Cognition, Brain, Behavior. An Interdisciplinary Journal

ISSN: 1224-8398
Volume XIV, No. 1 (March), 1-22

EFFECTS OF SELF-ACTIVATION ON REALITY MONITORING TASK PERFORMANCE: A PRELIMINARY EXPLORATION

Marek NIEZNAŃSKI *

Institute of Psychology, Cardinal Stefan Wyszyński University,
Warsaw, Poland

ABSTRACT

In three experiments participants performed a reality monitoring task: between study and test phase of the task they compared the self with others (i.e., they were instructed to think about similarities or differences between the self and others) or performed a control task, which did not activate the self-concept. Experiment 1 indicated that external information was most effectively discriminated in the condition when participants were thinking about differences between the self and others. In Experiments 1 and 2 self-activation induced a slightly worse detection of external stimuli. In Experiment 3 experimental setting was changed from group into individual, and this time self-activation induced better discrimination of external information. The data are analyzed using the multinomial modeling approach and the results are discussed in light of source monitoring framework and theories of social identity.

KEYWORDS: *self, social cognition, reality monitoring, multinomial modeling.*

* Corresponding author:
E-mail: mnieznanski@wp.pl

The term *source monitoring* refers to the set of processes involved in making attributions about the origins of information (Johnson, Hashtroudi, & Lindsay, 1993). In a simple source monitoring paradigm, participants are presented with items that originate from two different sources. At test, they are presented with old items and new distractors and are instructed to identify not only which items were originally presented but also the source of those items. There are three basic source monitoring types: distinguishing between external sources, distinguishing between internal sources, and finally between internal and external sources. The last one is termed *reality monitoring* and refers to the processes involved in discriminating self-generated memories and beliefs from those derived from perception (e.g., Johnson, 1997a; Johnson, Kounios, & Reeder, 1994). According to Johnson and colleagues' framework, people do not remember the source of a memory *per se*. Particular sources are rather inferred at the time of retrieval on the basis of various qualitative characteristics of memories. Johnson, Hashtroudi, and Lindsay (1993) categorized these pieces of information which aid in source identification as sensory/perceptual information, contextual information, semantic detail, affect, and cognitive operations that were established when the memory was formed. Additionally, source-judgment processes require setting criteria and choosing procedures of comparing memory characteristics to the criteria. The evaluative criteria are not fixed but depend on internal and external circumstances, so they are more or less lax or stringent; and the choice of judgment processes may be affected by many factors, including active goals, social context, emotions, cognitive effort, motivation, etc. (e.g., Johnson, 1997b). In the present study, some of these factors will be explored, namely the influence of focusing attention on the self and temporal activation of identity needs during retrieval.

Many recent studies have shown the importance of the cost of mistakes, current goals and agendas, prior knowledge, social context etc. for the source monitoring performance (e.g., Johnson, Kounios, & Reeder, 1994; Johnson & Raye, 2001; Lindsay & Johnson, 1991). For example, Hoffman et al. (2001) demonstrated that false attribution of source to the new item may be influenced by social conformity (i.e., compliance with an erroneous response of the confederate). Other researchers showed that source judgments may be influenced by test formats as a result of orienting participants to particular qualitative characteristics of items or changing the strictness of judgment criteria (Dodson & Johnson, 1993; Marsh & Hicks, 1998). Recently, Meiser, Sattler, and von Hecker (2007) have analyzed the role of metacognitive beliefs about recognizability of items from different sources on source memory decisions.

In another interesting study, Wippich (1995) explored whether source monitoring may be influenced by manipulations of the focus of attention at encoding. In his experiment participants were instructed to pay close attention to specific internal or external information. Wippich found that self-focused attention improved performance on an internal source-monitoring task, whereas attention directed outward into the specific features of an environment strengthened external source-monitoring performance. Similarly, in experiments presented here, participants' attention will be directed to the self, and consequences of this state of self-awareness will be studied. In contrast with Wippich's study, participants' attention will be manipulated more globally and during retrieval rather than encoding activity.

The main hypothesis of this paper suggests that increased focus on the self just before retrieval may direct participants' attention towards memory characteristics that are specific for the *self-as-a-source*. It may also increase the importance of comparing the memories with the self-concept. This heightened engagement into the self may improve accuracy of discrimination between external and internal sources. Such self-activation promotes interest in comparing oneself with others (Stapel & Tesser, 2001). It may be speculated that comparing the self with others will make discrimination between internal and external world more accurate because features of internal and external sources would be more distinctive.

Effects of comparisons between the self and others seem to be very important for participants' identity. The issue of the perception of personal distinctiveness is considered in several theories in the domain of personality and social psychology. In an *identity process theory* Breakwell included a "distinctiveness principle" among most important motives within identity. This motive impels an individual to the establishment and maintenance of a sense of differentiation from others. On a cognitive level that means that he or she will emphasize and perceive as more central all those aspects of the self which differentiate self from others. Distinctiveness principle, in interaction with other motives, guides the construction of a meaningful self-definition; any frustration or threat to the distinctiveness need will engage an individual in behavioral and cognitive strategies restoring a sense of distinctiveness (Vignoles, Chryssochoou, & Breakwell, 2000; 2002). According to Snyder and Fromkin's *theory of uniqueness* the state of extremely high similarity may threaten the need to view oneself as an unique individual. The theory predicts that very slight similarity is also aversive, therefore people tend to establish an optimal level of moderate degree of similarity between the self and others (Mandrosz-Wróblewska, 1983; Snyder & Endelman, 1979). In a similar vein, Brewer's *optimal distinctiveness theory* of social identity, postulates that people need to be assimilated to larger social collectives and, simultaneously, people need to be separated from others. These two fundamental and opposite drives hold each other in check so they tend to an equilibrium point. The needs operate on individual, relational, and collective levels of self-representation. At the individual level, which is considered in this paper, the conflict between motives is expressed by the conflict between the search for uniqueness and the search for similarity to others (Brewer & Roccas, 2001). Another well-known approach, the *self-categorization theory*, distinguished between social and personal identity. When social identity becomes a more salient one, people tend to accentuate intragroup similarities and intergroup differences (for review see, Kwiatkowska, 1999; Trepte, 2006; Turner, 1999).

Taking these theories into consideration, it was assumed, in the current paper, that focusing on differences between the self and others may temporarily and subtly disturb the balance of identity needs and may activate the need for assimilation to others, whereas focusing on similarities between the self and others will activate the self-differentiation need. It is supposed that activation of identity needs may influence guessing strategy in a reality monitoring task. Specifically, it is hypothesized that differentiation need will increase a tendency to avoid false attributions of events to the self, while assimilation need will decrease such tendency. It may be speculated that when you accept that someone else's thoughts and information may be your own, you agree that the differences between you and that other are not as crucial and important as to lead to different experience. And conversely, if you do not tolerate the possibility that someone else's thoughts and information is like your own, you point out the differences between you and that other. The role of self-concept differentiation for reality monitoring accuracy was already explored in one clinical study. In a group of patients with schizophrenia, Nieznański (2005) found a significant correlation between poor differentiation of concepts of self and others with misattributions of new and external items to the self.

Recently, many researchers have analyzed their data using a multinomial modeling approach, the statistical methodology introduced in source monitoring research by Batchelder and Riefer (1990; see also Batchelder & Riefer, 1999; Riefer & Batchelder, 1988; Riefer, Hu, & Batchelder, 1994). The great advantage of this methodology is that it permits the separate estimation of item detection, source discrimination, and various forms of response bias. Multinomial modeling assumes that easy observable response categories in source monitoring task arise from different sequences of hypothetical latent cognitive processes (Batchelder & Riefer, 1999; Hu & Phillips, 1999; Riefer & Batchelder, 1988). These processing sequences are represented as branches in a multinomial processing tree (e.g., Hu & Batchelder, 1994). Multinomial modeling approach was applied in all studies presented in this paper.

EXPERIMENT 1

Participants took part in Experiment 1 in several groups. They performed a reality monitoring task in which items were self-generated or provided on a list by the experimenter. Between study and test phase of the reality monitoring task participants were instructed to think about similarities or differences between *the self* and others ('most of their peers'). In order to clarify the nature of experimental manipulation, two additional conditions were planned where participants were focusing on differences or similarities between *the other* ('a person they know very well') and others. Two factors are manipulated in this experiment: 1) taking as an object of comparison the self versus the other, and 2) focusing on differences versus similarities during these comparisons. It was assumed that one combination of these factors, i.e., focusing on differences between the self and others should activate assimilation need (and it may be hypothesized that it will produce easier acceptance of undifferentiated items to the self), while focusing on similarities between the self and others should arise distinctiveness need (and therefore more stringent criteria will be adopted for self-attribution of undifferentiated items) and two other conditions should be neutral. Moreover, any kind of comparison between the self and others should increase self-activation and this experiment explored its influence on reality monitoring.

METHOD

Participants

One hundred sixty four introductory psychology students participated in the study, they were examined in groups during a regular class meeting. The participants were quasi-randomly assigned to four experimental conditions, each condition containing 41 participants.

Materials

In the study phase of reality monitoring task, participants were reading a list of 30 stimulus words and were giving their own associations to each word. The 30-words stimulus list was completed on the basis of the Polish word association norms to 100 stimulus words from the Kent-Rosnoff list (Kurcz, 1967). Stimulus words with the highest sum of frequencies computed for the five most frequent responses were chosen, thus these were the words with relatively small number of rare responses. The recognition list, used in the test phase of reality monitoring task, contained a randomized mixture of all the 30 stimulus words and 124 words which were the five most frequent associations to each of the 30 stimuli (some of associations repeated several times, therefore there were 124 rather than 150 associations included in the list).

The check-list used in the intermediate task as an experimental manipulation consisted of personality trait words of a high level of positive evaluation and low or medium level of ambiguity and belonging to maximally diverse personality dimensions (for more details see Nieznański, 2003).

Procedure

In a study phase of reality monitoring task participants were given 30 stimulus words typed in one column on the first page of a test booklet. They were asked to write down next to each stimulus word a single-word response (i.e., 'the first word coming to mind, connected with the stimulus'). After completing this free association task, they were asked to turn to the next page. It contained the check-list of 50 trait adjectives and, depending on experimental condition, participants were instructed to select all the traits that are common to them and most of their peers (Condition 1a, ‘self-others similarities’); that differ them from most of their peers (Condition 1b, ‘self-others differences’); that are common to a person they know very well and most of their peers (Condition 2a, ‘other-others similarities’); and that differ a person they know very well from most of their peers (Condition 2b, ‘other-others differences’). Finally, during the recognition phase of the reality monitoring task, on a list of 154 words, participants were asked to draw a single line under all stimulus words (i.e., experimenter provided words), and a double line under their responses (i.e., self-generated words) from the study phase. If a response was identical to one of the stimuli, they were instructed to draw a triple line under such a response (however, this occurred incidentally). Participants were instructed to ignore possible differences in grammatical forms (e.g., grammatical gender; the singular vs. plural) between their self-generated responses from study phase and words on the recognition list. There was no time limit for all these tasks, however, no large variability in the time taken was observed.

A number of self-generated responses from the first phase of the test that appeared in recognition phase was not predetermined. Approximately a half of self-generated words appeared then in the test list, however this proportion substantially varied across the participants. In spite of this weakness, this format also has some advantages, namely, it put little constraints on participants' test behavior, and controlled the kind of words that were given to recognize, thus all participants were given the same recognition list containing no seldom nor idiosyncratic responses. Importantly, the number of self-generated responses was not connected with the experimental manipulation, because participants were giving their responses to stimuli before experimental manipulation took place.

Statistical Approach

A two-high-threshold multinomial model of source monitoring was used in this study. This model was developed by Bayen, Murnane, and Erdfelder (1996) from one-high-threshold model originally constructed by Batchelder and Riefer (1990). The most general model of simple source monitoring task contains three separate processing trees for items from Source A, Source B and New items (see Figure 1). In the model, the probability of detecting Source A (Source B) items as old is represented by parameter D_A (for Source B items D_B). Parameters d_A and d_B represent the probabilities of discriminating the source of detected Source A or B items. The items detected as old but not discriminated as Source A (Source B) items are subject to guessing process. In such case, the parameter a represents the probability of guessing that the item belongs to Source A and the probability $1-a$ that it belongs to Source B. Finally, if an old item from Source A (Source B) is not detected as old, the observer may guess it is old with probability b, and it is new with probability $1-b$. Then g is the probability of guessing that undetected item guessed as an old one is from Source A and $1-g$ that it is from Source B (Batchelder & Riefer, 1990, 1999; Riefer, Hu, & Batchelder, 1994). In the two-high-threshold model, the New item tree assumes that with probability D_N observers correctly detect the item as new, and with probability $1-D_N$ they do not detect it (Bayen et al., 1996). The undetected items, like undetected items in Source A and B trees, are subject for guessing. The probability of any track through tree is the product of the probabilities along its arms. For each type of items (Source A, Source B and New) there are possible three answers (‘Source A’, ‘Source B’ and ‘New’). The probability of a particular answer is the sum of the probabilities of all tracks that end with that answer (Wickens, 2002).

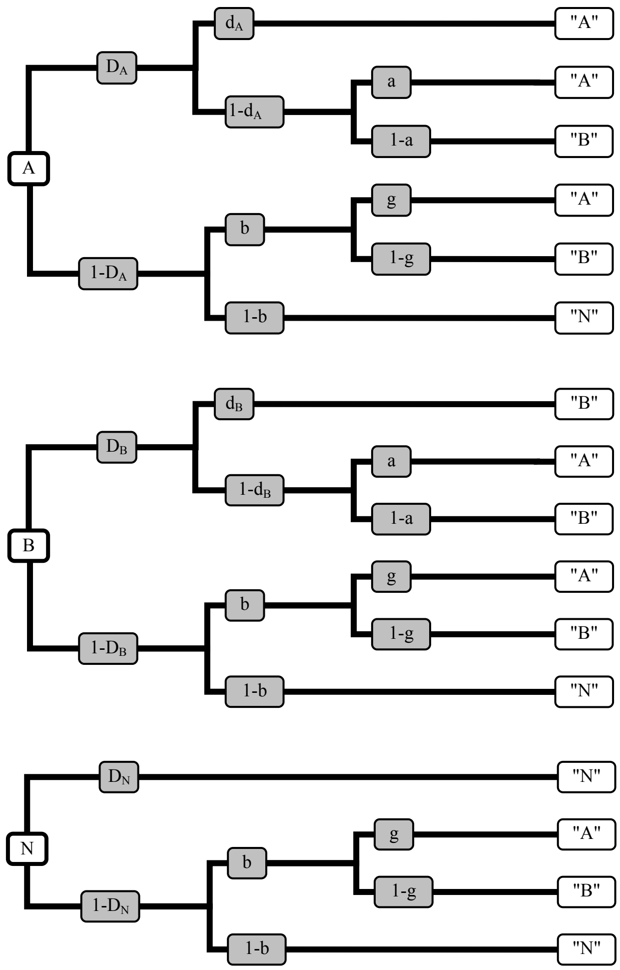

Figure 1
Two-high-threshold multinomial model of source monitoring for two sources developed by Bayen, Murnane, & Erdfelder (1996). D_A = the probability of detecting an item from Source A; D_B = the probability of detecting an item from Source B; D_N = the probability of detecting that a distractor is new; d_A = the probability of correctly discriminating the source of an item from Source A; d_B = the probability of correctly discriminating the source of an item from Source B; a = the probability of guessing that a detected item is from Source A; g = the probability of guessing that an undetected item is from Source A; b = the probability of guessing old to undetected item.

The full version of 8 parameters model (*D_A, D_B, D_N, d_A, d_B, a, g, b*) is technically non-identifiable, because there are only six degrees of freedom in the data. However, the number of parameters can be lowered by putting several kinds of restrictions. First, we can assume that detection parameters D_A and D_N or D_B and D_N are equal. Second, discrimination parameters d_A and d_B can be imposed equal. And finally, guessing rates *a* and *g* can be assumed equal. It has been shown that by combining the presence or absence of these restrictions nine submodels can be created, which are identifiable special cases of the general model (Bayen et al., 1996). The goodness-of-fit of submodels to empirical data can be tested with the log-likelihood ratio statistic (G^2) which is distributed asymptotically as a χ^2 distribution (e.g., Batchelder & Riefer, 1990; Hu & Batchelder, 1994).

RESULTS AND DISCUSSION

All computations of model parameters were conducted using Excel, following recommendations from Dodson, Prinzmetal, and Shimamura's (1998) paper (the results were also checked using HMMTree program by Stahl and Klauer, 2007).

The test format in the study was constructed in such a way that the number of self-generated responses was not predetermined during recognition. However, the number of self-generated responses that appeared in recognition test was very similar across all groups. It incidentally occurred that participants generated a response identical with one of the stimuli from the list or marked a word as both self-generated and experimenter-provided stimulus. These cases were double coded.

The analysis of the data started from choosing appropriate versions of the general multinomial model. In order to make comparisons clearer, the submodels fitting data in all experimental conditions were searched for. This criterion was met only by saturated submodels, that is those using as many parameters as there are degrees of freedom. Saturated models usually perfectly fit the data, and among them submodel 6c was chosen on theoretical grounds. Submodel 6c imposes equality on parameters *a* and *g* but it allows d_A to differ from d_B, which is its important advantage, because, as stayed in the introduction, source memory for self-generated information may be based on different memory characteristics than for external information.

The analyses conducted resulted in significant differences between conditions in values of source discrimination parameters d_{exp} representing probability of discriminating a detected old item as an experimenter-provided stimulus word. In 'self-others differences' group the parameter d_{exp} was significantly higher than in 'self-others similarities' group ($\Delta G^2(1)=11.90$, $p<.001$), 'other-others similarities' group ($\Delta G^2(1)=10.25$, $p<.005$), and 'other-others differences' group ($\Delta G^2(1)=5.57$, $p<.05$). The second source discrimination parameter d_{self} was not significantly different between groups. The value of parameters *a*=*g* was significantly higher in 'self-others differences' group than in 'self-others similarities' group ($\Delta G^2(1)=7.57$, $p<.01$), 'other-others similarities' group ($\Delta G^2(1)=4.26$, $p<.05$), and 'other-others differences' group ($\Delta G^2(1)=6.22$, $p<.05$).

When comparing combined groups of self-focusing participants (i.e., 'self-others differences' group combined with 'self-others similarities' group) and combined groups of other-focusing participants (i.e., 'other-others differences' group combined with 'other-others similarities' group) the only significant difference was observed in item detection parameter D_{exp} for experimenter provided stimuli ($\Delta G^2(1)=11,98$, $p<.001$). Next, groups thinking of differences were combined ('self-others differences' and 'other-others differences' groups) and groups thinking of similarities were combined (self-others similarities' and 'other-others similarities' groups). The comparisons between parameters in these groups indicated no significant difference.

The results showed that the probability of attributing undifferentiated items to self was quite low (the values of parameters $a=g$ were between .241 to .483). Perhaps participants had a bias to conclude that an item was not self-generated because they expected a low number of self-generated items at test (because these items had to be predicted in advance by the person who prepared test items list). In Experiment 1 there were no apparent generation effects on item and source memory. It may be speculated that this was due to the procedure applied, especially because self-generated words from study phase sometimes differed slightly in grammatical form from test items. Any mismatch between presented item and testing item may reduce the chance for correct recognition (McElroy, 1987; Rabinowitz, 1990; Toth & Hunt, 1990).

Table 1
Parameter estimates for experimental conditions in Experiment 1.

	Recognition		*Source accuracy*		*Response bias*	
Conditions	D_{exp}	$D_{self}=D_n$	d_{exp}	d_{self}	$a=g$	b
Self-others similarities	.746	.705	.862	.914	.241	.044
Self-others differences	.758	.726	.974	.852	.483	.049
Other-others similarities	.803	.751	.916	.877	.300	.054
Other-others differences	.787	.705	.883	.881	.274	.056
Self-others (combined)	.752	.715	.936	.888	.364	.047
Other-others (combined)	.795	.727	.900	.879	.286	.055
Differences (combined)	.772	.715	.938	.871	.368	.053
Similarities (combined)	.774	.728	.892	.895	.271	.049

Additionally, model-free comparisons were conducted using conditional source identification measure (CSIM), which is the probability of correct source identification given that the item was correctly identified as old (e.g., Bayen et al., 2000). These analyses showed that source discrimination of experimenter provided stimuli was better for ‘self-others differences’ group than in other groups, however this and any other differences were not statistically significant.

EXPERIMENT 2

In Experiment 1 participants generated their associations to the stimulus words freely, therefore, when deciding about the source in the recognition task, they could use knowledge about the self (a question like: "Is such an association consistent with the way I usually think?"). In Experiment 2 the test format was changed in order to reduce all the cues linking studied words with the self-concept. Participants generated words from experimenter-provided anagrams, therefore there were no reasons to link these words to the self-concept. It was hypothesized that this time the guessing strategies represented by parameters *a* and *g* will not be used to balance assimilation and differentiation needs. Again, it was assumed that thinking about similarities or differences between the self and others should heighten participants' self-awareness. In contrast, the self-awareness should not be heightened in a condition when participants are asked to find names of furniture and clothes on a given list of objects. The main memory characteristics that can be useful for source attribution would be the cognitive operations engaged in encoding (generation vs. reading).

METHOD

Participants

One hundred and eight introductory psychology students participated in the experiment in several groups. Participants from control condition took part in the study several months later, however they were recruited from the same population of students as participants in experimental conditions.

Materials and Procedure

The procedure and materials were very similar to those used in Experiment 1. However, this time the associations to stimulus words were not freely self-generated by participants but provided in the form of anagrams. These anagrams were highly frequent associations to the stimulus words with two displaced letters. In the study phase of source monitoring task participants were given a list of stimuli and anagrams and asked to assign the correct order to letters in anagrams - associations to each of the 30 experimenter provided stimuli. The next page contained the check-list of 50 trait adjectives. This time participants were instructed to select all the traits that are common to them and most of their peers (Condition A, n=41, ‘self-others similarities’) or that differentiate them from most of their peers

(Condition B, n=41, 'self-others differences'). In the control condition (n=26), participants were asked to find names of furniture and clothes on a list of 36 nouns. Finally, during the test phase, on a list of 154 words, participants were asked to find and draw a single line under all stimulus words, and a double line under anagrams (associations). They were informed that not all anagrams from the study phase are present on that list, and indeed only 15 out of 30 anagrams were placed in the recognition test. Therefore participants in Experiment 2, just like in Experiment 1, could not be sure that all the words they studied during first phase of the experiment appeared in the recognition test.

RESULTS

Parameter estimates of submodel 6c are presented in Table 2. Significance tests indicated that guessing parameters *a=g* did not differ significantly in the group focusing on 'self-others differences' in comparison with the group focusing on 'self-others similarities'. Similarly, both source discrimination parameters were not significantly different. The only parameter that significantly differentiated the groups was parameter *b* which was higher in 'self-others differences' group ($\Delta G^2(1)=8.22$, $p<.01$). The parameter *b* represents probability of guessing that a non-detected item was old. Results of the control group were then compared with the results of a combined 'self-others differences' and 'self-others similarities' group. These comparisons showed that participants in a control group more effectively detected experimenter-provided stimuli than participants from combined experimental groups ('self-activation group') ($\Delta G^2(1)=12{,}50$, $p<.0005$), and again the parameter *b* differed between groups ($\Delta G^2(1)=9{,}19$, $p<.005$)

Table2

Parameter estimates for experimental and control conditions in Experiment 2.

	Recognition		*Source accuracy*		*Response bias*	
Conditions	D_{exp}	$D_{ang}=D_n$	d_{exp}	d_{ang}	$a=g$	b
Self-others similarities	.411	.623	.783	.822	.454	.046
Self-others differences	.445	.660	.686	.892	.321	.072
Self-activation	.428	.642	.735	.863	.376	.058
Control	.506	.663	.863	.897	.452	.032

Additionally, model-free comparisons were conducted using CSIM. These analyses showed no significant differences in discrimination of anagrams or experimenter provided stimuli between 'self-others similarities' and 'self-others differences' groups. However, the control group significantly better discriminated experimenter-provided stimuli than participants from self-activation group (i.e., combined experimental groups) (mean CSIM= .922 vs. .869 for control and self-activation groups, respectively; t=2.59, p<.02).

EXPERIMENT 3

This time participants took part in the experiment individually. This allowed to overcome some of the procedural problems encountered in Experiment 1. In that experiment, the number of self-generated items that appeared in the test phase was not controlled and surface features (e.g., grammatical form) of some test items were not identical to the features of self-generated study items. These weaknesses might complicate the pattern of results, so they were excluded in Experiment 3. However, participants taking part individually in the experiment were placed in a quite different social context than participants in two previous experiments. Therefore, it was supposed that in this changed setting, experimental manipulation may influence performance in a different way than was observed in group settings of Experiments 1 and 2.

A second important modification introduced in Experiment 3, was the number of sources of information. This time three sources were used. Such design is recommended for multinomial analyses as a good solution in case of some problems with distinguishing between a response bias and source discrimination in source monitoring performance (Keefe, Arnold, Bayen, McEvoy, & Wilson, 2002; Riefer et al., 1994). The three sources of information were: experimenter-provided stimulus words; experimenter-provided anagrams; and self-generated response words. Therefore, in Experiment 3, self-generation was directly compared with generation from externally-provided material. Just as in Experiment 2, between study and test, participants were induced to think about differences or similarities between the self and others or, in a control condition, they were engaged in a neutral task that did not activated the self-concept.

METHOD

Participants
Seventy five first- and second-year psychology students participated in the experiment in return for extra credit in their courses.

Materials
For the source monitoring task 25 stimulus words were chosen from a list of association norms. For each stimulus word one of the most frequent associations was taken to be an anagram word and two additional frequent associations served as potential new items (two words were prepared in case a participant gives one of them as a self-generated response). The first and the last two stimuli and their

associations were excluded from the test list to neutralize recency and primacy effects.

The list of trait-adjectives used during experimental manipulation contained 36 traits that were most frequently chosen in previous experiments when participants were making comparisons between self and others. The list of words used in control condition contained 40 common nouns.

Procedure and design

In this experiment three conditions were planned, for each of them 25 participants were quasi randomly assigned. The conditions differed in the kind of task given to participants between study and test phases of a reality monitoring task. In the first condition participants were given a list of trait adjectives and were asked to mark all the traits that are common to them and most of their peers; the same list was given in the second condition but this time participants were to mark attributes that differentiate them from most of their peers. In the control condition participants were asked to find names of clothes and furniture on a provided list of 40 nouns.

Reality monitoring task was identical in all three conditions. It started from short instructions and several training trials. Participants were asked to try to remember all the words and their sources. During the study phase of the task, a stimulus word was read aloud by the experimenter then an anagram was presented to the participant on a card and he/she had to solve it, and finally the participant self-generated a word connected with the stimulus word. After gathering 25 stimulus – anagram – self-generated word series, the participant was given a filler task depending on experimental condition. During the test phase of reality-monitoring task the experimenter was reading the words and the participant had to decide if the word was new or if it was a stimulus, an anagram or a self-generated word from the learning phase. All the tasks were self-paced but no large differences between participants were observed.

Statistical approach

A multinomial model used for data analyses in Experiment 3 is an extension of Bayen et al.'s (1996) two-high-threshold model for three sources (described in Keefe et al., 2002). Detection and discrimination parameters are defined in the same way as in the model for two sources. Guessing probability that the detected item was either self-generated or presented by experimenter is represented by parameter a_1. Therefore, the participant guesses that the item was generated from an anagram with probability 1-a_1. Parameter a_2 is defined as guessing that the item was self-generated instead of experimenter provided. Guessing parameters g_1 and g_2 are analogically defined for undetected items (for more details and graphical illustration of the model see Keefe et al., 2002, Fig. A1). In order to improve the analyses some restrictions were imposed on parameters. Initially, the models were simplified by assuming, like in two previous experiments, equality of guessing parameters *a* and *g*. A goodness-of-fit test showed that only a_1 can be put equal to g_1, but the assumption that $a_2=g_2$ lead to quite a bad fit of the model to the data, and had to be rejected. Next, one of item recognition parameters was considered to be equal to the parameter of distractor detection (D_{new}). Such an assumption is often made for sake of simplicity in two-high threshold models (Macmillan & Creelman, 1991; Meiser & Bröder, 2002). Data from experimental groups and the control group were best fitted to models with additional restrictions $D_{exp}=D_{new}$ and $D_{ang}=D_{new}$. The model with $D_{ang}=D_{new}$ was chosen because it corresponds better with the model used in Experiment 2.

RESULTS AND DISCUSSION

This experiment showed no significant differences between participants concentrating on differences or similarities between the self and others. However, one significant difference was observed when control group was compared with a combined experimental group ('self-activation group', i.e., all participants thinking about differences or similarities between self and others). Specifically, participants from 'self-activation' group were significantly better in discrimination of experimenter-provided words (parameter d_{exp}) than the control group ($\Delta G^2(1)=6,23$, p<. 05).

Table 3
Parameter estimates for experimental and control conditions in Experiment 3.

	Recognition			*Source accuracy*			Response bias			
Conditions	D_{exp}	D_{self}	$D_{ang}=D_n$	d_{exp}	d_{self}	d_{ang}	$a_1=g_1$	a_2	g_2	*b*
Self-others similarities	.760	.870	.820	.633	.988	.728	.621	.012	.171	.598
Self-others differences	.805	.842	.781	.614	.974	.639	.580	.000	.221	.497
Self-activation	.784	.855	.801	.620	.982	.687	.601	.000	.203	.546
Control	.773	.855	.813	.280	.993	.641	.674	.001	.218	.564

Additionally, model-free comparisons were conducted using CSIM. These analyses showed no significant differences in source discrimination between 'self-others similarities' and 'self-others differences' groups. However, the 'self-activation' group significantly better discriminated experimenter-provided stimuli than control group (mean CSIM= .797 vs. .727 for self-activation and control groups, respectively; t=2.40, p<.02).

In retrospect, the experimental manipulation in an individual setting was probably sufficient to heighten self-awareness but too weak to induce activity based on identity needs. Moreover, it is possible that effects of experimental manipulation on source discrimination of self-generated items were obscured by a ceiling effect, that is, very high source monitoring performance for self-generated items. It should be also noted that the values of guessing parameters a_2 and g_2 were very low. It indicates that in case of uncertainty, participants tended to attribute an item to the experimenter rather than to the self. It may result from the strong belief that a self-generated item would be undoubtedly recognized, so if an item induced some uncertainty it must not have been self-generated (Meiser, Sattler, & von Hecker, 2007).

GENERAL DISCUSSION

Experiment 1 explored the hypothesis that activation of identity needs may influence results of a reality monitoring task. It was shown that activation of assimilation need (by focusing on self-others differences) resulted in a greater tendency for attribution of undetected or undifferentiated items to the self than in condition activating self-differentiation need. Analyses also indicated that detected as old experimenter-provided items are better source-discriminated in the group focusing on self-others differences than in all other comparison groups. However, these results were not confirmed in Experiment 3, in which there were no differences between these groups. Experiment 2 indicated that identity needs do not influence guessing bias toward one of the two sources when sources are not connected with the self. Source discrimination parameters were also not significantly influenced by activation of assimilation or differentiation needs in this experiment. Experimental manipulation influenced only the parameter representing probability of guessing that a non-detected item was old. This result was not predicted, however it suggests that activation of differentiation need may increase tendency to avoid false positive responses for all old items.

Experiments 1 and 2 showed that self-activation (by thinking about differences or similarities between the self and others) induces lower detection of items provided by the experimenter than in the control condition. However, Experiment 3 showed no significant difference in detection of experimenter's items but significantly better discrimination of these items in self-activation conditions than in the control condition. This contrast in the direction of the influence of self-activation between experiments stems from the differences in experimental settings (group setting in Experiments 1 and 2 and individual setting in Experiment 3). When tested individually by the experimenter, participants might be stronger motivated to respond correctly, than in a group condition, when they are giving their answers on a sheet of paper which is then collected with tests of other participants. The influence of such motivational factors is widely discussed in the research on social cognition. At least in Western cultures, people seem to be more motivated to perform well if their individual output is identifiable to other people, especially to an expert or authority. When people's outcomes (one's success or errors) are identifiable, they may expect a personal reward or criticism, which may be important for their self-esteem. Social psychology literature describes a phenomenon called *social loafing* which means a decrement in individual effort exerted when people work together in groups compared to when they work alone (e.g., Harkins & Szymanski, 1989; Williams, Harkins, & Latané, 1981). It may be speculated that self-activation induced greater personal involvement in participants examined individually by the experimenter in Experiment 3 than in group settings in Experiments 1 and 2, so that they were motivated to better differentiate experimenter-provided stimuli (Brickner, Harkins, & Ostrom, 1986).

As suggested by Johnson's source monitoring framework, source attributions are made on the basis of various memory characteristics. The experiments described here differed significantly in the availability and type of memory characteristics that can be used when judging the source. In Experiments 1 and 2 experimenter-provided stimuli were silently read by the participants, therefore the main differences between the sources (self vs. external) were connected with cognitive operations engaged when the item was presented (read vs. generated). In contrast, in Experiment 3 participants had a quite large range of additional characteristics available, and their decisions could be made also on the basis of perceptual and contextual details (e.g., voice characteristics, location of the source, visual vs. aural modality of presentation, etc.). As shown by Mather, Johnson, and DeLeonardis (1999) when source-specifying characteristics are less available (for example due to emotional focus on one's own emotions), people will rely more on their stereotypes and schemas about sources when making source attributions (see also: Sherman & Bessendoff, 1999). Thus in Experiment 1 more than in Experiment 3, an important cue for source attribution was the relation of semantic details of information to the self-concept (the answer to a question like "Is it possible that I generated such an association? Is it consistent with the way I usually think?") (Bayen, Nakamura, Dupuis, & Yang, 2000; Kahan & Johnson, 1992; Spaniol & Bayen, 2002).

Presented experiments support the notion that a state of self-activation can influence the judgment processes during source monitoring, at least in certain circumstances. It is quite important how the decision criteria would be set up, how clear and strong memory characteristics will be required in order to attribute a memory to the self. Experimental manipulation just before retrieval may influence the way participants answered their own questions about consistency of the memories with the self-concept. It is possible that such a question may be a more important judgment criterion when self-concept is activated. Conducted experiments clearly showed that self-activation during retrieval may influence reality-monitoring performance, however further experimentation would be necessary to find out specific mechanisms and directions of this influence. Experiment 1 explored one of such mechanisms, suggesting that in a group setting, after activation of an association need, people more often tend to accept external stimuli as their own. However, this result must be taken with caution, because it was not confirmed in Experiment 3. In future research, manipulations of identity needs have to be more carefully prepared (an example of such manipulation may be found in Pickett, Bonner, & Coleman, 2002). In this study there was no check if the manipulation was successful. It is possible that induction of a differentiation need failed because the 'others' were defined as 'most of your peers', so thinking about similarities between the self and members of an ingroup would not affect the need for differentiation. In contrast, thinking about differences between the self and other members of an own ingroup would be more aversive, and this time assimilation need may be increased, especially when this manipulation is made in a group setting.

This way of experimentation harmonizes with social and personality theories which have shown that judgment of being similar or different has important implications for individual's behavior and social interactions (Maslach, Stapp, & Santee, 1985). As Frable (1993, p. 87) noted "the dynamic self-concept copes with short-term threats to the individual's uniqueness or similarity by adjusting the availability of certain kinds of information". For example, people made to feel very similar to others exhibit preference for experiences unavailable to others (Fromkin, 1970). Moreover, asymmetry in the estimation of interpersonal distance is stronger when people are put in a state of deindividuation, that is, they feel that the others are closer to themselves than they are to the others, the effect interpreted as the sign of personal identity affirmation and defense (Codol, Jarymowicz, Kamińska-Feldman, & Szuster-Zbrojewicz, 1989; Snyder & Endelman, 1979). In a related vein, this study explored possibility that people balance their identity needs by changing their response strategies when attributing stimuli to the self or to an external source. As noted, this hypothesis did not receive clear suport.

Many researchers have pointed out a special relationship between the self and memory (e.g., Conway, 2005; Klein, 2001; Markus, 1980; Nieznański, 2009). The self is a product of personal memories and at the same time it regulates memory processes. In his classical work, Greenwald (1980) has given reasons in support of a parallel between a totalitarian political system and the self (ego). Just as the totalitarian propaganda, the self fabricates and revises personal history in order to preserve the system's organization. When accumulating personal experience self-knowledge is prone to several cognitive biases. Greenwald has pointed out three of them: egocentricity; 'beneffectance' that is perception of responsibility for desired, but not undesired, outcomes; and resistance to change (cognitive conservatism). This study suggested that the self may also open or close its border by recognizing uncertain items as its own or external, this way enhancing or diminishing self-others distinctiveness. In conclusion, presented experiments showed that self-activation influences discrimination of external stimuli, however these results do not permit clear and reliable interpretation concerning specific relations between reality monitoring and identity needs. Suggested interpretations are only preliminary and some of the post-hoc accounts given in the general discussion may be a good starting point for future investigation.

ACKNOWLEDGMENTS

The author is grateful to Ute J. Bayen, David Riefer, and an anonymous reviewer for their critical comments and suggestions on an earlier draft of the paper.

REFERENCES

Batchelder, W. H., & Riefer, D. M. (1990). Multinomial processing models of source monitoring. *Psychological Review, 97*, 548-564.

Batchelder, W. H., & Riefer, D. M. (1999). Theoretical and empirical review of multinomial process tree modeling. *Psychonomic Bulletin & Review, 6*, 57-86.

Bayen, U. J., Murnane, K., & Erdfelder, E. (1996). Source discrimination, item detection, and multinomial models of source monitoring. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 22*, 197-215.

Bayen, U. J., Nakamura, G. V., Dupuis, S. E., & Yang, C.-L. (2000). The use of schematic knowledge about sources in source monitoring. *Memory and Cognition, 28*, 480-500.

Brewer, M. B., & Roccas, S. (2001). Individual values, social identity, and optimal distinctiveness. In C. Sedikides & M. B. Brewer (Eds.), *Individual Self, Relational Self, Collective Self* (pp. 219-237), Philadelphia, PA: Psychology Press.

Brickner, M. A., Harkins, S. G., & Ostrom, T. M. (1986). Effects of personal involvement: Thought-provoking implications for social loafing. *Journal of Personality and Social Psychology, 51*, 763-769.

Codol, J.-P., Jarymowicz, M., Kamińska-Feldman, M., & Szuster-Zbrojewicz, A. (1989). Asymmetry in the estimation of interpersonal distance and identity affirmation. *European Journal of Social Psychology, 19*, 11-22.

Conway, M. A. (2005). Memory and the self. *Journal of Memory and Language*, *53*, 594-628.

Dodson, C. S., & Johnson M. K. (1993). Rate of false source attributions depends on how questions are asked. *American Journal of Psychology, 106*, 541-557.

Dodson, C. S., Prinzmetal, W, & Shimamura, A. P. (1998). Using Excel to estimate parameters from observed data: An example from source memory data. *Behavior Research Methods, Instruments, & Computers, 30*, 517-526.

Frable, D. E. S. (1993). Being and feeling unique: Statistical deviance and psychological marginality. *Journal of Personality, 61*, 85-110.

Fromkin, H. L. (1970). Effects of experimentally aroused feelings of undistinctiveness upon valuation of scarce and novel experiences. *Journal of Personality and Social Psychology, 16*, 521-529.

Greenwald, A. G. (1980). The totalitarian ego. Fabrication and revision of personal history. *American Psychologist, 35*, 603-618.

Harkins S. G., & Szymanski, K. (1989). Social loafing and group evaluation. *Journal of Personality and Social Psychology, 56*, 934-941.

Hoffman, H. G., Granhag, P. A., Kwong See, S. T., & Loftus, E. F. (2001). Social influences on reality-monitoring decisions. *Memory & Cognition, 29*, 394-404.

Hu, X., & Batchelder, W. H. (1994). The statistical analysis of general processing tree models with the EM algorithm. *Psychometrika, 59*, 21-47.

Hu, X., & Phillips, G. A. (1999). GPT.EXE: A powerful tool for the visualization and analysis of general processing tree models. *Behavior Research Methods, Instruments, & Computers, 31*, 220-234.

Johnson, M. K. (1997a). Source monitoring and memory distortion. *Philosophical Transactions of the Royal Society (London B)*, *352*, 1733-1745.

Johnson, M. K. (1997b). Identifying the origin of mental experience. In M. S. Myslobodsky (Ed.), The mythomanias: The nature of deception and self-deception (pp.133-180). Mahwah, NJ: Erlbaum.

Johnson, M. K., & Raye, C. L. (2001). Cognitive and brain mechanisms of false memories and beliefs. In D. L. Schacter & E. Scarry (Eds.), *Memory, brain, and belief* (pp. 35-86). Cambridge, MA: Harvard University Press.

Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin, 114*, 3-28.

Johnson, M. K., Kounios, J., & Reeder, J. A. (1994). Time-course studies of reality monitoring and recognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 20*, 1409-1419.

Kahan, T. L., & Johnson, M. K. (1992). Self effects in memory for personal information. *Social Cognition, 10*, 30-50.

Keefe, R. S. E., Arnold, M. C., Bayen, U. J., McEvoy, J. P., & Wilson, W. H. (2002). Source-monitoring deficits for self-generated stimuli in schizophrenia: Multinomial modeling of data from three sources. *Schizophrenia Research, 57*, 51-67.

Klein, S. (2001). A self to remember: A cognitive neuropsychological perspective on how self creates memory and memory creates self. In C. Sedikides & M. B. Brewer (Eds.), *Individual Self, Relational Self, Collective Self* (pp. 219-237). Philadelphia, PA: Psychology Press.

Kurcz, I. (1967). Polskie normy powszechności skojarzeń swobodnych na 100 słów z listy Kent-Rosanoffa [Polish norms for free associations to 100 words from Kent-Rosanoff list]. *Studia Psychologiczne, 8*, 122-255.

Kwiatkowska, A. (1999). Tożsamość a społeczne kategoryzacje [Identity and social categorizations]. Warszawa: Instytut Psychologii PAN.

Lindsay, D. S., & Johnson, M. K. (1991). Recognition memory and source monitoring. *Bulletin of the Psychonomic Society, 29*, 203-205.

Macmillan, N. A., & Creelman, C. D. (1990). Response bias: Characteristics of detection theory, threshold theory, and "nonparametric" indexes. *Psychological Bulletin, 107*, 401-413.

Mandrosz-Wróblewska, J. (1983). Unikalność - dążenie do odrębności (koncepcja C. R. Snydera i H. L. Fromkina) [Uniqueness - striving for separateness (A theory of C. R. Snyder and H. L. Fromkin)]. *Przegląd Psychologiczny*, *26*, 553-563.

Markus, H. (1980). The self in thought and memory. In D. M. Wegner & R. R. Vallacher (Eds.), *The self in social psychology* (pp. 102-130). New York: Oxford University Press.

Marsh, R. L., & Hicks J. L. (1998). Test formats change source-monitoring decision processes. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *24*, 1137-1151.

Maslach, C., Stapp, J., & Santee, R. T. (1985). Individuation: Conceptual analysis and assessment. *Journal of Personality and Social Psychology, 49*, 729-738.

Mather, M., Johnson, M. K., & De Leonardis, D. M. (1999). Stereotype reliance in source monitoring: Age differences and neuropsychological test correlates. *Cognitive Neuropsychology, 16*, 437-458.

McElroy, L. A. (1987). The generation effect with homographs: Evidence for postgeneration processing. *Memory & Cognition, 15*, 148-153.

Meiser, T., & Bröder, A. (2002). Memory for multidimensional source information. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 28*, 116-137.

Meiser, T., Sattler, C., & von Hecker, U. (2007). Metacognitive inferences in source memory judgments: The role of perceived differences in item recognition. *Quarterly Journal of Experimental Psychology, 60*, 1015-1040.

Nieznański, M. (2003). The self and schizophrenia: A cognitive approach. *Swiss Journal of Psychology, 62*, 45-51.

Nieznański, M. (2005). Reality monitoring failure in schizophrenia: Relation to clinical symptoms and impairment of self-concept. In J. E. Pletson (Ed.), *Progress in schizophrenia research* (pp. 45-76). Hauppauge, NY: Nova Science Publishers.

Nieznański, M. (2009). Recognition Memory for Self-Relevant Personality-Trait Words. *Swiss Journal of Psychology, 68*, 133-142.

Pickett, C. L., Bonner, B. L., & Coleman, J. M. (2002). Motivated self-stereotyping: Heightened assimilation and differentiation needs result in increased levels of positive and negative self-stereotyping. *Journal of Personality and Social Psychology*, *82*, 543-562.

Rabinowitz, J. C. (1990). Effects of repetition of mental operations on memory for occurrence and origin. *Memory & Cognition, 18*, 72-82.

Riefer, D. M., & Batchelder, W. H. (1988). Multinomial modeling and the measurement of cognitive processes. *Psychological Review, 95*, 318-339.

Riefer, D. M., Hu, X., & Batchelder, W. H. (1994). Response strategies in source monitoring. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 20*, 680-693.

Sherman, J. W., & Bessendoff, G. R. (1999). Stereotypes as source-monitoring cues: On the interaction between episodic and semantic memory. *Psychological Science, 10*, 106-110.

Snyder, C. R., & Endelman, J. R. (1979). Effects of degree of interpersonal similarity on physical distance and self-reported attraction: a comparison of uniqueness and reinforcement theory predictions. *Journal of Personality, 47*, 492-505.

Spaniol, J., & Bayen, U. J. (2002). When is schematic knowledge used in source monitoring? *Journal of Experimental Psychology: Learning, Memory, and Cognition, 28*, 631-651.
Stahl, C., & Klauer, K. C. (2007). HMMTree: A computer program for latent-class hierarchical multinomial processing tree models. *Behavior Research Methods, 39*, 267-273.
Stapel, D. A., & Tesser, A. (2001). Self-activation increases social comparison. *Journal of Personality and Social Psychology, 81*, 742-750.
Toth, J. P., & Hunt, R. R. (1990). Effect of generation on a word-identification task. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *16*, 993-1003.
Trepte, S. (2006). Social identity theory. In J. Bryant & P. Vorderer (Eds.), *Psychology of entertainment* (pp. 255-272). Mahwah, NJ: Erlbaum.
Turner, J. C. (1999). Some current issues in research on social identity and self-categorization theories. In N. Ellemers, R. Spears, & B. Dossje (Eds.), Social identity: Context, commitment, content (pp. 6-34). Oxford: Blackwell.
Vignoles, V. L., Chryssochoou, X., & Breakwell, G. M. (2000). The distinctiveness principle: Identity, meaning, and the bounds of cultural relativity. *Personality and Social Psychology Review, 4*, 337-354.
Vignoles, V. L., Chryssochoou, X., & Breakwell, G. M. (2002). Evaluating models of identity motivation: self-esteem is not the whole story. *Self and Identity*, *1*, 201-218.
Wickens, T. D. (2002). *Elementary Signal Detection Theory.* Oxford: Oxford University Press.
Williams, K., Harkins, S., & Latané B. (1981). Identifiability as a deterrent to social loafing: Two cheering experiments. *Journal of Personality and Social Psychology*, *40*, 303-311.
Wippich, W. (1995). Self-awareness and source monitoring. *Swiss Journal of Psychology*, *54*, 131-140.