APPLIED COGNITIVE PSYCHOLOGY
Appl. Cognit. Psychol. **16**: 845–862 (2002)
Published online in Wiley InterScience
(www.interscience.wiley.com) DOI: 10.1002/acp.859

Comparisons of Target Output Monitoring and Source Input Monitoring

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SUMMARY

Five experiments were conducted to compare source memory to target memory. For the current purposes, source memory was defined as information that was learned from two sources (i.e. information input) whereas target memory was defined as information that was delivered to two sources (i.e. information output). The paradigm that we developed involved receiving concrete objects from two people in the source-monitoring conditions or giving away these same objects to two people in the target-monitoring conditions. This procedure allowed a direct comparison of source monitoring to target monitoring holding all other experimental variables constant. Target-monitoring performance exceeded source monitoring except when the decision component of target monitoring was eliminated and incorporated into source monitoring. Commonalities and differences between source and target monitoring are discussed as are the real-world implications of target memory for social behavior and facilitating communication. Copyright © 2002 John Wiley & Sons, Ltd.

In social situations a person's role as an observer versus a contributor often changes over the course of the interaction. In some situations such as a lecture hall setting, the instructor may primarily play the role of the contributor and the student only the occasional contributor. In other situations such as an informal conversation over lunch, people's roles as contributor versus observer are presumably more equal as they engage in normal conversational turn-taking. In still other situations such as a group brainstorming session people's personal biases to contribute tend to make some group members active participants and others more passive, social loafers (e.g. Harkins *et al.*, 1980). The point is that, depending on the role that one is playing in a given situation, one's cognitive processing is either directed at comprehending information delivered by another person or one is attempting to impart information to others. Therefore, in different situations information is either being received or it is being transmitted. This article concerns one aspect of people's memory for information that is either received or transmitted, namely, memory for the origin of incoming information versus memory for the destination of outgoing information.

As it turns out, we know a great deal about people's memory for the origin of information that comes in to the cognitive system. This literature concerns the source-monitoring

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framework (Johnson *et al.*, 1993). According to this framework, people encode qualitative characteristics of memory traces, such as the type of perceptual or contextual details, the amount of affective information, or the cognitive operations associated with elaborating or imagining at the time of encoding. These characteristics are then examined to determine the origin of a memory by applying decision criteria. For example, if the perceptual detail in the memory trace is vivid enough then the event was probably experienced and not imagined. As another example, if one can remember the deep, rich voice of a particular acquaintance, then one has diagnostic evidence of who spoke a particular piece of information. These decision processes are flexible and they can be applied heuristically or more strategically depending on the situation in which an origin judgement needs to be made (e.g. Marsh and Hicks, 1998). Thus, a very advanced conceptual framework exists with a very broad empirical base that specifies how people determine the origin of physical and mental experiences laid down in memory traces.

By contrast to this deep understanding of the memory for the origin of incoming information, very little has been published concerning people's memory for what they have said or given to other people. In other words, we know a great deal about source (input) monitoring but we know relatively less about target (output) monitoring. Although input and output monitoring have been used as descriptive labels to convey this dichotomy (Koriat *et al.*, 1991), we prefer to use the terms source and target monitoring, respectively, because of the large literature on source memory. In a review of the relevant literature, Koriat *et al.* argued that target monitoring will often depend on the retrieval of contextual information as was just described to account for accurate source monitoring. However, those authors also concluded that encoding contextual information in target monitoring situations is more difficult and accomplished less efficiently than it is in source monitoring situations. According to Koriat *et al.*'s account, incoming information receives richer associative links with the environmental context and should therefore be better remembered as compared with events that were self-generated where there are fewer contextual details stored in memory. The research evidence on human communication supports Koriat *et al.*'s assertions. In memory tests of naturally occurring conversations, people remember more of the content of what their conversational partner says and much less of their own contributions (Stafford *et al.*, 1988; Stafford and Daly, 1984). Extrapolating these results on memory for content to the contextual details of source versus target information, this work suggests better memory for incoming (source) information and relative worse memory for outgoing (target) information.

Although we find this argument and evidence compelling, we also note that the source-monitoring framework places great weight on the mental experiences contributing to characteristics of a memory trace and Koriat *et al.*'s (1991) definition appears to limit the definition of context to external physical cues. In the source-monitoring framework, both physical cues and self-generated mental characteristics provide diagnostic cues to the origin of a memory. As an example of mental characteristics, when one imagines a picture of a cow, the most diagnostic evidence that the item was imagined is the mental cognitive operations laid down during imagination and the lack of external perceptual details that seeing a picture of a cow would have left in the memory trace (cf. the distinctiveness heuristic, Schacter *et al.*, 1999). We reasoned that the decision process to impart (or to withhold) information from someone in conversations would likewise contribute to cognitive operations and therefore subserve good target memory. The simple point is that target monitoring may not always be inferior to source monitoring as Koriat *et al.* have

suggested. In fact, we were compelled by the fact that self-generated information is usually better remembered than other-generated information (Slamecka and Graf, 1978). Therefore, memory to whom something was delivered might also be better than memory from whom it was received, all other factors being equal. At this juncture it remains an open empirical question of whether source memory or target memory differ from one another because they have never been directly compared. In addition, if they do differ, then no existing theory specifies whether memory might favor source versus target information.

As Brown *et al.* have argued (poster presentation at the annual meeting of the Society for Applied Research in Memory and Cognition, Toronto, 1997), investigating target monitoring is an important endeavour because target memories can determine our social behaviour. For example, if one can remember that a particular joke was told to Jennifer then one can avoid the potential embarrassment of accidentally repeating it to her (Brown *et al.*). Perhaps more embarrassing would be having no source memory that Jennifer originally told the joke in the first place and an attempt was made to repeat it to her. Nevertheless, the repetition of information is only one consequence of poor target monitoring. Perhaps the greater utility of remembering to whom information was delivered concerns the common ground established in relationships with friends, colleagues, and others. For example, if one is aware that one told their spouse a certain fact, then one need not repeat that information but can continue a conversation later with only an oblique reference to the original information that was delivered earlier. More specifically, if one tells a colleague earlier in the week about a flat tyre, an utterance to that same person such as 'Twice in one week is amazing' can be easily understood without elaborate explanation. By this account, target memories concerning whom we have told facts allow short-hand communication and a shared understanding much like the given-new strategy facilitates language comprehension (Haviland and Clark, 1974). On a practical level, supervisors in the workplace need to remember to whom they have delegated a task in order to follow up on its status towards completion.

As just summarized, there are important practical reasons to investigate target monitoring. There are also important theoretical reasons which include, among others, assessing whether target monitoring might be governed by principles similar to those specified by the source-monitoring framework (Johnson *et al.*, 1993). However, we defer this issue to the General Discussion section after the data from five experiments are reported. In Experiment 1, participants either received concrete objects from one of two fictitious people in one condition or they gave them away to the same two people in another condition. The first is a classic source-monitoring situation and the second is a target-monitoring situation. In Experiment 2, participants received objects from two people (source monitoring) and then gave those same objects away to two different people (target monitoring). Memory for the donors and recipients was again compared. In Experiment 3 the decision component of target monitoring was removed and inserted into the source monitoring condition to investigate the mechanisms underlying these two different types of memory. In Experiments 4 and 5, half the objects were received from two people and the other half were given away to the same two people. Participants first had to decide whether the object was received or was given away, and then they had to specify with whom the object was associated. These last two experiments differed in whether participants elaborated on the reasons for why they either received or gave objects away.

EXPERIMENT 1

The purpose of Experiment 1 was to test conditions in which participants either received equal numbers of objects from two fictitious people or they gave away equal numbers of objects to these same people. The manipulation was conducted between-subjects and was intended to mimic in its essential properties learning information from or disseminating information to two people. The use of male versus female sources has a long tradition in the source-monitoring literature (e.g. Ferguson *et al.*, 1992; Johnson *et al.*, 1995). Consequently, we decided to use fictitious male and female names as the sources and targets in this experiment. After participants received or gave away all 60 objects (half associated with each of the male and female names) they took a memory test modelled after standard source-monitoring tests. The 60 old items were intermingled with 30 new items and participants decided whether the object was new or had been associated with the male or female (i.e. standard three-alternative test). The only difference between the conditions was whether participants received or gave away items during learning. To our knowledge, this experiment constitutes the first direct comparison of source versus target monitoring with a set of materials and procedures that was otherwise equivalent in the two conditions. Obviously, this experiment lacks the rich, real-world connections between people who exchange objects but this laboratory approach seemed to be an excellent starting point for a first comparison of these two different types of memorial information.

Method

Participants

Thirty-four University of Georgia undergraduates volunteered in exchange for partial credit towards a course requirement. Each participant was tested individually in sessions that lasted approximately 25 minutes. As described shortly, 18 participants were randomly assigned to the source-monitoring condition and 16 were tested in the target-monitoring paradigm.

Materials and procedure

Ninety concrete nouns were selected from clusters 7 and 8 of the Toglia and Battig (1978) normative compendium. These items were generally of medium to high word frequency (e.g. *book, telephone*) and chosen with some care that they could not be assigned to a male or female based on any stereotypical gender related associations (e.g. tie, earring, football, etc.). For the source-monitoring condition, 60 of these were randomly chosen anew for each participant by the software. These items were presented at study with half of the items randomly assigned to each of the male and female sources. The remaining 30 items were intermingled anew with the old items as distractors for the source/target test. The male and female names were Edwin and Sally. During learning in the source condition, the phrase 'FROM SALLY' (or Edwin) appeared for 1 s in the centre of the computer monitor and then two lines below it the object label appeared for an additional 5 s. There was a 500 ms ITI between study trials. A running tally was kept at the top of the screen of the number of objects received from each of the two sources because participants in the target-monitoring condition needed this information to assign equal numbers of objects to the two people.

In the target condition, an object label appeared in the centre of the screen and participants had been instructed to press one of two keys to give away the object to either

Sally or Edwin. As soon as they did, the phrase 'TO SALLY' (or Edwin) appeared in the same location as the 'from' message had appeared in the source condition. If the decision took less than 5 s (which it generally did according to the pilot testing conducted) then the 'to' message and the object label remained on the screen until 5 s had elapsed to equate the study duration to items studied in the source condition. Quite importantly, participants were instructed not to use any special strategy for assigning objects such as alternating back and forth between the recipients. They were also told that the software would not allow them to give away unequal numbers of objects to the two people. As such, they were instructed that they should not let the assignment become too unbalanced because this would constrain their last few decisions out of the 60 objects to be assigned. The experimenter monitored each participant to ensure that these admonitions were followed. Participants in both conditions had been informed that their memory would be tested later, but the type of test was not specified prior to learning.

After encoding, both groups took an identical test in which their memory was tested for which person was associated with the objects. The software randomly intermingled the 60 old items with the 30 new items for each participant tested. People were informed that some of the items were new and that they should specify whether a test item was new, or if old, determine the person with which the object was associated. Three computer keys were labelled Sally, Edwin, and New for this purpose. By design, this test sequence is identical to those used commonly in the source-monitoring literature. The tests were administered after a short delay in which participants read instructions off the computer screen and then listened to the experimenter reiterate them. The interval between the end of the study sequence and the beginning of test averaged approximately 4 min.

Results and discussion

Unless specified otherwise by a p-value, statistical significance does not exceed chance by the conventional 5% throughout this article. The results are presented in Table 1. Columns represent actual sources and rows represent participants' beliefs about those items. The source-monitoring data are presented in the top half of Table 1 and the target-monitoring data are presented in the lower half. In each half, columns sum to unity because we have presented the proportion of claims for each source (or target) on the test. Therefore, correct performance is located on the upper-left to lower-right diagonal and misattributions are represented by the off-diagonal entries. Because the misattributions did not lend themselves to any outstanding insights concerning performance, we focus on correct target versus source monitoring.[1]

A 2 (source versus target) $\times$ 3 (New, Sally, Edwin) mixed-model ANOVA was conducted on the two diagonal entries of Table 1. Participants were better able to detect new items as new than they were able to identify correctly the two old classes; and this was true of new items in both conditions, $F(2, 64) = 31.6$, $MSE = 0.01$. The important outcome was that target monitoring resulted in better person identification than source monitoring,

[1]Standard errors are provided in the table. Direct comparisons between means can be inferred by using a rule of thumb that two means differ statistically if they differ by more than two averaged standard errors with the caveats that for within-subjects comparisons this will be a very conservative test and for between-subjects comparisons it will be somewhat liberal. In addition, we could have pooled across the two old sources in Experiments 1 and 2 such that Tables 1 and 2 would have only two columns representing old and new items and three rows representing new, correct, and incorrect beliefs about the source and target decisions. We decided not to present the data in this fashion in order to highlight the fact that there were no biases to choose one fictitious person rather than another during the two types of test.

Table 1. Proportion of correct identifications and confusions in the source- and target-monitoring conditions of Experiment 1

Participant	Item origin		
Responds	New	Sally	Edwin
		Source monitoring	
'New;	0.88	0.13	0.09
	(0.03)	(0.02)	(0.01)
'Sally'	0.06	0.73	0.13
	(0.02)	(0.03)	(0.02)
'Edwin'	0.06	0.15	0.77
	(0.02)	(0.02)	(0.03)
		Target monitoring	
'New'	0.95	0.09	0.10
	(0.01)	(0.02)	(0.01)
'Sally'	0.03	0.83	0.07
	(0.01)	(0.03)	(0.02)
'Edwin'	0.02	0.09	0.83
	(0.01)	(0.02)	(0.02)

Note: Standard errors are in parentheses.

$F(1, 32) = 6.8$, $MSE = 0.02$. The interaction between the conditions and sources in the test was not significant, $F(2, 64) < 1$. Better target monitoring than source monitoring is a result that does not agree with Koriat *et al.*'s (1991) analysis of output and input monitoring, respectively. In fact, Koriat *et al.* made the opposite prediction that output monitoring should be worse than source monitoring. Moreover, that outcome is also inconsistent with findings on memory for the content of natural conversations in which people better remember what was said to them (source) as compared with what they said (target). However, the present results are entirely consistent with the source memory literature. Source-monitoring decisions in the source condition must be based on whatever contextual details can be associated between object and person at encoding. Because the computer chose which objects would come from each source, participants had to develop some study strategy such as imagining the person giving them the object.

By contrast, participants in the target-monitoring condition probably based their decisions on some more idiosyncratic method such as deciding who might like the object more, equating the value of items given to one person versus the other, and so forth. Informally, some of the participants reported that they found themselves sometimes thinking of these issues but did not consciously try to use such strategies. In Experiments 4 and 5 we will return to consider how such strategies could affect the interpretation of the results. For now, we believe that the memorial details of these decisions should principally leave more cognitive operations on which to base the retrospective target-monitoring decisions as compared with source monitoring. This argument about cognitive operations is a relative one in which the decisions made during encoding in the target-monitoring condition would leave more memorial details than simply receiving objects. As discussed later, we are not arguing that target monitoring will always be better than source monitoring.

EXPERIMENT 2

Experiment 1 was designed as a simple, first test of whether differences between source and target monitoring might be found. The results of that experiment suggest that target monitoring was better than source monitoring as tested in a between-subjects design. In Experiment 2, we made performance more difficult by having participants receive all 60 objects from one of two females and then immediately give away the objects to one of two males. Thus, differences between target versus source monitoring was made a within-subjects comparison. In addition, each object now had an associated donor *and* a recipient. Because donors were of the same gender and recipients were of the same gender, the greater similarity of the two should generally reduce performance as it does in the source-monitoring literature (Ferguson *et al.*, 1992; Johnson *et al.*, 1979).

Method

Eighteen participants from the same pool used in Experiment 1 were tested. None had volunteered in Experiment 1. The stimuli and procedures used in this experiment were identical to those described before except that the source and target information were learned sequentially for all 60 items. At encoding, an object was received in an identical manner to the source condition of Experiment 1. After studying from whom the object was received for 5 s, the screen changed to the target condition and participants decided to whom they would give away the object. Running tallies for the source and target aspects at encoding were identical to Experiment 1. The source aspect of each item always preceded the target decision because we did not believe it to be very sensible to give away an object that had not yet been received. Participants worked with an item for a total of 10 s: 5 s for source information and 5 s for target information. Participants studied the source and target information for one item before proceeding on to the next item in the learning sequence. The two female names used for the source aspect of the items were Sally and Mary whereas the two male names for the target aspect were Derek and Robby. As in Experiment 1, participants were admonished not to use any special strategies such as assigning all of the objects from one of the females to one of the males. The experimenter observed each participant to ensure that this never occurred.

Because the test instructions were slightly more complicated to explain and to understand, the retention interval between study and test was increased by a minute or two. The test was conceptually similar to the test in Experiment 1 except that source and target judgements were made sequentially for each item in a manner similar to the encoding session. During the test, an object label was presented and the query 'FROM SALLY OR MARY?' appeared beneath it. Participants had been warned that although the two names were in the query, there was always the possibility that the item was new. Participants pressed one of three keys to indicate from whom they thought they had received the object (or was new). After doing so, the query 'TO DEREK OR ROBBY?' replaced the previous query and the object label remained as it had for the source judgement. After the target judgement, an ITI of 500 ms occurred before the next test item and its source query appeared. All 90 items were tested in this fashion in a different random order for each participant tested.

Results and discussion

The results are set forth in Table 2 in a manner similar to Table 1 except that for target monitoring the male names appear in the lower half of the table to denote the target

Table 2. Proportion of correct identifications and confusions for the source- and target-monitoring decisions in Experiment 2

	Item origin		
Responds	New	Sally	Mary
	Source monitoring		
'New'	0.81	0.07	0.06
	(0.05)	(0.02)	(0.02)
'Sally'	0.11	0.48	0.43
	(0.03)	(0.03)	(0.02)
'Mary'	0.08	0.45	0.50
	(0.02)	(0.03)	(0.02)
	Target monitoring		
	New	Derek	Robby
'New'	0.81	0.07	0.06
	(0.05)	(0.02)	(0.02)
'Derek'	0.11	0.74	0.19
	(0.03)	(0.04)	(0.04)
'Robby'	0.08	0.19	0.75
	(0.02)	(0.04)	(0.05)

Note: Standard errors are in parentheses.

decisions. Performance was worse than in Experiment 1 as we had intended. We first describe the pattern of results, and then present the statistical results. Participants responded similarly to the new items when making source versus target judegments. This result was almost pre-ordained because if a participant believed an item was received, they knew that they had also given it away during learning. There was, however, no bias to choose Sally over Mary or Derek over Robby (or vice versa). Examining the four cells in the lower right-hand corner of the source data is revealing. Misattributions from whom objects were received were almost as prevalent as correct source attributions. The same four cells of the target monitoring data reveal much better target monitoring (by approximately 25%). Importantly, the detection of old items as old meant that the attributions of old items as new were identical for the target and source decisions (0.07 and 0.06 in upper and lower halves of Table 2).

Because the attributions of new items were somewhat dependent decisions for source and target judgements and because old items that went undetected and were called new should have been somewhat dependent as well, we analysed only the lower four cells of the source and target monitoring data.[2] In a 2 (target versus source) $\times$ 2 (fictitious person) within-subjects ANOVA, target monitoring was better than source monitoring, $F(1, 17) = 41.1$, $MSE = 0.03$. This result replicates Experiment 1 and suggests that, in the paradigm

[2]The cells we chose not analyse with statistics are not necessarily dependent across source and target judgements because participants could have claimed that an old item was new for the source judgement and then realized on the target question that they had remembered giving that item away during encoding. Thus, there was no statistical dependence that would invalidate inferential statistics. However, the data do not suggest that this occurred and therefore the dependence that led us to change our analysis was a more important psychological dependence. We do not view this as a shortcoming of the experiment. Rather, having both source and target information about the very same item results in a very powerful test in comparing source to target monitoring.

developed here, the decisions about who will receive objects leads to better memory for the target than does the encoding operations of receiving objects. More generally, these data also suggest that one is more likely to forget which of two people made a given statement than one is likely to forget which of two people were told a similar fact. Therefore, compared to better memory for the conversational content of what one is told (source) versus the poorer memory for what one says (target), these first two experiments may have revealed an important dissociation. That dissociation concerns memory for the item (or content of a conversation) and the contextual detail(s) concerning with which person it is associated. Dissociations of this sort can be found in the source-monitoring literature such as when a self-focus at encoding improves item memory but reduces source memory compared to adopting an other-focus orientation (Johnson *et al.*, 1996). In Experiment 3 we investigate one potential mechanism that may confer the advantage in target monitoring that has been found over source monitoring in both Experiments 1 and 2.

EXPERIMENT 3

One principal difference in our paradigm between target and source monitoring is that participants in the former case must make a conscious decision to whom they want a particular object to be given. This decision component during learning is entirely absent from the source monitoring aspect of Experiments 1 and 2 because those decisions are made for the participants. Consequently, target memory may be better as a result of more elaborated cognitive operations that are stored in memory from the decision-making process of who should receive which items. If this is the reason that target memory is better than source memory, then eliminating the decision component from target monitoring and inserting it into source monitoring should reverse performance in the two conditions. In other words, having participants chose from whom they would like to receive objects and instructing them to whom they should give objects could make source monitoring better than target monitoring. In this next experiment we test whether the decision component is the primary reason for target monitoring being much better in Experiments 1 and 2. In Experiment 3, participants chose from whom they would receive objects (i.e. chose the source) and gave objects to whom the computer specified (i.e. the target). We also changed one other aspect of the procedure. In Experiments 1 and 2, participants had to press keys to indicate their choice of person in the target-monitoring conditions. Because this could have improved memory, we had participants in this next experiment press keys to indicate which fictitious individual was being referred to in both the source and target conditions which will eliminate such a confound between the two conditions.

Method

Participants

Twenty-six University of Georgia undergraduates volunteered in exchange for partial credit towards a course research requirement. Each participant was tested individually in sessions that lasted approximately 30 minutes. An additional participant was tested but failed to detect less than 20% of the old items as having been studied and therefore has not been included in the analyses.

Materials and procedure

The basic procedure used in Experiment 2 was used here in which 60 objects were received from Sally or Mary and then immediately given away to Derek and Robby. The received and given aspect of learning was sequential for each item as it was in Experiment 2. However, rather than the computer printing a 'FROM' message as the source of the donor, participants had to choose from whom they wanted to receive each object. The constraints and contingencies were the same as they were in the two previous experiments insofar as obvious strategies were disallowed and an equal number of objects had to be received from each female. The experimenter monitored the learning phase to ensure that these instructions were followed. After a source decision was made by pressing one of two keys, the object and their decision (e.g. FROM SALLY) remained on the screen for a duration that made the source learning last a total of 5 s. After the source decision, the computer told participants to whom they should give the same object and participants had to press a key corresponding to the appropriate male indicating that they had complied. The message 'TO DEREK' (or Robby) remained on the screen for 5 s for each item. The test sequence in terms of prompting for source and target judgements was identical to that described in Experiment 2.

Results and discussion

The results are summarized in Table 3 in a manner identical to Table 2. As was true of that previous experiment, identification of the new items was quite good, but when they were attributed to having been studied there was no bias to attribute them to either of the fictitious people for either the source or target judgements. The critical entries in Table 3 are the lower right-hand four entries in each of the upper (source) and lower (target) halves of the

Table 3. Proportion of correct identifications and confusions for the source- and target-monitoring decisions in Experiment 3

	Item origin		
Responds	New	Sally	Mary
	Source monitoring		
'New'	0.73	0.16	0.11
	(0.04)	(0.02)	(0.01)
'Sally'	0.13	0.61	0.27
	(0.02)	(0.04)	(0.03)
'Mary'	0.14	0.24	0.62
	(0.03)	(0.03)	(0.03)
	Target monitoring		
	New	Derek	Robby
'New'	0.73	0.14	0.13
	(0.04)	(0.02)	(0.02)
'Derek'	0.14	0.52	0.34
	(0.03)	(0.03)	(0.03)
'Robby'	0.13	0.34	0.53
	(0.02)	(0.02)	(0.03)

Note: Standard errors are in parentheses.

table. As can be seen there, when the decision component was made integral for items that were received and removed from the items that were given away, source monitoring performance was better than target-monitoring performance. These observations were confirmed in the 2 (target versus source) $\times$ 2 (fictitious person) within-subjects ANOVA. Source monitoring was better than target monitoring, $F(1, 25) = 11.18$, $MSE = 0.02$.

These data indicate that the decision component largely confers better memory for that aspect of performance in which it plays an integral role. Therefore, the results of this experiment suggest that when target monitoring contains a decision concerning to whom information should be imparted, that piece of contextual information may be remembered better than the context information from whom the same information was learned originally. From an applied perspective, therefore, it may not make very much sense to argue very strongly that target monitoring is better or worse than source monitoring, at least in an absolute sense. For example, if one needs to make a decision to whom among several different students a project or task is to be delegated, target memory is likely to be good because a decision among several alternatives had to be made. However, if one needs to receive a piece of information from one of the same group of students, a decision component concerning which one to ask may lead to equally good source memory from whom the answer was provided. From this perspective, target versus source memory in more real-world settings is going to be governed by the extent to which decisions are involved. However, we believe that, on average, memories involved with outputting information (target) involve more decisions than information input (source). We turn now to three outstanding issues that will be addressed in Experiments 4 and 5.

EXPERIMENTS 4 AND 5

One aspect of performance that has not been measured in Experiments 1–3 is whether or not participants have better memory for what they received versus what they gave away independently of their memory for who the donor or recipient was. The previous experiments have only addressed memory for who was associated with target versus source items. In these next two experiments, we have created conditions that will allow us to test people's memory for whether objects were given away or received, and then subsequently test their memory for the exact person to whom they gave or from whom they received objects. To accomplish this goal, thirty objects were received from two people (Sally and Edwin) at encoding and a different 30 objects were given away to the same two people. At test, participants first answered whether objects were received or given away (or were new) and then answered with whom the object was associated. The first decision will allow us to ascertain whether participants have better memorial detection for information that was received or given away, and the second decision will allow us to determine if the discriminability of sources differs under source versus target monitoring. Experiments 1–3 do not speak to the first question, but they do suggest that the answer to the second question will be that aspect of performance associated with making a decision. We returned to having the target monitoring contain the decision component because, as just discussed, that better mirrors the normal state of affairs in more real-world settings.

There was a second reason for conducting Experiments 4 and 5. The results of Experiments 1–3 suggest that a decision component leads to better memory for either source or target information depending on the aspect of learning with which it is associated. However, there may be an additional basis for the better memory associated

with the decision component. Some of the participants remarked throughout Experiments 1–3 that they found themselves coming up with rationales for why one fictitious person over the other should be given an item or would want to part with various objects. These rationales were in the form of comments such as 'It seemed Sally was more of an outdoor person' or 'Robby was probably overweight and on a diet' or 'Mary seemed to be a typical sorority member'. Of course, because the objects associated with sources and targets were randomly chosen by the computer and the objects were carefully chosen to be non-stereotypic of either gender, such personification of the fictitious people was unexpected. However, to the extent that participants are coming up with rationales for their decisions, perhaps it is not the decision component, *per se*, that is leading to an improvement in memory. Rather, perhaps it is the elaboration or rationale that goes into making such a decision. To test this hypothesis both Experiments 4 and 5 were conducted as described in the previous paragraph. However, in Experiment 5 we had participants generate elaborations or reasons for why Sally and Edwin were giving them each object, and likewise, why the participants were giving the objects to each person.

Because the elaborations were given out loud to the experimenter, we expected better memory for whether items were received versus given away in Experiment 5 as compared with Experiment 4. Also, because items being given away contain the decision component, target monitoring should be better than source monitoring in Experiment 4 because only the target decisions contain natural elaborations. The question of interest was whether in Experiment 5 the elaborations given for both source and target items would equate source- and target-monitoring performance. If target and source monitoring are equated by the explicit elaboration manipulation, then the decision component is simply a form of elaboration. If target monitoring continues to be better in Experiment 5 when elaborated rationales are collected on both target and source items, then we can conclude that it is the decision in which a choice is made among two people that confers the memorial advantage.

The third reason for conducting Experiments 4 and 5 concerned an alternative interpretation of the results. Because participants choose in target monitoring who will receive items, they may be assigning items to targets in non-random sets (i.e. item-selection effects). This could not happen in the source conditions because the computer randomly assigned items. The fundamental issue here is that at test, participants may not actually remember who they gave an object to, but rather, are basing their decisions on the person schema (i.e. personality) that was developed or emerged during encoding. However, forcing participants to come up with rationales in the source condition will also cause these same personality traits to emerge. To the extent that target monitoring is still better in the face of such elaborations that outcome would suggest that the better memory in target monitoring is not purely a consequence of such an alternative interpretation of Experiments 1–3. Experiments 4 and 5 are presented together for the sake of brevity.

Method

Participants

Sixty-two University of Georgia undergraduates volunteered in exchange for partial credit towards a course research requirement. Thirty and thirty-two were tested in Experiments 4 and 5, respectively. Each participant was tested individually in sessions that lasted approximately 30 minutes. An additional participant was tested in Experiment 4 but failed to complete the task as assigned and consequently was excluded from the analyses.

Materials and procedure

The materials were identical to those used previously. Of the 60 items encountered during the study session half were designated as objects received from Sally and Edwin (15 from each person). The remaining 30 objects were to be given away to Sally and Edwin (15 to each person). The software was rewritten such that each trial at encoding was randomly either a source trial (items received) or a target trial (items given away). Identical screens appeared with tallies as before and 'to' queries (target monitoring) and 'from' statements (source monitoring) appeared as before. When an item appeared from one of the two fictitious people, participants had 8 s to study its source in Experiment 4. In Experiment 5, they had the same amount of time to generate a reason why the object was being given away (e.g. *drum* because he quit the band). When an item appeared for a decision as to which of the two people would receive it, the object label also remained on the screen for a total of 8 s (along with its recipient after the decision was made). In Experiment 5, participants also had to generate a reason for giving the object to that person (e.g. *lantern* because she is going camping). The experimenter recorded the first 20 or so reasons for each participant during study so that they would take the task seriously. However, the experimenter also ensured that an elaboration was given for all 60 studied items.

The test sequence was different from that of the previous experiments. The same 90 objects were used again (60 were old and the remaining 30 were distractors). An object label appeared in the centre of the computer monitor and participants first decided whether the object had been received, given away, or was new based on the study session by pressing one of three labelled keys on the computer keyboard. If the participant decided an object was new, then the 500 ms ITI ensued before presentation of the next object label. If the object was determined to be received (source monitoring) then the query 'FROM SALLY OR EDWIN?' appeared. If the object was designated as one that had been given away (target monitoring) then the query 'TO SALLY OR EDWIN?' appeared. Therefore, the first decision had three options (new, received, given) whereas the second option was a binary one about who was associated with each object. The test phase was identical in Experiments 4 and 5.

Results and discussion

The data concerning participants' memory for whether objects were received or given away are set forth in Table 4 in manner conceptually consistent with Tables 1–3. The upper half of that table summarizes Experiment 4 without reasons being generated for each item whereas the lower half of the table summarizes Experiment 5 where reasons (i.e. elaborations) were generated for both source and target items. When new items were claimed to be old, there was a bias to believe that they were received rather than given away, $t(29) = 2.91$ and $t(31) = 2.47$ for Experiments 4 and 5 respectively. According to Marsh and Hicks's (1998) analysis, this asymmetry suggests that participants believe that they have better memory for the objects that they gave away under the target-monitoring conditions as opposed to what they received under the source-monitoring conditions. Not surprisingly, the elaborations provided in the form of reasons for why objects were received or given away resulted in better memory in Experiment 5 as compared with Experiment 4. However, the overall correct attribution of whether items were received or given away did not differ in Experiment 4 (0.65 versus 0.67), $t(29) < 1.0$, or in Experiment 5 (0.83 versus 0.81), $t(31) = 1.02$. Therefore, these results suggest that participants have equally good memory for whether items were received (source) versus

Table 4. Proportion of correct identifications and confusions for whether objects were received or given away in Experiments 4 and 5

Participant	Item origin		
Responds	New	Received	Given
		Experiment 4	
'New'	0.86	0.19	0.13
	(0.03)	(0.02)	(0.02)
'Received'	0.09	0.65	0.20
	(0.02)	(0.02)	(0.02)
'Given'	0.05	0.15	0.67
	(0.01)	(0.02)	(0.03)
		Experiment 5	
'New'	0.97	0.07	0.11
	(0.01)	(0.01)	(0.01)
'Received'	0.02	0.83	0.08
	(0.01)	(0.02)	(0.01)
'Given'	0.01	0.10	0.81
	(0.00)	(0.02)	(0.02)

Note: Standard errors are in parentheses.

whether they were given away (target). This outcome was true regardless of whether elaborations were collected or not. When they were not sure about an item, participants had a small bias to believe it was received rather than given away. Therefore, the answer to the first question is that participants have equivalent memory for whether items were source versus target items, and that memory can be improved with elaborations at study, but source versus target memory was the same in both conditions.

After participants judged whether an item was received or given away they decided with whom the item was associated. In Experiment 4, for the correct attributions of items that were received (0.65) and were given away (0.67), their memory to whom they gave the objects was better ($M = 0.89$, $SEM = 0.02$) than their memory from whom they received the objects ($M = 0.80$, $SEM = 0.02$), $t(29) = 3.10$. The same was true in Experiment 5 for items that they gave away ($M = 0.95$, $SEM = 0.01$) as compared with items that they received ($M = 0.88$, $SEM = 0.02$), $t(31) = 5.54$. Because the elaborations were provided in both the source and target conditions, memory for the person associated with target and source items could have been equated. However, this result did not occur. Rather, the target condition still resulted in better person memory even with the elaborated reasons that were requested during encoding. Therefore, these results suggest that it is not the elaborations that matter, but rather, the decision process associated with choosing between two people that makes target monitoring better in Experiments 1, 2, 4, and 5, and presumably, why source monitoring resulted in better person identification in Experiment 3 when it contained the decision component. By the same token, the elaborations required in Experiment 5 should have extended the personality schema to the items being received. If such schemata were being used, then target and source memory should have been equated, but they were not. That outcome weakens the viability that target monitoring was better because of some idiosyncratic item-selection effects and subsequent reliance on a non-memorial strategy during testing. Of course, we are not saying that such a strategy

would not be possible in real-world settings, only that the data from these experiments do not strongly support this alternative interpretation.

In Experiment 4, 15% and 20% of the items were misattributed to being given away (when received) or received (when given away), and in Experiment 5 these misattributions were 10% and 8% respectively (see Table 4). Nevertheless, participants were required to make claims about the person associated with these misattributed items. Of these misattributions participants specified the correct person 67% of the time in both cases in Experiment 4 which was well above chance performance with received called given, $t(25) = 2.90$, and given called received, $t(29) = 3.71$ (these are one-sample *t*-tests against 50% and the degrees of freedom differ because not every participant was observed to have both biases). The same was true of the 69% and 67% correct identification rate of person with misattributed items in Experiment 5 where the performance was also above chance, $t(28) = 3.25$ and $t(24) = 2.74$. These results suggest that people may not be able to identify whether an object was received or given away but they nevertheless have access to identifying information with whom the object was associated. Therefore, this last result suggests a dissociation between source (or target) identifying information and the information about the particular individuals associated with the objects. We turn now to the implications of these results.

GENERAL DISCUSSION

The results of the five experiments conducted here converge on the notion that either target or source monitoring can be better than the corresponding type of memory. Which will be better appears to be determined by which contains a decision component. In everyday life, however, we probably have fewer opportunities to determine who will give us things or tell us things than we do to determine to whom we will give or tell comparable things. Therefore, to the extent that Experiment 3 represents a somewhat contrived state of affairs (or one that occurs less frequently), then generally speaking, target monitoring is probably better than source monitoring more often than it is not. We have argued that the decision processes used in the target-monitoring conditions (when the normal decision component was involved) resulted in more differentiated memory traces with more cognitive operations than simply attempting to associate items with people in the source-monitoring conditions. Cognitive operations are often important diagnostic cues to origin especially when verbal materials are used as was done here (e.g. Johnson *et al.*, 1981). These results emphasize the importance of defining contextual details as including features of the original experience that go beyond simple external and episodic physical details (e.g. Koriat *et al.*, 1991). Cognitive operations are the result of elaborating or organizing information at the time it was encountered. In the case of target monitoring, people make decisions about what they will and will not say and do in their interactions with others. In those cases when we make decisions about from whom we will seek out information or advice, then source monitoring should be better as compared with when the same information is unsolicited. We have operationalized these ideas here in a simple manner by having participants decide to whom they will 'give' objects and in Experiment 3 from whom they will 'receive' objects. The type of memory associated with the decision component always resulted in better person identification (i.e. a contextual detail).

We have framed our results as relevant to memory for what other people have told an individual (source monitoring) versus what an individual believes to be true of whom they

have told similar information. Being able to determine the source of information that is input to the cognitive system is incredibly important in assessing the accuracy of memory, verifying the veracity of a causal chain of events, or simply assessing the credibility of one's memory for a particular fact or statement. For different reasons, target memory is also quite useful in avoiding repetition errors, eliminating questions that begin 'Did I tell you . . . ?' and generally facilitating communication between individuals. If one can remember that information has been delivered to another individual, then one can adopt a given-new strategy and focus on what is novel in a conversation. This benefit in common ground of knowing that another individual possesses a piece of information is seen more generally in group memory phenomena where individuals working in a group assume certain facts and details are common knowledge and utilize that knowledge to facilitate their performance as a group (e.g. Hinsz *et al.*, 1997; Wegner, 1987).

Ironically, the current results are entirely contrasted with work that has found that people generally have better memory for what their conversational partner says than for what they themselves say (Stafford *et al.*, 1988; Stafford and Daly, 1984). As Koriat *et al.* (1991) note, it is possible that the act of generation (as in contributing to conversations rather than listening) could be a demand on limited cognitive resources that would detract from encoding target (or source) information (see also Jurica and Shimamura, 1999). In the source-monitoring literature, both positive and negative consequence from generation have been reported (see Marsh *et al.*, 2001). Because we do not exactly understand the circumstances that produce positive versus negative generation effects for source monitoring, it would be rather premature in a first article on target monitoring to speculate further about such consequences of generation.

Nevertheless, that target monitoring would generally be better than source monitoring because it often contains the decision component is similar to the generation effect that commonly produces benefits to memory (Slamecka and Graf, 1978). From this standpoint, the decisions made in target-monitoring (or source-monitoring) conditions are akin to a levels of processing manipulation (Craik and Lockhart, 1972). However, this cannot be wholly true because the elaborations collected in Experiment 5 did not equate performance in the source and target conditions. Rather, making a decision concerning the choice of one of two people conferred its own unique advantage above and beyond elaborations at encoding. The important point of these experiments is that they begin to address in a principled fashion whether memory for having told another person something is different from memory for who told us something. Both types of memories are fallible, but they might be so to differing degrees. These present results suggest that source memory should be somewhat worse than target memory when there is no choice or decision about the origin. However, we do not want to claim that it should always be so, as Experiment 3 demonstrated. In everyday target monitoring, if a statement is made to someone in passing without a great deal of thought or elaboration, then perhaps later when the same topic arises with the same individual the risk of repetition will be great because there is little or no memory for having made the statement originally.

However, source and target memories are not simply the opposite sides of the same coin. One difference, for example, is that one can have memory for not divulging information whereas the same is not true of having memory for the absence of source information. We have all had the experience of a topic coming up in conversation which resulted in biting one's lip because divulging a piece of information to the person would break a confidence or otherwise be hurtful to our conversational partner. These memories of not targeting an individual for a piece of information can be as vivid as actually making

the person a target for that information. In this way, target monitoring also includes judgements of who does not know information.

As we have stated at the outset, target monitoring is used to guide our social interactions (Brown *et al.*, 1997) as well our professional ones. For example, most professors will tailor their discussions with students based on what they believe a student knows and does not know. For example, if one remembers having a conversation in which signal detection analysis was defined, then on a subsequent occasion memory for that conversation can be used to explain a new topic such as dual process theories of recognition. More generally, the way one chooses to interact with people will vary as a function of many things, but certainly as a function of what one remembers to be true about how they have interacted in the past. One interesting aspect to the results of Experiments 4 and 5 was that people could forget whether they received or gave away an object, but they nevertheless had above chance memory concerning with whom the object was associated. This dissociation is likely to be common in everyday cognition with facts and recounted actions of others. For example, one can know that a certain fact has an association with a given individual but simply not know whether the association is from having learned the fact from that person or the association is derived from telling that person. As Brown *et al.* (1997) speculate, such confusions might be quite common as we learn a fact from one person and repeat that same fact to many different people.

We have echoed a similar claim before in a different article on source monitoring (Marsh *et al.*, 1997, p. 896). In that earlier work, we claimed that memories for ideas that are repeatedly revisited or repeated often will lose their source-specifying characteristics and are excellent candidates for unconscious plagiarism or inadvertent belief of authorship. If this claim is true, then experiments in which some objects are given away greater numbers of times as compared with others that are given away fewer numbers of times might have less source-specifying information associated with them, perhaps as a consequence of something akin to a fan effect in memory (e.g. Anderson, 1974). Although such an idea could be tested with simple extensions to the paradigm developed here, we hope that others will also pursue new, and more complex paradigms that investigate people's target memory. Although we have argued that target monitoring might be governed by principles specified in the source-monitoring framework and freely admit that this is a claim open to empirical tests, the greater challenge will be to find those variables that dissociate target from source monitoring.

ACKNOWLEDGEMENTS

We wish to thank Norma Gable, Kellie Linscott, and Don Sparks for their dedicated help in collecting the data. We also thank J. Don Read and several anonymous reviewers for their suggestions on earlier versions.

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