

Factors affecting source memory: Effects of the amount and source-attribution level of information presented by sources

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情報源記憶の正確さに及ぼす情報量と情報内容の情報源への帰属レベルの影響

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要約

成人 100 名を調査対象者として、音声情報の発話者（男性もしくは女性）を特定するソースモニタリングテストを、情報量と情報内容の発話者への帰属レベルを操作した 4 条件で行った。情報量は、情報が単語か文かで操作され、情報内容の発話者への帰属レベルでは、単語もしくは文が発話者の自己紹介すなわち情報は発話者に関するものであるという文脈で発話されるか（情報源帰属）、何の文脈もなしに発話されるか（ニュートラル）で操作された。調査対象者には、記銘時に、男性のみが発話する 11 項目の単語または文、女性のみが発話する 11 項目、男性と女性の両方が発話する 11 項目の計 33 項目を聴かせ、テスト時には、ディストラクタ 11 項目を追加した 44 項目に対して、それぞれ、男性が言った項目か、女性が言った項目か、両方が言った項目か、記銘時にはなかった項目かを 4 択で判断させた。その結果‘文—情報源帰属’条件が、最もソースモニタリングが正確であり‘単語—ニュートラル’条件が最も不正確であった。また、‘情報源帰属’条件では、両方が言った項目についてのソースモニタリングが不正確になった。これらの結果から、発話者の情報量と、情報の帰属レベルの両方がソースモニタリングの正確さに影響すること、情報の帰属レベルの影響は、判断項目の種類によって異なること等が明らかになった。

Key words

memory, source monitoring, auditory information, source-attributed information, binding

1. Introduction

Source monitoring refers to the set of processes involved in making attributions about the origins of memories, knowledge, and beliefs (e.g., Johnson, Hashtroudi, & Lindsay, 1993). We often misattribute or confuse the origin of information in everyday situations, for example, “Did my son really pass the entrance exam, or did I just dream he did?”; “Did I actually turn the air conditioner off, or did I just intend to turn it off?”; “Did John or Mary tell me the story?”, and so on. According to the framework for the processes of source monitoring (Johnson et al., 1993; Johnson & Raye, 1981), there are three types of source monitoring. Reality monitoring requires discriminating memories of internally generated information from memories of externally derived information, such as distinguishing memories of thoughts and imagination from memories of perceived events. Internal source monitoring refers to realization judgments of two internally generated activities, such as performing and imaging. Finally, external source monitoring refers to the ability to discriminate externally derived sources, such as identifying two

speakers (e.g., “Which person told the story? Person A or B?”).

Since Johnson and her colleagues have presented the framework of source monitoring, various memory studies have adopted the idea of source-monitoring error or source misattribution to explain the process of false-memory creation (e.g., Kahan, 1996; Kahan, Mohsen, Tandez, & McDonald, 1999; Henkel, Franklin, & Johnson, 2000; Reyna, 2000) and of the suggestibility of eyewitness memory (e.g., Chambers & Zaragoza, 2001; Lindsay, 1990; Lindsay & Johnson, 1989; Zaragoza & Koshmider, 1989). Furthermore, several aging studies (e.g., Chalfonte & Johnson, 1996; Glisky & Kong, 2008; Mitchell, Johnson, & Mather, 2003) showed greater age-related impairments in source memory compared with item memory.

These above-mentioned studies mainly focused on the process of reality monitoring and internal source monitoring, in which even adults often make misattribution errors; however, they were less interested in the adult’s performance of external source monitoring probably because previous developmental studies (e.g., Foley, Johnson, & Raye, 1983; Foley & Johnson, 1985; Lindsay, Johnson, & Kwon, 1991) showed a high ability of external source monitoring in adults and older children. For example, Lindsay et al. (1991; Experiment 1) demonstrated that children had more difficulty with distinguishing between words

spoken by two speakers of the same gender than those spoken by a male and a female; however, the performance of the adults was not affected by the similarity of the two sources. Furthermore, more recent studies have shown that even 5 year olds can achieve ceiling performance when identifying two dissimilar videotaped speakers (Kovacs & Newcombe, 2006).

However, the performance of the adults in several previous studies suggested that the nature of the information spoken by sources, but not the similarity of the sources, may influence the accuracy of external source monitoring in adults. One possible factor was the difference in the amount of information. In the source-monitoring task conducted by Lindsay et al. (1991; Experiment 1), the participants heard a list of words spoken by a male and a female speaker and were then given a source-monitoring test asking them to remember the source of each word by means of alternatives comprising male, female, and new (i.e., was not presented in the acquisition phase). In Experiment 2, on the other hand, they used a series of sentences replaced by the list of words to replicate the results of Experiment 1 with more naturalistic and complex materials. The participants watched two videotapes, each of which showed a person telling a story comprising a list of sentences. Namely, they heard a list of sentences spoken by a male and a female in the acquisition phase. The source-monitoring score observed in Experiment 2 was considerably higher than that observed in Experiment 1; that is, adults have more difficulty identifying the source of a word than of a sentence. It was assumed that the reduction in semantic information spoken by source persons under the word condition reduced the chances that listeners would bind features of the speaker to the semantic content of what was being said compared with the sentence condition. Nevertheless, in Lindsay et al. (1991), the comparative results of word condition (i.e., Experiment 1) with sentence condition (i.e., Experiment 2) were not demonstrated. Furthermore, the conditions of those experiments were different in the procedural details, including whether the voices were presented by an audio speaker or a video monitor. Therefore, in this study, source-monitoring performance when identifying the voice of a person who speaks a list of words versus a series of sentences was directly compared.

We assumed that another factor was the content of the information given by the sources. Johnson, Nolde, & Leonardis (1996) demonstrated that affective focus on the sentences spoken affects source-monitoring accuracy. In their experiment, participants heard sentences that focused them either on how they felt about the sentences (i.e., Self-focus condition) or on how they thought the speakers felt about the sentences (i.e., Other-focus condition). Results showed that the participants under the Other-focus condition made more correct source identifications than did those under the Self-focus condition. The advantage of the Other-focus condition, which induced listeners to focus on the feelings of the source persons, suggested that source-monitoring accuracy may be based on how much the content of the

information was related to the attribution of the source persons. Thus, the present study examined whether the source-attributed information improves source-monitoring accuracy by means of comparing two conditions: the source-attributed condition in which source persons present information related to themselves (e.g., “I don’t like bananas”) and the neutral condition in which source persons present neutral information (e.g., “Bananas are a nutritious fruit”).

Accordingly, the aim of the present study was to examine how the nature of the information presented by sources, that is, the amount of information (i.e., word or sentence) and the content of information (i.e., source-attributed or neutral), affects external source-monitoring accuracy assessed by a standard source-monitoring task (e.g., Foley et al., 1983; Lindsay et al., 1991; Wilding, 1999). It is expected that the participants are more likely to accurately identify the source of source-attributed information described in a sentence.

The second issue examined in this study was how well adults can achieve new types of source-identification, such as when both person A and person B spoke a certain sentence or word. Several eyewitness studies (Hekkanen & McEvoy, 2002; Lindsay & Johnson, 1989; Zaragoza & Lane, 1984) were designed to investigate source misattribution errors of “both” responses, such as the items that participants had only read as post-event information were misidentified as items that they had also seen in the target event; however, the previous studies in which a standard source-monitoring task was used did not examine the accuracy of identifying sources when the two sources presented the same information. Thus, in this study, a standard source-monitoring task was modified to explore the accuracy of the “both” response to the items told by both Speaker A and Speaker B. In the acquisition phase, the participants listed three types of items, which were read by only a male, read by only a female, and read by both the male and female, and then they were asked to identify the sources of the test items by means of alternatives consisting of Male only, Female only, Both, and Neither.

2. Methods

2.1 Participants

One hundred adults (ages 18-28 years, mean = 21 years) participated in this experiment. An equal number of participants were assigned to the four conditions: word and neutral information (word-NEU), word and source-attributed (word-SA), sentence and neutral (sentence-NEU), and sentence and source-attributed (sentence-SA).

2.2 Materials

For the sentence-SA condition, a list of 44 sentences regarding self-introduction including favorite food and hobby (e.g., “I like watching TV”) was generated (see Table 1). These sentences were assigned to one of four sublists comprising 11 sentences: read by only a male voice, read by only a female voice, read by

Table 1: Examples of stimuli used in this experiment

sentence-NEU condition	sentence-SA condition
• <u>Bananas</u> are a nutritious fruit.	• I don't like <u>bananas</u> .
• <u>Teachers</u> are popular jobs.	• My dream is becoming a <u>teacher</u> .
• <u>English</u> is a compulsory subject.	• <u>English</u> is my best subjects.
• <u>Dogs</u> are owned as pets.	• I have a <u>dog</u> .
• <u>Yellow</u> is warning coloration.	• <u>Yellow</u> is my favourite color.

Note. Underlined words were used in word-NEU and -SA condition.

both a male and a female, and distractors, which were new items presented in the source-monitoring test. Two types of recitations of self-introduction (i.e., produced by a male and a female) comprising their name, greeting, and 22 sentences regarding themselves were recorded by means of a voice recorder. For example, the male version is as follows: “Hello, my name is Taro. Please allow me to introduce myself. I like watching TV. I don’t like bananas. ... (22 sentences in all).” These sentences were recorded at 3-second intervals. Six patterns of the recitations were prepared by changing the combination of the 22 sentences to control for the effects of the differences among the sentences. For the sentence-NEU condition, the structure of the sentences and of the sublists was the same as for the sentence-SA condition; however, each sentence described neutral information (i.e., “Bananas are a nutritious fruit”), and the introduction comprising their name and greeting was omitted. For the word condition, the structure of the stimuli was the same as for the sentence conditions with the exception that the underlined words (see Table 1) were independently recorded. The following introduction was added only for the word-SA condition: “Hello, my name is Taro. Here, I’m going to say my favorite words.”

The response sheets used during the source-monitoring test consisted of the numbers from 1 to 44 with alternatives “male only,” “female only,” “both,” and “neither.”

2.3 Procedure

The experiment was conducted with a subgroup of 4 to 6 participants in a quiet lab room. The participants were informed that their task would be to listen to a list of sentences (sentence condition) or a list of words (word condition) read by a female and a male voice coming from either the right speaker or the left speaker. They were not informed of the true purpose of listening to these stimuli. Following those instructions, the participants listened to the two types of stimuli (i.e., produced by a male and a female). Half of the participants first listened to the male voice and then listened to the female voice. The rest of the participants listened to the reverse condition. Following a 5-minute filler task, the participants were given a source-monitoring test regarding 44 items (i.e., 33 old and 11 new), in which they were asked to indicate the source of each test item by selecting either “male only,” “female only,” “both,” or “neither” by means of the response sheets. The experimenter read the test items one by

one and then instructed participants to make a source judgment before moving on to the next item (e.g., “‘I like bananas.’ Which voice was this sentence read by? Male only, female only, both, or neither? Please choose your judgment from the four alternatives on the response sheet.”).

3. Results

One point was given for each correct response (i.e., selecting a correct source from the four alternatives), and a summed score was calculated for each type of source judgment (i.e., male only, female only, both, neither) as the source-monitoring score (maximum = 11). Table 1 and Figure 1 show the mean source-monitoring scores as a function of conditions and types of source judgments. A two-way (condition $4 \times$ type of source judgment 4) analysis of variance (ANOVA) was conducted. Condition was between-participants, and type of source judgment was a repeated measure. The main effect of the condition was significant, $F(3, 96) = 8.04$, $p < .001$, indicating that the participants in the word-NEU condition responded less correctly than those in the other three conditions ($t(96) = 2.43$, $p < .016$, for word-SA; $t = 3.93$, $p < .0001$, for sentence-NEU; $t = 4.48$, p

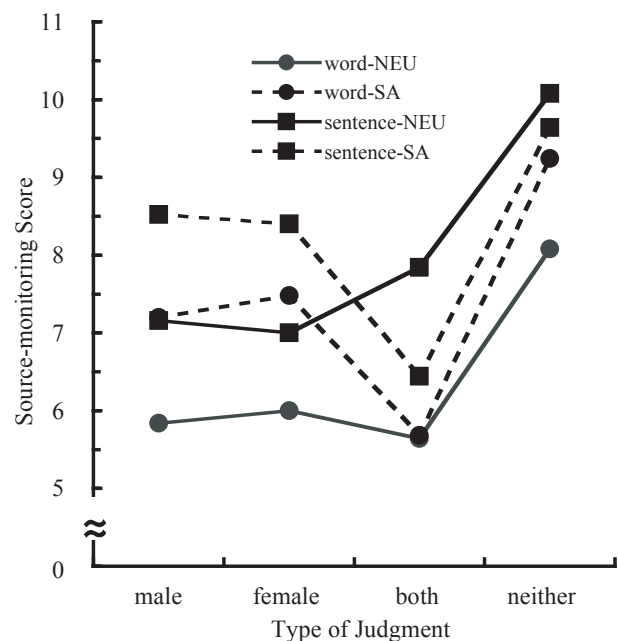


Figure 1: Mean source-monitoring score of each condition and type of judgment

Table 2: Mean source-monitoring score of each condition and type of judgment

Type of judgment	Condition							
	word-NEU (N = 25)		word-SA (N = 25)		sentence-NEU (N = 25)		sentence-SA (N = 25)	
male	5.84	(2.15)	7.20	(2.77)	7.16	(2.41)	8.52	(2.29)
female	6.00	(2.29)	7.48	(1.73)	7.00	(2.72)	8.40	(2.04)
both	5.64	(2.64)	5.68	(2.93)	7.84	(1.93)	6.44	(2.45)
neither	8.08	(3.28)	9.24	(2.49)	10.08	(1.19)	9.64	(2.22)
total	25.56	(4.74)	29.60	(6.91)	32.08	(5.50)	33.00	(4.74)

Note. SD is shown in parentheses.

< .00002, for sentence-SA) and that the participants in sentence-SA responded more correctly than those in word-SA ($t = 2.05$, $p < .043$).

The main effect of type of source judgment was significant ($F(3, 288) = 31.29$, $p < .00001$). The multiple comparisons indicated that the “both” judgment was the most inaccurate of the four types of judgment ($t(288) = 2.52$, $p < .012$, for the male-only judgment; $t(288) = 2.65$, $p < .008$, for female-only; $t(288) = 9.25$, $p < .00001$, for neither) and the “neither” judgment was the most accurate ($t(288) = 6.72$, $p < .00001$, for the male-only; $t(288) = 6.59$, $p < .00001$, for the female-only). There was no significant difference between the “male-only” and “female-only” judgments.

The interaction of condition \times type of source judgment was also significant ($F(9, 288) = 2.13$, $p < .026$). The simple main effect of condition in “male” judgment ($F(3, 384) = 5.22$, $p < .001$), “female” judgment ($F(3, 384) = 4.35$, $p < .004$), “both” ($F(3, 384) = 4.69$, $p < .003$), and “neither” ($F(3, 384) = 3.21$, $p < .023$) were all significant. With respect to multiple comparisons of condition in the “male” and “female” judgments, the score for word-NEU was significantly lower than those for the other three conditions, and the score for sentence-NEU was lower than that for sentence-SA. Regarding both judgments, the score for sentence-NEU was higher than in the other three conditions. As for the “neither” judgment, the score for word-NEU was significantly lower than those for sentence-SA and for sentence-NEU. The simple main effects of type of source judgment in word-NEU ($F(3, 288) = 6.75$, $p < .0002$), word-SA ($F(3, 288) = 11.14$, $p < .00001$), sentence-NEU ($F(3, 288) = 10.56$, $p < .00001$), and sentence-SA ($F(3, 288) = 9.24$, $p < .00001$) were all significant. Multiple comparisons indicated that the “neither” judgment was the most accurate, and there were no significant differences among the other three judgments in the word-NEU and sentence-NEU conditions. In the word-SA condition, multiple comparisons indicated that the “both” judgment was the most inaccurate of the four types of judgment; the “neither” judgment was the most accurate, and there was no significant difference between the “male-only” and “female-only” judgments. In the sentence-SA condition, the “both” judgment was the most inaccurate of the four types of judgment, and the “neither” judgment

was more accurate than the “female-only” judgment.

4. Discussion

The overall results showed that both the amount of information (i.e., word or sentence) and the content of information (i.e., source-attributed or neutral) affected source-monitoring accuracy. In particular, the participants in the sentence-SA condition showed the highest performance in identifying male or female. In contrast, the participants in the word-NEU condition showed the lowest performance. Source-attributed information also improved the source-monitoring accuracy of the male and female judgment. These results could mean that the semantic information of the individual characteristics of the source person strengthened the binding between the information and the source.

First, source-monitoring performance when identifying the voice of a person who speaks a list of words versus a series of sentences was compared. As a result, the participants in the sentence-NEU condition performed more accurately than did those in the word-NEU condition for all four judgments (i.e., male, female, both, and neither). Although the higher accuracy in identifying the source who spoke a list of sentences in Lindsay et al. (1991) was possibly because of the presentation of those sentences by videotape, the results in this study showed that the difference in the amount of information between a word and a sentence directly affected the accuracy of source monitoring. It can be concluded that the reduced semantic information in words decreased the chances that listeners would bind the voice of the speaker to the content of what was being said.

Second, the comparison of the sentence-NEU and sentence-SA conditions in male/female judgments suggested that the source-attributed sentences improve the accuracy of source monitoring. Johnson et al. (1996) demonstrated that affective focus on the sentences by means of rating how the participants thought about what the speakers felt about the sentences (i.e., Other-focus) was effective for source-monitoring performance compared with rating how the participants felt about the sentences (i.e., Self-focus). The sentences used in the sentence-SA condition in this study (e.g., “I don’t like bananas”) directly refer to the speakers’ feelings; therefore, they may have a positive

impact on source monitoring under the Other-focus condition.

Source monitoring in the word-SA condition was more accurate than in the word-NEU condition, indicating that the cognitive framework formed by the source-attributed instruction where the speaker says his/her favorite words is more likely the result of improved source-monitoring accuracy rather than the content of what the speaker said. An identical list of words was used in the word-SA and -UN conditions, and the only difference between the two conditions was whether the favorite-word instruction was told before listening to a list of words. It is interesting that the previous instruction, which does not directly lead the participants to focus on each word and the speaker, was effective in binding the information and the source.

It was unclear in this study whether the high performance in the sentence-SA condition in the male/female judgment was because of the other-focused sentences (e.g., "I don't like bananas") or the self-introduction framework (i.e., "Please allow me to introduce myself"). The procedure in the sentence-SA condition was a compound of different types of source-attributed information, that is, information from the sentences and the instructions before listening to the series of sentences. Further studies are needed to reveal which factors among the source-attributed information mostly contribute to source-monitoring accuracy.

Finally, the results of the accuracy of identifying sources when the two sources present the same information (i.e., "both" judgments) indicated that no difference was shown among male, female, and both judgments in the neutral condition. Previous developmental research using the same paradigm as this study (Kondo, 2009) demonstrated that the accuracy of the both judgments in young children was extremely low compared with the male and female judgments; however, no differences can be seen among these three judgments in the adult participants in the present study. This contradiction may be because of the difference process between the both and male/female judgments. The correct male/female judgment needs to retrieve a binding of a word/sentence and a source who spoke the word/sentence. In contrast, the both judgment process includes retrieving two kinds of binding of a word/sentence and a source and deciding whether these words/sentences are identical. Young children probably have difficulty identifying correct sources through the two-stage process because they have less working memory than adults.

The participants in the source-attributed condition showed lower performance in the both judgment compared with the male/female judgments. This result suggests that the source-attributed framework prevented the participants from finding another pairing for binding of a word/sentence to a source once they had found a pair of binding in the retrieving process. Another possibility is that inaccuracy of the both judgments was because of failure in the encoding process. The participants at first were given the self-introduction or favorite-word frame-

work, of which the two sources will most likely say different information concerning their individual characteristics. As a result, they could encode only one binding even when the two sources told the same information. The factors affecting the accuracy in the both judgment and the process of identifying sources when two sources presented the same information need to be addressed in future studies.

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