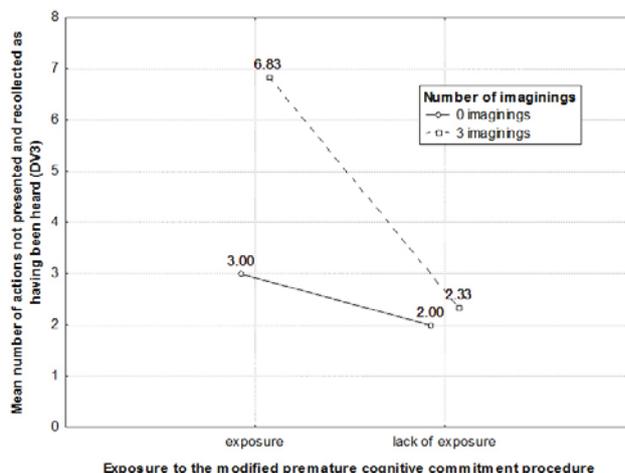


Figure 2. Mean number of actions not presented to subjects and recollected as having been heard (DV3) in each group.

not presented to subjects and recollected as having been imagined) revealed the main effect of IV2 (the exposure to the modified premature cognitive commitment procedure), $F(1, 21)=4.32, p<.06, \eta^2=17\%$. Subjects exposed to the modified premature cognitive commitment procedure developed more false memories ($M=4.42, SD=2.97$) than subjects not exposed to this procedure ($M=2.25, SD=1.91$). Thus, second hypothesis was confirmed. There was neither main effect of imagination (first hypothesis was not confirmed) nor interaction effect.

Theoretical framework allowed to predict that the greatest number of false memories would be obtained among subjects who made imaginings during session two and were exposed to the modified premature cognitive commitment procedure (third hypothesis). Contrast analysis on DV2 did not confirm this prediction. On the contrary, the mean number of actions not presented to subjects and recollected as having been imagined was highest among

subjects who made no imaginings but were exposed to the procedure (group I as compared to all other groups simultaneously, $M=5.17, SD=2.56, t(20)=2.11, p<.05$). One by one between-group comparisons revealed, however, that the result for group I was greater only in comparison to group II (subjects from this group made no imaginings and were not exposed to the procedure, $M=1.33, SD=1.37, t(20)=2.71, p<.02$). Table 1 and Figure 1 show mean number and standard deviation for DV2 in each group.

The main effect of IV2 was also obtained on DV3 (the number of actions not presented to subjects and recollected as having been heard), $F(1, 21)=5.28, p<.04, \eta^2=20\%$. Subjects exposed to the modified premature cognitive commitment procedure developed more such false memories ($M=4.92, SD=4.17$) than subjects not exposed to this procedure ($M=2.17, SD=1.19$). Thus, second hypothesis was confirmed again. IV1 (number of imaginings) revealed no significant effect (first hypothesis was not confirmed).

Interaction effect was not observed, either.

Analysis conducted on DV3 did not confirm the third hypothesis. Between-group comparisons revealed only one statistically significant result. More false memories were observed among subjects who made imaginings and were exposed to the modified premature cognitive commitment procedure (group III, $M=6.83$, $SD=3.49$) than among subjects who made imaginings but were not exposed to the procedure (group IV, $M=2.33$, $SD=1.63$, $t(20)=2.74$, $p<.02$). Mean number and standard deviation for DV3 in each group are shown in Table 2 and Figure 2.

Discussion

Results obtained in the experiment confirmed the second hypothesis. More false memories were observed among subjects who were exposed to the modified premature cognitive commitment procedure. Thus, it can be stated that these subjects came to believe that they were prone to the specific deficit of recall and tried to behave contrary to the assumptions underlying this deficit. According to Petty and Wegener (1995) they were using *bias correction*, which influenced their source monitoring decisions and consequently led to errors.

However, two issues must be taken into consideration. First, the main effect of the modified premature cognitive commitment was observed only among actions which were not presented at the beginning of the experiment and later were recollected as having been imagined or heard. Such false memories do not reflect the case in which subjects confuse imaginings with actions. Of most interest were cases in which subjects would claim that they had performed actions which were never presented. This effect was not obtained.

Second, it can be argued whether mindful or mindless processes underlied decisions made by subjects exposed to the modified premature cognitive commitment. In Chanowitz and Langer's (1981) study it was obvious that subjects had mindlessly accepted the information which later guided their behavior. Here, after changing the procedure and giving the chance for *bias correction* to emerge, it is not so clear. In order to explain this ambiguity two levels of mindfulness must be separated. The first level would reflect mindful attitude of subjects after exposure to the modified premature cognitive commitment procedure. This means that subjects applied *bias correction* and devoted all their attention in order not to behave in a way which could confirm that they are prone to the deficit (i.e. they avoid admitting that they do not remember some actions from session one). The second level would reflect mindful source monitoring during which subjects correctly distinguished what they had performed, imagined or heard in each session of the experiment. It seems plausible that

subjects were mindful at the second level to a certain degree, which helped them to make correct decisions about what they had performed during the first session (such false memories were not observed). But when it came to distinguish between what had been imagined or heard more mindless processes might have been engaged. Assuming that mindfulness from the first level was still high it seems reasonable that source monitoring errors finally occurred. It is safer for subjects to claim that they imagined or heard something that had never been presented than to claim that they performed something that had never taken place. Such a situation has less serious consequences and still might be sufficient as *bias correction*.

It is interesting that the influence of exposure to the modified premature cognitive commitment procedure resulted in more false responses that something was "imagined" when subjects made no imaginings during session two and, on the other hand, in more false responses that something was "heard" when subjects made imaginings during session two. It seems that the additional acts of imagination during session two weakened the ability to exact source monitoring of what had been heard during session one. When there were no such additional imaginings, the effect of false "heard" responses disappeared and the effect of false "imagined" responses took its place. This situation reflects a kind of interaction effect but, because such an effect has no reflection in statistical analyses, it is highly speculative.

Surprisingly, the first hypothesis was not confirmed. Subjects who made imaginings during session 2 did not develop more false memories than subjects who made no imaginings. The fact that the classic effect of imagination inflation was not observed needs extensive explanation. This might be because of different procedures used in the present study and in the study of Goff & Roediger (1998). Goff and Roediger used 136 items, half of which were object items (they required an object to be performed, e.g. "Flip the coin"). In the present study only 68 items were used and all of them were non-object items (e.g. "Cross your fingers"). What is more, Goff & Roediger showed that object statements were better recognized (p. 29). It resulted in more recognition accuracy and, therefore, gave more chances for false memories to develop. In the present study recognition accuracy was probably lower and presumably it was the purpose of the lack of the imagination inflation effect.

There were two other discrepancies in procedures which might have influenced the results. First, Goff and Roediger used immediate, one-day, one-week and two-week periods between sessions. In the present study there was only one-week period. Second, Goff and Roediger used wider range of number of imaginings (0, 1, 3 or 5), whereas in the present study there were only two levels (0 or 3 imaginings). Probably, more levels of these independent variables allowed to gather more varied results. There is

one more factor which might have led to the lack of the imagination inflation effect in the present study. In each study concerning imagination there is a question whether imaginings made by subjects are detailed. Although scales to rate the vividness of imagined items were used, there is no proof that subjects really put significant effort in their imaginings. Such an effort resulting in imaginings with many perceptual features seems to be crucial to obtain the effect of imagination inflation.

To recapitulate briefly, the aim of this study was to point new factors which can lead to the creation of false memories. Although the classic effect of imagination inflation was not obtained the results revealed much more interesting effect. More false memories developed when the modified premature cognitive commitment procedure was conducted. This procedure activated *bias correction*, an attitude which resulted in source monitoring errors. Such new factors influencing the creation of false memories were not analyzed in the literature so far. Further research is required to determine the exact impact of these factors.

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