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Longitudinal Study of Young Children's External Source-Monitoring Ability in a Real-life Event

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Abstract

The present study investigated intra-individual changes in young children's external source monitoring abilities with respect to facial identification accuracy for complex live events. In the first experiment, young children watched a magic show in which three different female magicians (i.e., source persons) each performed three different kinds of magic tricks. Approximately one month after watching the show, the children were asked to recognize what kinds of magic tricks had been performed and to make face identifications as to which magician had performed those magic tricks. Then, approximately one year after the first experiment, a second experiment was conducted on the same children. Almost the same procedure as the first experiment was repeated; however, the three source persons and three magic tricks were different from those used in the first experiment. The results showed that the children's ability to recognize event details had improved over the course of the year, whereas their ability to identify source persons had not. These results are discussed from the aspect of individual differences in the distortion of eyewitness memory.

Key words: young children, source monitoring, face identification, eyewitness memory

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). Developmental studies of source monitoring are mainly divided into three issues according to the nature of the monitoring: reality monitoring, internal source monitoring, and external source monitoring (Roberts, 2000). In particular, a number of studies have investigated reality monitoring, for example, discriminating self-generated from other-generated action (e.g., Foley & Ratner, 1998; Markham, Howie, & Hlavacek, 1999) and in internal source monitoring, which refers to realization judgments of two self-generated activities such as performing and imaging (e.g., Foley, Harris, & Hermann, 1994; Parker, 1995).

In contrast to the extensive body of research on reality monitoring and internal source monitoring, only a small number of studies have examined external source monitoring ability in preschool-age children. In Lindsay, Johnson, and Kwon (1991), 4- and 6-year-olds and adults received information from two external sources (e.g., two videotaped storytellers) and were later asked to identify the sources of particular details. As a result, although the 4- and 6-year-olds did

not perform as well as the adults, there were considerable improvements in source-monitoring ability from the 4- to 6-year-olds. Kovacs and Newcombe (2006) also demonstrated that 5-year-olds showed high performance on identifying two videotaped similar speakers (i.e., two female speakers). These studies suggest that even young children are quite capable of monitoring external sources, and that their performances improve during the preschool years. However, it remains unclear whether the results can be applied to the ability of children for real life events. As pointed out by Roberts (2002), there are numerous source distinctions relevant to the forensic arena (e.g., "Which of two people carried out an action in the target incident?"); however, little is known about the external source monitoring ability of children in eyewitness situations.

Recently, Sugimura (in press) examined the external source monitoring ability of children with respect to facial identification accuracy when watching a live event in which three performers appeared. In the experiment, 5-6 year olds and adults watched a magic show in which three different female magicians each performed three different kinds of magic tricks. After approximately one month, the participants were asked to make face identifications as to which person had performed the magic tricks. The results showed that the children were less accurate than the adults in source-monitoring judgments regarding which person did a certain magic trick. However, Sugimura (in press) did not examine developmental differences with respect to preschool age. Although a previous experimental study (e.g., Lindsay, et al., 1991) demonstrated that there was considerable improvement in external source-monitoring ability from 4- to 6-year-olds, it is unclear whether such improvements seen in an experimental study will also hold true for real-life situations.

Accordingly, the present study was designed to examine developmental changes in the external source-monitoring ability of children in real-life situations by means of the procedure used in Sugimura (in press). First, the participants experienced a target event as a part of their kindergarten curriculum, and then one month later they were asked to recognize the event details and identify the source persons. Second, in the test session of the source-monitoring task, the participants were asked to identify, from arrays of facial photographs, the persons (i.e., sources) who actually did a certain performance in the previous event.

One interest of the present study is the issue of intra-individual changes in the abilities to recognize event details and identify source persons over the course of one year. A large number of studies have shown the developmental differences between, for example, 4- and 5-year-olds by means of cross-sectional methods. However, there are few longitudinal studies in the field of memory development. Therefore, this study focused on changes in the individual performances of event recognition and facial-identification over the course of one year in preschool-age children. The children's ability to recognize event details and identify faces was assessed two times through two experiments. The first experiment was conducted when the mean age of the children was 4:9, and the second experiment was conducted when the mean age was 5:9.

The other issue examined in this study is whether there are any differences between the facial-identification ability of source monitoring and recognition. In this experiment, two indexes of the person-identification test were prepared: the source-monitoring score, in which the correct response was defined as identifying the person who did a certain performance; and the recognition score, in which the correct response was defined as identifying who performed in an event.

It was hypothesized that the source-monitoring score in the second experiment would not improve compared with that in the first experiment. Although a number of experimental studies have demonstrated remarkable improvement in source-monitoring ability during the preschool years, the higher task demands of the present experiment using real-life events are not likely to yield good performance one year after the first experiment. In addition, it was assumed that the recognition score would improve over the course of the year and be higher than the source-monitoring scores obtained in both the first and second experiments. This is because a large number of eyewitness studies (e.g., Leichtman & Ceci, 1995; Pozzulo & Lindsay, 1998) have demonstrated the high ability of young children to make recognition and increase in recognition accuracy with age provided they are not given suggestive questions or misleading information.

Method

Participants

Twenty-five preschool children participated in this study. Their age range was 3:10 (years:months) to 5:7, with a mean age of 4:9 at the time of the first experiment. At the time of the second experiment, these values had changed to 4:10 to 6:7, and 5:9, respectively.

Materials

Trick-recognition test: Nine 6cm × 9cm picture cards, on which were drawn the scenes of nine magic tricks, were used. Three of these depicted tricks that were actually performed in the show (e.g., three ropes that changed into one long rope quickly), three were distracters similar to the three target scenes described above (e.g., three rings that changed into one large ring quickly), and three were dissimilar distracters (e.g., three butterflies that changed into one big butterfly).

Person-identification test: Nine 9cm × 6cm color facial photographs of Japanese females taken from the shoulders up were used. All photographs were front views with neutral expressions, and each person wore identical gray clothes. Three out of these nine females were the source persons (i.e., Source A, Source B, and Source C) who actually performed the tricks, and the other six females were distracters.

Procedure

Overview: In the first experiment, the participants watched a magic show in which three different female magicians (i.e., source persons) performed three different kinds of magic tricks. Approximately one month after watching this show, the participants were then asked to recognize what kinds of magic tricks had been performed (trick-recognition test) and to identify who performed a certain trick (person-identification test). Next, approximately one year after the first experiment, the second experiment was conducted. Almost the same procedure as that for the first experiment was repeated (i.e., watching a magic show, trick-recognition test and person-identification test a month after seeing it), with the exception that the three source persons and three kinds of magic tricks were different from those of the first experiment.

Watching the event: A male announcer greeted the children and introduced them to the first magician, i.e., Source A. "Hello everyone! We are now going to show you a wonderful magic show by three great magicians from Magic Land. Here comes the first magician!" Source A then came into the room, performed (for example) the Rope Trick, and exited the room. This protocol was repeated for the second magician, i.e., Source B, who performed (for example) the Flower Trick,

and the third magician, i.e., Source C, who performed (for example) the Handkerchief Trick. The exposure time for each source person was 1.5 minutes. After the three magic tricks had been performed, the announcer said good-bye to the children and exited the room. It took approximately 6 minutes to perform the entire magic show.

Trick-recognition test: After approximately one month, the participants were asked to recognize what the magic show they had seen was like. A female experimenter, sitting across a table from each participant, first built up a rapport and then asked the following. "Can you remember the magic show that took place at your school just before the last winter holiday? What kind of magic tricks did they do? Now, I'm going to show you some picture cards depicting a variety of magic tricks." The experimenter then put the nine picture cards on the table, one by one, while describing each picture (e.g., "Here is a magical handkerchief that changes color by itself quickly."). Finally, the experimenter asked the participant to chose all the cards that depicted the magic tricks performed in the magic show.

Person-identification test: For the participants who made perfect responses to the trick-recognition test, the following dialogue was then used. "Great. All of your responses were correct. Now, can you tell me who performed these magic tricks?" The experimenter kept one of the three correct picture cards (e.g., the Rope Trick) up on the table while clearing off the other cards. The card remained on the table as a cue to easily understanding which magician was being asked about. "First of all, who did the Rope Trick?" The experimenter then arranged the nine facial photographs into a 3 × 3 array and asked the participant to select the person who performed the Rope Trick. After the participant's response, the experimenter cleared the photos off the table and said. "Next, can you tell me who did (for example) the Flower Trick?" She then re-arranged the nine facial photographs and asked the participant to select the person who performed the Flower Trick. This procedure was then repeated for (for example) the Handkerchief Trick. The orders of asking about the three tricks and the arrangement of the nine photos were randomized for each participant. For the participants who made imperfect responses to the trick-recognition test, the experimenter told them the correct answer before proceeding with the person-identification questions.

Results

Trick-recognition accuracy

The numbers of participants who correctly chose all three of the cards depicting the magic tricks performed in the magic show were calculated. Table 1 shows the proportions of the four types of participants as a combination of achieving a perfect score (or not) in the first (or second) experiment. A McNemar test revealed that the proportion of the participants who achieved a perfect score in the second experiment but not in the first was significantly higher than those of

Table 1 Number and Proportion of Four Types of Participants as for Two Recognition Test

		Second experiment					
		Not perfect		Perfect score		Total	
		N	%	*N*	%	*N*	%
First experiment	Not perfect	3	12.0	16	64.0	19	76.0
	Perfect score	2	8.0	4	16.0	6	24.0
	Total	5	20.0	20	80.0	25	100.0

the other three types of participants ($p < .001$). That is, the children's ability to recognize event details (i.e., what the magic show was like) improved over the course of the year.

Person identification accuracy

As for the source-monitoring score, a correct response was defined as identifying who had performed a certain type of magic. One point was given, for example, when the participant's selection for the person-identification question of "Who did the Rope Trick?" was really the person who performed the Rope Trick (maximum = 3).

Regarding the recognition score, a correct response was defined as identifying a person who had performed in the magic show. One point was given even if, for example, the participant's selection for the person-identification question of "Who did the Rope Trick?" was actually the person who performed either the Flower Trick or the Handkerchief Trick (maximum = 3). Figure 1 shows the mean source-monitoring and recognition scores as a function of the time of the experiments. A two-way (time of experiment 2× type of score 2) ANOVA was conducted. Both factors were repeated measures. The main effect of type of score was significant, $F(1, 24) = 46.53$, $p < .000$, indicating that the recognition score was higher than the source-monitoring score. The main effect of time and the interaction of time and score type were not significant, indicating that both the source-monitoring and recognition score did not improve during the intervening one year period.

In order to analyze in more detail the intra-individual variability of the source-monitoring and recognition scores, the subtraction scores (i.e., from -2 to 2), consisting of the scores of the second experiment minus the scores of the first experiment, were calculated for each participant. Scores of 0, plus scores, and minus scores reflected no-change, improvement, and reduction, respectively. Table 2 shows the proportion of participants for each possible subtraction score as a function of

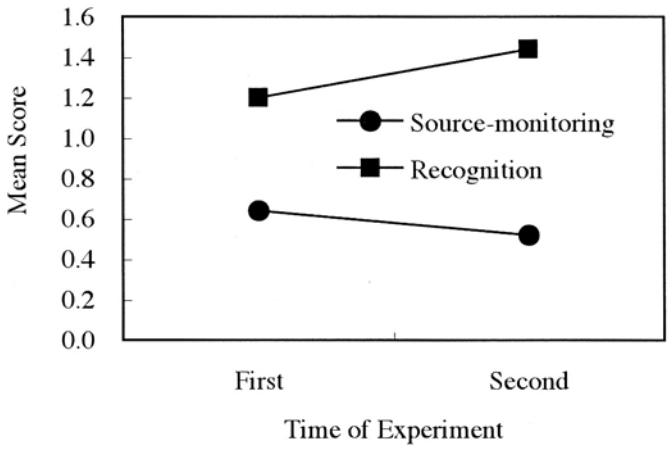

Figure 1 Mean Source-monitoring and Recognition Scores as a Function of Time of Experiment

Table 2 Number and Proportion of Participants Who Made Each Subtraction Score

Score-type		Subtraction score -2	-1	0	1	2	Total
Source-monitoring	*N*	2	5	12	6	0	25
	%	8.0	20.0	48.0	24.0	0.0	100.0
Recognition	*N*	1	4	12	4	4	25
	%	4.0	16.0	48.0	16.0	16.0	100.0

score type. These results confirmed that most of the young children could not achieve a score higher than the score they had achieved one year before.

A correlation analysis was also conducted on the source-monitoring and recognition scores between the first and second experiments. The results indicated that both the source-monitoring and recognition scores in the first experiment significantly correlated with their counterparts in the second experiment ($p < .025$ and $p < .024$, respectively).

Discussion

The children's ability to recognize event details (i.e., trick-recognition accuracy) improved over the course of one year. Although previous studies have demonstrated developmental changes in event-memory ability during preschool age by means of cross-sectional methods, this study showed that age-related intra-individual changes are also involved. In addition, while 80 % of the children achieved a perfect score in the second experiment, 8 % has achieved a perfect score in the first but not in the second experiment. This result confirmed that the individual performance of event recognition remarkably improved over the course of one preschool year.

In the second experiment, the participants, whose mean age at that time was 5 years and 9 months, showed high performance for recognizing details of the event that had occurred approximately one month before. This result corresponds with previous eyewitness studies that demonstrated that 6-year-olds have just as high reliability in recognizing the details of past events as adults (e.g., Goodman & Reed, 1986). The children's high performances in this study can likely be attributed to the procedure used, in which no suggestive or misleading information was given to the children. It is a well-known fact that the eyewitness memories of young children are vulnerable to suggestive questions and misleading information.

Second, in contrast to the observed improvement of event-recognition accuracy, person-identification accuracy, that is, both the source-monitoring and recognition scores, did not improve during the intervening one year period. As for source monitoring, the children's scores were extremely low in both the first and second experiments (mean score = 0.64 and 0.52, respectively), indicating that the participants had much difficulty in binding the face of a certain source person to the act performed by that person. Further, the low performances might have been a result, as expected, of the higher task demands of this study. Thus, even though previous experimental studies had concluded that external source monitoring ability remarkably improves over the course of the preschool years, the current study revealed that such findings should not be generalized to the ability of young children in real-life events.

Contrary to the study hypothesis, the children's performance in recognizing the faces of the source persons did not improve either. In this study, a target-present lineup, about which, for children, is easier to make correct responses than a target-absent lineup, was adopted as the facial identification task. Several studies have also shown that children from 4 to 6 years of age produce correct identification rates as well as adults under target-present lineup conditions (Pozzulo & Lindsay, 1998). Why, then, could the improvement in facial recognition accuracy not be observed under the easier condition?

There are two possible explanations for the difficulties observed not only with the source-monitoring but also the recognition. One is the complexity of the target event that the

participants watched in this study. Previous studies adopted live events or video-taped events in which only one main person performed as the target event, and a facial identification test was then conducted for that one target person. In contrast, this study required the participants to watch an event in which three people appeared, after which they were then asked to identify all three persons. Thus, it is possible that the task demands of memorizing a number of faces presented simultaneously were beyond the processing resources of the preschool children. The other possibility is that the high level of similarity among the source persons prevented the children from distinguishing them. As is well known from previous studies, similarity of sources or events greatly affects the accuracy of source monitoring (e.g., Roberts, 2000, 2002; Sugimura, in press). In this study, the three performers were of the same age, gender, and race, and they had similar height. Furthermore, they gave similar performances. Thus, the preschool-age participants may not have developed sensitivity to the subtle differences among a number of similar-looking persons.

Third, the individual data demonstrated that 28 % of the participants made lower scores than they had one year before in the source-monitoring judgment task used to measure facial identification. This proportion was considerably higher than the rate of participants who had a lower score for the trick-recognition test in the second experiment (i.e., 8.0 %). These results suggest that source monitoring performance used as a measure of facial identification in a real-life event is not stable in preschool age children. The observed performance on recognizing event details probably reflects the simple ability to recognize certain things. However, the performance on identifying sources may be attribute to the ability to recognize the binding of two things. In this study, it is possible that the process of binding a certain performer's face with his/her performance had been affected by not only the children's memory capacity but also a variety of variables, such as the impressionability or attractiveness of both a face and a performance. Thus, some children's performance might not have simply improved as a function of age.

Finally, both the source-monitoring and recognition scores in the first experiment significantly correlated with their counterparts in the second experiment. These results demonstrated that the participants who made a high score in the first experiment showed a high performance on the test after one year. Several studies (e.g., Young, Powell, & Dudgeon, 2003; Geddie, Fradin, & Beer, 2000; Scullin & Ceci, 2001) have demonstrated that in eyewitness memory, developmental changes can be attributed to not only age-related differences but also individual differences, such as tolerance to suggestible information or misleading questions. Although the ability to recognize event details was found to generally improve over the course of the year, source-monitoring ability measured by facial identification as well as tolerance to suggestibility is likely to vary considerably in individuals.

The results of the present study suggest that the source-monitoring ability of young children in real-life events does not improve during the preschool years. However, it is unclear whether the results can be applied to stressful events such as criminal incidents. Further studies are needed to elucidate the issues of developmental change and individual differences in source-monitoring ability in forensic situations.

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