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The Effect of Planning on Preschoolers' Reality Monitoring Errors

by

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Abstract

Previous research suggests that preschoolers tend to misremember others' actions as their own when those actions are performed within a collaborative context (e.g., Ratner, Foley, & Gimpert, in press). The purpose of the present study was to examine the contribution of planning to these types of source monitoring errors. Four-year-olds collaborated with an experimenter in the construction of a model farm in one of 4 conditions: 2 in which children actively planned the experimenter's actions, and 2 in which the child had no direct input into the experimenter's actions. Children who directed the experimenter's actions tended to incorrectly take credit for those actions in a subsequent source monitoring task. Results suggest that in certain contexts an increase in cognitive effort can decrease source memory performance.

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TABLE OF CONTENTS

List of Tables

The Effect of Planning on Preschoolers' Reality Monitoring Errors

Source monitoring refers to the processes involved in making decisions as to the origins of memories, knowledge, and beliefs (Johnson, Hashtroudi, & Lindsay, 1993). Johnson et al. identified three distinct types of source monitoring. External source monitoring involves discriminating between two or more sources external to the self ("Did Sally eat the cookie, or did Billy eat the cookie?"). In contrast, internal source monitoring refers to discriminating between two or more self-generated acts ("Did I eat the cookie, or did I imagine eating the cookie?"). Finally, reality monitoring involves discriminating between an externally derived event and an internally-generated event ("Did I eat the cookie or did Sally eat the cookie?"; "Did Billy eat the cookie or did I imagine that Billy ate the cookie?"). Although much of the early research investigating source monitoring processes has focused on source monitoring abilities in adults (e.g., Johnson, Raye, Foley, & Foley, 1981; Raye, Johnson, & Taylor, 1980) and older children (e.g., Foley, Aman, & Gutch, 1987; Johnson, Raye, Hasher, & Chromiak, 1979), researchers have recently turned their attention to the development of source monitoring abilities in preschool children. The purpose of the present study was to investigate one particular type of source monitoring in preschoolers: namely, reality monitoring.

Cognitive Processes in Source Monitoring

The bulk of the research investigating the cognitive processes underlying source monitoring supports a model proposed by Johnson and Raye (1981). Although this model, called the Reality Monitoring Model, primarily describes the processes underlying reality monitoring, researchers have recently modified the model to include descriptions of the processes involved in all three types of source monitoring. The result is a general source monitoring model which states that source monitoring of all types is based on the characteristics of memories in combination with judgment processes (Johnson et al., 1993). That is, when making a source attribution regarding a particular memory, an individual will examine specific attributes associated with that memory (e.g., sensory information, cognitive processing information), and make a source judgment based on these attributes.

Johnson and Raye (1981) propose that all memories are encoded with various types of information or characteristics. Specifically, memory characteristics that are important for source monitoring include sensory and perceptual information (e.g., sound, colour), contextual information (e.g., spatial and temporal information), semantic detail, affective information (e.g., emotional reactions), and cognitive operations information (e.g., records of organizing, imaging, and elaborating). In their model, Johnson and Raye suggest that memories from different sources vary along these dimensions. For example, these authors propose that externally derived memories have more sensory, perceptual, contextual, affective and semantic detail than internally-generated memories, and that this information is encoded automatically with little cognitive effort. In contrast, generating events internally requires more cognitive processing, and consequently internally-generated events have more cognitive attributes than memories generated by external sources. In reality monitoring, when an individual must distinguish between an internal and an external source with regards to the origin of a memory, he or she would consider the memory characteristics. If the memory contained more records of imaging than sensory information, the memory would be attributed to an internal source. Conversely, if the memory trace contained more perceptual information than records of imaging or elaboration, the memory would be attributed to an external source.

It is important to note here that memories from internal and external sources differ only in the *degree* of sensory, perceptual, affective, contextual, semantic, and cognitive information they contain. That is, Johnson and Raye (1981) do not suggest that internally-generated memories have *no* sensory and perceptual information; rather, memories of this nature merely have less of this information than externally-generated memories. Similarly, memories of external sources have some information regarding cognitive processing, but they have less of this type of information than do memories generated by internal sources.

Although the model originally proposed by Johnson and Raye (1981) focused specifically on reality monitoring, this model has subsequently been applied to both external and internal source monitoring (Johnson et al., 1993). Internal source monitoring generally consists of judging the reality status of an event (i.e, was the event real or imagined?). According to the Source Monitoring Model, imagined events tend to contain more cognitive operational information than actual events, while actual events are associated with more perceptual and sensory detail than events that are imagined (Johnson et al., 1993). An individual would rely on these characteristics to attribute the event to either reality or imagination. In external source monitoring, an individual would consider the specific perceptual and sensory information associated with the event, rather than comparing amounts of cognitive and perceptual information (Foley & Johnson, 1985; Johnson et al., 1993). For example, when determining whether Billy or Sally uttered a particular remark, an individual may recall the sound of Billy's voice, and thus attribute the statement to Billy.

The process described above is considered an automatic process of source monitoring, as the source attribution does not happen consciously (Johnson et al., 1993). That is, one remembers the source of a memory in the process of recalling the event itself, without conscious awareness of the attribution process involved. However, Johnson and Raye (1981) propose that, although this process is usually automatic, if memory characteristic information is lacking or unavailable, an individual must rely on more strategic processing when deciding on the origin of a particular memory. This controlled judgment process involves utilizing additional information about the event in memory, retrieval of supporting memories and existing knowledge, and more sophisticated reasoning. For example, suppose a young woman recalls a time six months ago when she was riding in a red convertible, yet cannot remember if she was driving the car or if her friend, Scott, was driving the car. This individual may draw on her pre-existing knowledge that six months ago she had a broken arm and could not drive a car, and thus conclude that Scott must have been the driver of the red convertible. Both automatic and controlled judgment processes are important for source monitoring, and both can be utilized in any given source monitoring task.

The Generation Effect

Support for Johnson and Raye's (1981) model of source monitoring is found in research investigating the generation effect. The generation effect refers to the ability to better remember self-generated information than information produced by sources external to the self (Slamecka & Graf, 1978). For example, Slamecka and Graf asked adults both to generate words using cue words and a specific rule (e.g., provide a synonym for "ocean" beginning with the letter "s"), and to simply read words from a card. When later tested, adults showed better recognition memory for words they had generated than for words they had read.

Johnson et al. (1981) claim that the generation effect is produced by an increase in cognitive operations generally associated with self-generated actions. In Experiment 1, these researchers asked adult participants to generate words from specific cue words, and to listen to a researcher generate words from specific cues. In one condition, the cue words were adjectives (e.g., hot), and the generated words were to be opposites of the cue words (e.g., cold). In a second condition, the cue words were category nouns (e.g., colour), and the generated words were to be common instances of the categories (e.g., blue). In a subsequent recall memory test, participants remembered self-generated words better than they remembered experimenter-generated words when those words were category instances, but not when they were opposites. Johnson et al. suggest that generating opposites required less cognitive effort because there were so few possible words that could be generated in response to each cue. In contrast, when generating common category instances, participants were forced to engage in more search and decision-making processes because there were several possible words that could be generated in response to each cue. Johnson et al. concluded that the increased cognitive effort involved in generating category instances produced the generation effect for these words.

While the majority of the research investigating the generation effect focuses on adults (Johnson et al., 1981; Raye et al., 1980; Slamecka & Graf, 1978), researchers have found that both 6-year-olds (Baker-Ward, Hess, & Flannagan, 1990) and 8-year-olds (Johnson et al., 1979) are likely to show the generation effect as well. For example, Baker-Ward et al. (1990) asked first and third grade children to perform and to observe others performing a series of goal-directed actions (e.g., bouncing a ball into a trash can). Children were later asked to recall the actions; consistent with the generation effect, children recalled more performed actions than observed actions.

It is important to note that research investigating the generation effect examines recall and recognition memory, not memory for source. Although these types of memory tasks assess different aspects of memory, the generation effect has implications for source monitoring research in that it provides information about how internally-generated events are encoded in, and later retrieved from, memory. To illustrate, in reality monitoring tasks, individuals are asked to discriminate between responses they produced themselves and responses produced by another. According to the generation effect, and Johnson and Raye's (1981) Reality Monitoring Model, this task is a relatively easy one, as the cognitive operational information associated with self-generated acts serves as a cue for which actions were performed by the self. Any actions encoded with less of this information are, by default, attributed to external sources. Thus, the generation effect works to improve performance on reality monitoring tasks. However, it is possible that increasing the cognitive workload associated with externally-generated events could increase the likelihood that those events are attributed to internal sources. In this case, the generation effect would actually be a detriment to source memory performance, a proposal investigated in the present study.

Young Children's Performance on Source Monitoring Tasks

Although the empirical literature investigating source monitoring abilities in preschool children is limited, the available research suggests that children as young as 3 years of age have some ability in identifying the sources of their knowledge (Gopnik & Graf, 1988; O'Neill & Gopnik, 1991; Pillow, 1989; Pratt & Bryant, 1990). However, 3-year-olds are not nearly as efficient at this task as older preschoolers (Gopnik & Graf, 1988; O'Neill & Gopnik, 1991; Roberts & Blades, 1995; Welch-Ross, 1995). Furthermore, several researchers propose that children as young as 4 years of age perform as well as adults on certain types of source monitoring tasks (Foley, Johnson, & Raye, 1983; Lindsay, Johnson, & Kwon, 1991; Markham, 1991) and that developmental differences are limited to specific circumstances, such as situations in which sources are very similar (Lindsay et al., 1991; Markham, 1991), or when children are asked to discriminate between memories of actual and imagined events (Day, Howie, & Markham, 1998; Parker, 1995).

Foley and Johnson (1985) compared the performance of 6-year-olds, 9-year-olds, and adults on each of the three types of source monitoring. After performing, imagining, and watching the performance of a variety of actions (e.g., touching your nose), participants indicated which of two sources had produced a particular action. In the internal source monitoring task, participants were asked to indicate whether they had performed an action, or if they had only imagined themselves performing that action. In the external source monitoring task, participants were asked to indicate which of two researchers had performed a particular action. Finally, in the reality monitoring task, participants were asked to indicate whether they had performed an action themselves, or if a researcher had performed that action. Foley and Johnson found that all age groups performed best in the reality monitoring condition, followed by the external source monitoring condition. In these two conditions, both the 9-year-olds' and the 6-year-olds' performance was equivalent to that of adults. The children's performance was poorest in the internal source monitoring condition; the 9- and the 6-year-olds' internal source discrimination was significantly worse than that of the adults. Adults' performance in the internal source monitoring condition did not differ from their performance in the external source monitoring condition.

Children's success on reality monitoring tasks and difficulty with internal source monitoring tasks is a pattern well-documented in the source monitoring literature focusing on younger children (e.g., Foley et al., 1983; Lindsay et al., 1991). For example, Foley et al. (1983) found that 6-year-olds' source monitoring performance was better when they were asked to distinguish between what they said and what they heard someone else say (reality monitoring) than when they were asked to distinguish between what they said and what they imagined themselves saying (internal source monitoring). However, several factors, such as source similarity, including imagining as a source, and source monitoring in collaborative contexts, have been observed to alter children's performance on all three types of source monitoring. The significance of each of these factors will be discussed in the sections to follow.

Source similarity. Lindsay et al. (1991) found that source similarity can negatively influence young children's performance on external source monitoring tasks. Four-year-olds, 6-year-olds, and adults watched either two similar storytellers (two young females) or two dissimilar storytellers (a young female and a male senior citizen) telling two different stories. The researchers then presented participants with various details from each of the two stories and asked them to identify which of the two storytellers had mentioned each detail. While the manipulation had no effect on adults, the children who heard the stories read by similar storytellers were more likely to confuse the sources than the children who heard the stories read by dissimilar storytellers. In addition, 4-year-olds were more affected by the source similarity than 6-year-olds. Thus, in external source monitoring, the similarity of the sources impacts children's, but not adults', ability to discriminate between sources, and this effect is particularly strong for younger children.

Lindsay et al. (1991) also investigated the impact of source similarity on internal source monitoring and reality monitoring. Children aged 7 to 10 years and adults took part in a series of actions (e.g., touch your nose). Conditions involving similar sources required participants to perform and imagine themselves performing several actions, and to watch another person perform and imagine that person performing several actions. In these two conditions, the agent of the actions (i.e., the person touching his/her nose) was the same: the self or another person. Conditions involving dissimilar sources required participants to perform and imagine another person performing a series of actions, and to watch another person perform and imagine themselves performing a series of actions. Once again, adults performed well in all conditions. When the sources were dissimilar, both 7- and 10-year olds' performance was comparable to that of the adults. In contrast, when the sources were similar, the children in both age groups performed significantly worse than the adults. Specifically, children performed poorly when the actor involved in both the performance and the imagined performance was the same (either the self or another person). Thus, even though children demonstrate considerable competence in reality monitoring (Foley & Johnson, 1985; Foley et al., 1983), this early emerging ability can be easily derailed by factors such as source similarity.

Imagining as a source. While source similarity does appear to play a role in children's poor performance on specific source monitoring tasks, many researchers alternatively argue that it is the imaginative aspect of certain tasks that contributes most to children's difficulty with internal source monitoring and reality monitoring involving imagination. Johnson and Raye (1981) suggest that the capacity for thoughts to have as much perceptual and sensory detail as actual events can create confusion when discriminating between real and imagined memories. Parker (1995) argues that this confusion is particularly evident in younger children. Recall that Johnson and Raye (1981) propose that internally-generated memories are encoded with more cognitive operational information, while actual, perceived events are encoded with more sensory and perceptual detail. Parker (1995) suggests that young children's imagining can take on more perceptual and sensory detail than cognitive operational information, thereby creating memories of imagined events that are similar to memories of actual events in terms of the amount of perceptual, sensory, and cognitive details associated with them. This equating of internally- and externally-generated memories contributes to confusion between the two types of memories when making source monitoring decisions, leading children to misidentify the memory of an imagined event as a memory of an actual event.

Collaboration. A third factor that interferes with children's performance on reality monitoring tasks in particular is collaboration. In several recent studies, researchers have suggested that when children as young as 4 years old collaborate with another person in working towards a specific goal, memory for source decreases (Foley, Passalacqua, &

Ratner, 1993; Foley & Ratner, 1998; Foley & Ratner, 2000; Ratner, Foley, & Gimpert, in press). In these situations, children demonstrated a tendency to claim ownership of the other person's actions.

Foley and her colleagues (Foley et al., 1993; Foley & Ratner, 1998) examined this error pattern in 4-year-olds. In a series of studies, 4-year-olds collaborated with an experimenter in the construction of a puzzle, alternating turns placing puzzle pieces on a puzzle board. When later questioned about who placed each puzzle piece, the children claimed they had placed the pieces the experimenter had placed ("I did it" errors) more often than they claimed the experimenter placed pieces the children had actually placed ("You did it" errors). Foley and her colleagues proposed that this effect occurs only within a collaborative context with a well-defined goal. These researchers maintained that when working toward a collaborative goal, young children encode their partners' actions as self-actions, as they are focused on their partners' actions in relation to the goal.

To explore the cognitive processes underlying these findings and to determine their implications for learning, Ratner et al. (in press, Experiment 1) investigated the impact of decision-making on the "I did it" versus "You did it" error pattern in 5-year-olds. They asked 5-year-olds to collaborate with an experimenter in furnishing a dollhouse with six empty rooms. In one condition, children selected the appropriate furniture to go into each room (i.e. bathroom, kitchen, etc). The children and the experimenter alternated turns placing furniture into the dollhouse, but the children indicated which pieces they and the experimenter would place, and in what order. In a second condition, the experimenter placed half of the furniture in the dollhouse before the children entered the room, and then told children which items to move into the house, where to place them, and in what order to place them. In a subsequent source memory test, children who participated in the planning of the furnishing task (i.e., children who decided which furniture items they and the experimenter would place in the dollhouse) made more "I did it" errors than "You did it" errors than children who did not take part in this decision-making process. Ratner et al. interpreted these findings as demonstrating that when children assume the decision-making role of their partners in collaborative tasks, they "recode" their partner's actions as self-actions.

Ratner et al. (in press, Experiment 2) furthered their findings in a second experiment. In one condition, the experimenter decided which furniture items both she and the child would place in the dollhouse. In a second condition, the experimenter and the child each made their own furniture selections. In a subsequent source memory test, children in both groups tended to make comparable numbers of "I did it" and "You did it" errors. That is, when children did not direct the experimenter's actions, they also did not later take credit for these actions. This finding contrasts with the condition in the first experiment in which children decided which furniture items the experimenter placed in the dollhouse. Recall that in this condition, children made more "I did it" errors than "You did it" errors. Ratner et al. concluded that children's direct involvement in a collaborative task with the experimenter (i.e., directing the experimenter's actions) resulted in an increase in cognitive operations associated with the experimenter's actions, thereby leading children to later "assume agency" of the experimenter's actions.

In order to examine whether making a significant number of "I did it" errors facilitates children's later independent performance of the collaborative task, children in both experiments were asked to correctly re-furnish the dollhouse, placing all of the furniture back into the appropriate rooms, following the source memory test. Children who made more "I did it" errors than "You did it" errors (children who selected all of the furniture items the experimenter placed in the dollhouse) were more organized (i.e., re-furnished one room in its entirety before moving on to another room) and demonstrated more planning behavior in this re-furnishing task than children who did not show this pattern of errors. Ratner et al. (in press) concluded that children's "recoding" of their partner's actions in collaborative tasks later facilitates children's independent performance of these tasks.

Reality Monitoring and Planning

Ratner et al. (in press) suggest that within collaborative contexts, an increase in cognitive operational information associated with an observed event can lead children to misidentify that event as self-generated. It is proposed that these findings are consistent both with Johnson and Raye's (1981) Reality Monitoring Model, as well as with research investigating the generation effect. As discussed previously, self-generated events require more cognitive processing than perceived events, and the resulting cognitive processing information serves as a cue for later identifying these events as self-generated. According to Ratner et al. (in press), when an externally-generated event takes on more cognitive attributes than perceptual attributes, the confusion between internally- and externally-generated events increases.

It is unclear, however, which factors create a sufficient increase in cognitive information in externally-generated events to produce the pattern of errors (i.e., more "I did it" errors than "You did it" errors) found in Ratner et al's (in press) studies described above. Note that in Ratner et al.'s studies, children only demonstrated this pattern of errors in conditions that required them to direct (or plan for) the experimenter in her furniture selections for the dollhouse (i.e., when children planned both their own and the experimenter's furniture selections). The number of "I did it" errors and "You did it" errors were similar when children had no involvement in the experimenter's furniture selections (i.e., when the experimenter and children each planned their own furniture selections; when the experimenter planned all of the furniture selections). Planning is a skill requiring complex cognitive processing (Kreitler & Krietler, 1987), and it is proposed that in Ratner et al's (in press) studies having the children plan the experimenter's actions increased the cognitive details associated with these actions, equating them with the child's own actions in terms of cognitive workload. This increase in cognitive detail resulted in the children claiming the experimenter's actions were their own.

The Present Study

The purpose of the present study was to systematically examine the effect of varying planning agents on children's reality monitoring performance. A group of 4-year-olds collaborated with an experimenter in the construction of a miniature farm, alternating turns with the experimenter in placing farm pieces on a pre-constructed farm base. Manipulations regarding the planning agent, designed to either increase or decrease the number of "I did it" errors, were used, resulting in four conditions.

Table 1 summarizes the four planning conditions. In the first condition, the experimenter and the child each planned the location of their own farm pieces on the farm base (Each Plans Own). In a second condition, the experimenter and the child planned the location of each other's pieces (Each Plans Other). In a third condition, the child planned the location of all the farm pieces (Child Plans Placement), and in the fourth condition the experimenter planned the location of all the pieces (Experimenter Plans Placement). Upon completion of the farm construction, and after a delay, children were asked to indicate who placed each item on the farm, and source memory errors were compared across all four conditions.

In contrast to Ratner et al.'s (in press) experiments, in the present study children's error patterns were examined independent of the additional factor of instructional setting. In Ratner et al.'s studies, planning took place within an instructional context: each piece of furniture had a specific, correct room it belonged in. If a child incorrectly selected a piece of furniture to go in a specific room (e.g., a bed for the kitchen), he or she was corrected. Upon completion of the memory test, children were asked to correctly re-furnish the dollhouse. It is possible that planning on its own is ineffective in producing a greater number of "I did it" errors than "You did it" errors, and

Table 1

Summary of Planning Conditions

Group	Planning Agents
Each Plans Own	Child plans where Child will place his/her pieces on the farm. Experimenter plans where Experimenter will place her pieces on the farm.
Each Plans Other	Child plans where Experimenter will place her pieces on the farm. Experimenter plans where Child will place his/her pieces on the farm.
Child Plans Placement	Child plans where Child and Experimenter will place their pieces on the farm.
Experimenter Plans Placement	Experimenter plans where Child and Experimenter will place their pieces on the farm.

that the patterns of errors demonstrated by the children in Ratner et al.'s studies was due to an increase in cognitive effort associated with learning. In order to gain a clearer understanding of the effect of planning alone on children's source monitoring performance, the learning component present in Ratner et al.'s studies was removed from the collaborative situation in the present study. While there was still a collaborative goal (i.e., building the farm), there were no "correct" locations for items to be placed on the farm; the location of each item was decided upon by the planning agent, which varied depending on the condition.

If planning alone provides sufficient cognitive processing for producing more "I did it" errors than "You did it" errors, this error pattern was expected to be present when children planned the placement of all the farm pieces (Child Plans Placement condition), and when the experimenter and the children planned the placement of each other's items (Each Plans Other condition). It was proposed that in both of these conditions, children's cognitive processing associated with the experimenter's actions should be increased, thereby creating confusion between internal and external sources. In the cases where the experimenter planned the placement of all the items (Experimenter Plans Placement condition), and the experimenter and the child planned their own actions (Each Plans Own condition), the cognitive workload associated with the self-generated actions should be greater than that associated with the experimenter's actions. Therefore, it was proposed that the source memory errors in these conditions would be random, and no error pattern would be present.

Method

Participants

Sixty-three children (30 boys and 33 girls) ranging in age from 4 to 5 years participated in this study. Children were recruited from preschools and daycare centres throughout Calgary, Alberta, and were all from homes in which English was the primary language spoken. Children were randomly assigned to one of four conditions: the Each Plans Own condition (n = 16, Mean age = 4.48, SD= .28), the Each Plans Other condition (n = 15, Mean age = 4.50, SD = .27), the Child Plans Placement condition (n = 16, Mean age = 4.55, SD = .28), or the Experimenter Plans Placement condition (n = 16, Mean age = 4.51, SD = .26). Ages did not significantly differ across the four planning conditions. Thirteen additional children (2 girls and 11 boys) were tested but were excluded from the final sample for the following reasons: 5 children (1 girl and 4 boys) failed to either understand or follow instructions, 2 boys did not meet the age requirements, 2 boys were participants in an earlier study designed to examine children's familiarity with the items used in the present study, 1 boy did not speak English as a first language, and 3 children (1 girl and 2 boys) were excluded due to experimenter error. In addition, 4 children (2 girls and 2 boys) were excluded because they were statistical outliers (see Scoring and Data Reduction section).

Materials

Twenty miniature farm accessories (see Figure 1) were used in the farm construction and source memory test. Items included a cow, a horse, a dog, a pig, a

Figure 1. Photograph of model farm and animals.

rooster, a cat, a rabbit, a basket of apples, a ladder, a bucket, a rake, a watering can, a plant, a hay bale, a birdhouse, a broom, a saw, a shovel, a boy, and a girl. These items were selected because they were easily identifiable to 4-year-olds (as confirmed by a pretest with 10 additional 4-year-olds), and because it was thought that each item could be treated independently of the other objects (i.e., did not include a rooster and a rooster pen). An opaque, square box (7.5" x 5" deep) was used to store the objects. A piece of felt was attached over the top opening of the box; a small slit was cut into the felt to allow the participants and the experimenter to take objects from the box without seeing them. In addition, pictures for colouring and crayons were used for the distractor task.

A farm base was constructed using a three-sided stage (25.5" long, 9.5" high, 12" deep) with a floor (see Figure 1). Coloured foam board was used to create grass (green) on the floor of the stage, sky (blue) on the two sides and the back of the stage, and a two-dimensional barn (brown and black) on the back of the stage. A piece of white foam board measuring 26" x 12.5" was used to cover the stage during the source memory test.

Procedure

A between-subjects design was used, in which children participated in one of four conditions: two shared planning conditions and two independent planning conditions. Each child was seen individually by a female experimenter. The child was seated beside the experimenter, either on the floor or on a chair at a small table. The stage containing the base for the farm construction was situated in front of the child and the experimenter. In all conditions, the experimenter told the child "Old McDonald needs a farm. It is going to be our job to build him one". The experimenter then showed the child a large opaque box, and told him/her that it contained everything needed to build the farm. The child was not shown the contents of the box before the actual task of constructing the farm had begun. In all conditions, the experimenter and the child alternated turns *blindly* taking farm pieces from the box; thus, the farm pieces were selected randomly. The experimenter always took the first piece. Both the child and the experimenter retrieved 10 items each. Each took his or her *own* pieces from the box; however, the person who planned the location of those pieces on the farm varied depending on the condition. Note that there were no "correct" locations for the farm pieces to be placed on the farm. Refer to Table 1 for a summary of the four planning conditions.

Shared planning. In the two shared planning conditions, the child and experimenter both actively took part in the planning of the placement of the farm accessories. In the *Each Plans Own* condition, the experimenter told the child: "You and I are going to take turns taking farm pieces out of this box. We each get to choose where our own pieces go on the farm. First, I will take a piece out of the box without peeking. Then I will think carefully about where a good spot is for that piece on the farm, and I'll put the piece in the spot I choose. Then it will be your turn to take a piece out of the box, and you can choose a good spot for your piece." The experimenter then reached into the box, pulled out a piece, named it ("Oh look, I got a cow!"), verbalized her decision about where it should go on the farm ("I think a good place for the cow on the farm is here"), and placed the object in its selected spot. The child was then told that it was his/her turn to take a piece from the box. After the child took his/her piece, he/she was encouraged to name the piece (if he/she had not spontaneously done so), and then told: "Now, think carefully, where do you think would be a good spot for a _______ on the farm?". Once the child selected a spot, he/she placed the piece in that location, and it was again the experimenter's turn. Note that in this condition, the child and experimenter took, planned the placement of, and placed their own pieces.

In the *Each Plans Other* condition, the experimenter told the child: "You and I are going to take turns taking pieces out of this box. You get to choose where my pieces go on the farm, and I get to choose where your pieces go on the farm. First, *I* will take a piece out of the box without peeking. Then *you* will think very carefully about where a good spot is for that piece on the farm, and then *I'll* put the piece in the spot you choose. Then it will be *your* turn to take a piece out of the box, and *I* will choose a good spot on the farm for the piece you take, and *you* will put the piece in the spot I choose." The experimenter then reached into the box, pulled out a piece, named it, and said to the child: "Now, think carefully, where do you think would be a good place for a _________ on the farm?" Once the child selected a spot, the experimenter placed the object in that location. The child was then told that it was his/her turn to take a piece from the box. After the child took his/her piece, he/she was encouraged to name the piece. The experimenter then said, pointing to the selected spot: "I think a good place for a _________ on the farm is here." Once the experimenter selected a spot, the child placed the piece in that location, and it was again the experimenter's turn to take a piece out of the box. Note that in this condition, the child and experimenter took and placed their own pieces, but it was the other person who planned the placement of those pieces. That is, the child planned the placement of the experimenter's pieces, and the experimenter planned the placement of the child's pieces.

Independent planning. In the independent planning conditions, only one person, either the child or the experimenter actively planned the placement of all twenty farm pieces. In the *Child Plans Placement* condition, the experimenter told the child: "You and I are going to take turns taking farm pieces out of this box. But *you* get to choose where all the pieces go on the farm. First, I will take a piece out of the box without peeking. Then *you* will think carefully about where a good spot is for that piece on the farm, and I will put the piece in the spot you choose. Then, it will be your turn to take a piece out of the box, and you can choose a good spot for the piece you take." The experimenter then reached into the box, pulled out a piece, named it, and said to the child: "Now, think carefully, where do you think would be a good spot for a _________ on the farm?" Once the child selected a spot, the experimenter placed the object in that location. The child was then told that it was his/her turn to take a piece from the box. After the child took his/her piece, he/she was encouraged to name the piece. The experimenter then said: "Now, think carefully, where do you think would be a good spot for a _________ on the farm?" Once the child selected a spot, the child placed the piece in that location, and it was again the experimenter's turn to take a piece out of the box. Note that in this condition, the child and experimenter took and placed their own pieces, but it was the child who planned the placement of all the pieces.

In the *Experimenter Plans Placement* condition, the experimenter told the child: "You and I are going to take turns taking pieces out of this box. But *I* get to choose where all the pieces go on the farm. First, I will take a piece out of the box without peeking. Then I will think very carefully about where a good spot is for that piece on the farm, and then I will put the piece in the spot I choose. Then, it will be your turn to take a piece out of the box, and I will choose a good spot for the piece you take, and tell you where to put it." The experimenter then reached into the box, pulled out a piece, named it, and said to the child: "I think a good spot for a _________ on the farm is here." Once the experimenter selected a spot, the experimenter placed the object in that location. The child was then told that it was his/her turn to take a piece from the box. After the child took his/her piece, he/she was encouraged to name the piece. The experimenter then said, pointing to the selected spot: "I think a good place for a _________ on the farm is here." Once the experimenter selected a spot, the child placed the piece in that location, and it was again the experimenter's turn to take a piece out of the box. Note that in this condition, the child and experimenter took and placed their own pieces, but it was the experimenter who planned the placement of all the pieces.

<u>Distractor task.</u> Upon completion of the farm, children participated in a distractor task that consisted of colouring a picture on their own for 5 minutes. If a child was not able to complete this activity in 5 minutes, he/she was allowed to complete it after he/she

had finished the source memory test. During this time period, the experimenter covered the farm with a piece of foam board that rested on the three sides of the stage, leaving one side open for the source test.

Source test. Following the distractor task, children were given a surprise memory test in which they were asked to identify who placed each farm piece on the farm. The covered stage was turned so that the open end faced the experimenter, and the child could not see the farm. Because children could not see the farm pieces on the farm, they could not rely on location as a cue in the source memory test. The experimenter said to the child: "Now we're going to play a memory game! I'm going to see if you can remember who put the pieces on the farm. I'm going to show you a piece from the farm, and ask you who put that piece down." The experimenter reached into the opening, selected a farm piece, showed it to the child, and asked: "Did you (I) put the ________ on the farm or did I (you) put the ________ on the farm?" Children's responses were recorded manually on pre-made recording sheets. The experimenter then returned the piece to its original location, and selected the next piece. The experimenter replaced the farm pieces in their original location on the farm in order to keep the construction intact. This was done to avoid the possibility that children might become upset if the farm they had helped to build was de-constructed. The order in which the farm pieces were shown to the child in the source test was randomized across participants, with the constraint that no more than three items placed by one person followed each other consecutively. In addition, the order of the answer options (you vs. I) in the source question was alternated across trials.

Scoring and Data Reduction

Each correct response was given a score of 1, and each incorrect response was given a score of 0. A total source score was calculated out of 20 (the total number of items placed on the farm by the child and experimenter combined). In addition, the total number of incorrect responses was tallied and examined for type of error. The number of "I did it" errors (the child said he/she placed an object the experimenter actually placed), and the number of "you did it" errors (the child said the experimenter placed an object the child actually placed) were tallied. The total number of misattribution errors possible for each type was 10.

Data were screened for outliers, normality, and skewness. Children with a number of "I did it" and "You did it" errors greater than 3 standard deviations above or below the mean were replaced. These outliers were not specific to any particular planning condition; 1 was from the Each Plans Own condition, 1 was from the Each Plans Other condition, and 2 were from the Child Plans Placement condition.

Results

General Source Memory Performance

A summary of children's total correct source attributions within each condition is provided in Figure 2. In order to assess differences between the groups on overall source memory performance, a one-way Analysis of Variance (ANOVA) was conducted with

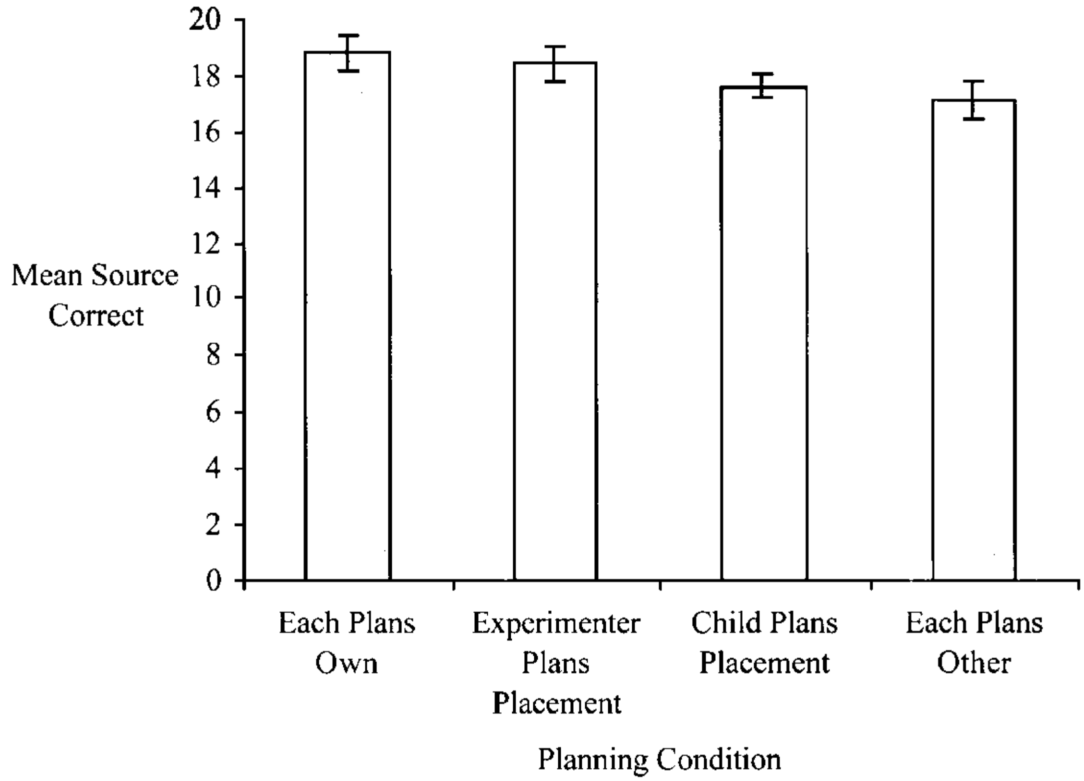

Figure 2. Mean number of correct source attributions within each planning condition.

Planning Condition (Each Plans Own vs. Each Plans Other vs. Child Plans Placement vs. Experimenter Plans Placement). This analysis revealed no differences between the planning conditions on the total correct source attributions; F (3, 59) = .70, ns.

In addition, children's overall source memory performance was compared to the level expected by chance alone. Using the Binomial table, it was determined that the probability of children making 14 (out of a possible 20) correct source attributions was equal to .04. The number of children in each group whose performance exceeded chance levels, that is, made 14 or more correct source attributions, was then tallied. All 16 children in each of the Each Plans Own, Child Plans Placement, and Experimenter Plans Placement conditions performed at above chance levels. In the Each Plans Other condition, 12 out of 15 children made 14 or more correct source attributions. Thus, in all conditions, the majority of children made more correct source attributions than what would be expected by chance alone.

Source Memory Error Analysis

In order to examine whether planning would affect source memory errors, the number of "I did it" errors was compared to the number of "You did it" errors within each of the four planning conditions. Recall that it was predicted that children in the Each Plans Other and Child Plans Placement conditions would make more "I did it" errors than "You did it" errors. In contrast, children in the Each Plans Own and Experimenter Plans Placement conditions were expected to make random errors. Gender was also included in the analysis to examine any possible effects of gender on source monitoring abilities. A 4

(Planning Condition) x 2 (Gender) x 2 (Type of Error) mixed design ANOVA was conducted with Type of Error as the within-subjects variable. This analysis yielded a significant main effect of gender, F (1, 55) = 4.56, p = .04; overall, boys (M = 2.50, SD = 1.93) made more source memory errors than girls (M = 1.52, SD = 1.89). This analysis also indicated a significant main effect of Type of Error, F (1, 55) = 14.64, p < .001. Overall, children made more "I did it" errors (M = 1.35, SD = 1.60) than "You did it" errors (M = 0.64, SD = 0.92). The main effect of Planning Condition was not significant, F (3, 55) = 2.69, p = .06, however, there was a significant interaction between Planning Condition and Type of Error, F (3, 55) = 6.99, p < .001. No other main effects or interactions were significant.

A summary of the number of "I did it" and "You did it" errors within each planning condition is provided in Figure 3. Protected t-tests with a Bonferroni adjustment (α = .0125.) were used to examine the significant Planning Condition by Type of Error Interaction. To assess whether or not planning produced a greater number of "I did it" errors than "You did it" errors, the number of each type of error was compared within each of the four Planning Conditions. As predicted, children made significantly more "I did it" errors than "You did it" errors in both the Each Plans Other condition ("I did it": M = 2.33, SD = 2.19; "You did it": M = .53, SD = 1.13); t (59) = 4.50, p <.001 and the Child Plans Placement condition ("I did it": M = 1.81, SD = 1.22; "You did it": M = .56, SD = .81); t (59) = 3.38, p < .01. This difference was not significant in the Each Plans Own condition ("I did it": M = .81, SD = 1.22; "You did it": M = .38, SD = .50); t

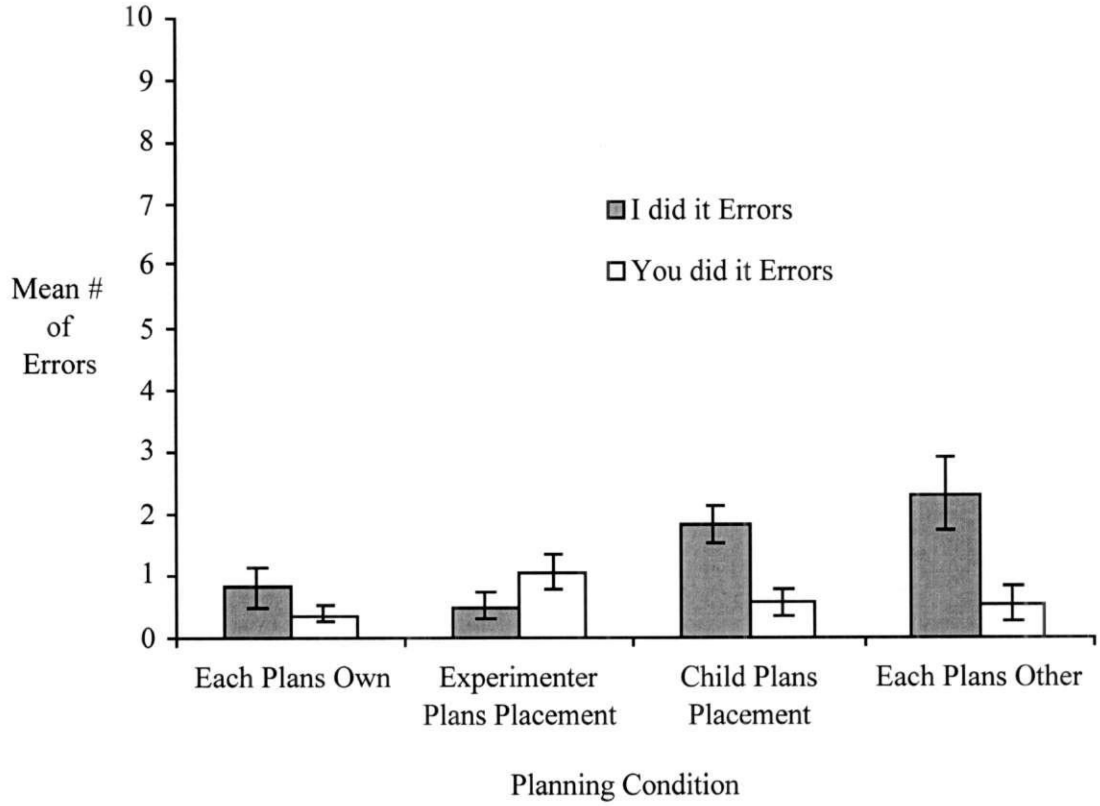

Figure 3. Mean number of "I did it" and "You did it" errors within each planning condition.

(59) = 1.16, ns, or in the Experimenter Plans Placement condition ("I did it": M = .50, SD = .89; "You did it": M = 1.06, SD = 1.06), t (59) = -1.51, ns. In summary, children in the Child Plans Placement and Each Plans Other conditions (i.e., children who planned the experimenter's actions) made more "I did it" errors than "You did it" errors, while children in the Each Plans Own and Experimenter Plans Placement conditions (i.e., children who did not direct the experimenter's actions) did not.

Discussion

The purpose of this study was to examine the effect of planning on children's reality monitoring within collaborative contexts. Children participated in one of four conditions designed to either increase or decrease the number of "I did it" errors by manipulating the planning agents in a collaborative effort to construct a model farm. In the Child Plans Placement and Each Plans Other conditions, children were directly involved in planning the experimenter's actions during the activity. In contrast, in the Experimenter Plans Placement and Each Plans Own conditions, children had no direct input into the experimenter's actions. The number of "I did it" errors and the number of "You did it" errors were compared within each condition.

This study yielded two major findings. First, the findings of the present study support the hypothesis that planning leads to a specific error pattern in reality monitoring tasks. In the two conditions in which children planned the location of the experimenter's items on the farm (Child Plans Placement and Each Plans Other conditions), children consistently made more "I did it" errors than "You did it" errors in the source monitoring test. In contrast, in the conditions in which children did *not* plan the placement of the experimenter's farm pieces (Experimenter Plans Placement and Each Plans Own conditions), the "I did it" and "You did it" errors were comparable. Thus, those children who directed the experimenter's actions tended to later take credit for those actions more often than they gave the experimenter credit for their own (the children's) actions.

As predicted, planning another person's actions increased children's tendency to later take credit for those actions. It is proposed here that this effect is due to increasing the cognitive information associated with those particular events in memory. That is, when children plan actions performed by *external* sources, their memories of these actions consequently contain amounts of cognitive information comparable to that generally associated with memories of self-generated actions. Faced with this increased amount of cognitive information as a cue to identify the source of an event, children are led to misidentify the externally-generated event as one stemming from an internal source. Children in the present study made more "I did it" errors than "You did it" errors only when they were required to plan the location of the experimenter's farm pieces on the model farm. An interpretation of these findings that is consistent with the Source Monitoring Model (Johnson et al., 1993; Johnson & Raye, 1981) suggests that in these cases, children may have encoded the experimenter's actions of placing the farm piece (e.g., a cow) on the farm with more cognitive information than perceptual information. When later asked about the agent of these actions (e.g., placing the cow on the farm), children misattributed these acts as ones generated by an internal source. Therefore, it is proposed that the pattern of errors (i.e., more "I did it' errors than "You did it" errors) found in the present study is the result of an increase in cognitive information associated with the actions of external sources.

It is important to note that the greater number of "I did it" errors than "You did it" errors made by children in the present study does not appear to stem from a general deficiency in source monitoring abilities. Consistent with previous source monitoring research (e.g., Foley et al., 1993; Foley & Ratner, 1998; Lindsay & Johnson, 1985; Ratner et al., in press), the majority of the children in all four planning conditions performed at above chance levels on the source memory test, and there were no significant differences between the groups on the total number of correct source attributions. Children in each group correctly identified the source of a comparable number of items. The primary difference between the groups involved the *types of errors* made. Children who did not plan the experimenter's actions tended to make random errors, whereas those children who planned the location of the experimenter's farm pieces tended to make more "I did it" errors than "You did it" errors. This finding suggests that the group differences were the result of the planning manipulation and not less developed source monitoring abilities of children in the Child Plans Placement and Each Plans Other conditions.

As with all research regarding preschoolers, a certain amount of caution must be exercised when interpreting children's responses to test questions. Some researchers have argued that the specific wording of the test question may influence what children *think* they are being asked (e.g., Lewis & Osborne, 1990; Siegal & Beattie, 1990). Specifically, in the present study, it is possible that children were misinterpreting the source question "Who put the __________ on the farm?" as "Who *decided* to put the _______ on the farm?" However, the pattern of errors found in the Each Plans Other condition suggests that children were not misunderstanding the source question. In the Each Plans Other condition, children planned where the experimenter placed her farm pieces and the experimenter planned where the children placed their farm pieces. If children had misinterpreted the source question as "Who decided to put the ________ on the farm?", then one would expect the number of "You did it" and "I did it" errors in this condition to be comparable. However, children in the Each Plans Other condition made a greater number of "I did it" errors than "You did it" errors, suggesting that children's performance was not the result of their misunderstanding the test question in the source memory test.

In summary, planning a partner's actions within collaborative tasks leads children to make a greater number of "I did it" errors than "You did it" errors. This pattern of errors is proposed to be the result of an increase in cognitive information associated with the partner's actions, and not a consequence of source monitoring deficiencies or a misunderstanding of the source test question.

A second and somewhat unexpected finding in the present study was that overall, boys made more source monitoring errors than girls. While gender differences in source monitoring are seldom reported, this difference may be attributable to gender differences in specific executive function abilities. Recent research has demonstrated that, with preschool children, girls out-performed boys on a number of inhibitory control measures (Carlson & Moses, 2001). Inhibitory control refers to the ability to inhibit responses that are unrelated to the cognitive task at hand. In the present study, children were instructed to refrain from playing with the farm (i.e., touching or moving pieces around) during farm construction, and were required to inhibit this action. In addition, children were required to inhibit the "I did it" or "me" response during the source memory test. Playing with the farm during farm construction could be the cause of source confusion as children would have increased contact with the experimenter's farm pieces. Physical contact with the experimenter's farm pieces could lead children to mistakenly claim they had placed those pieces on the farm, as physical contact information may be used a cue in the source test. In addition, an inability to refrain from stating "I did it" in response to the source questions would also contribute to increased source errors. Carlson and Moses' claim that boys demonstrate more difficulty than girls in inhibitory control tasks suggests that decreased inhibitory control may have contributed to boys' performing more poorly than girls in the source memory test in the present study.

It is important to note that the overall gender differences in total source memory errors were consistent across all planning conditions. Further, boys and girls did not differ in the *types* of errors made. Thus, boys and girls were *not* differentially affected by the planning manipulation, and the effects of planning on children's reality monitoring can be discussed across gender.

The finding that planning produces more "I did it" errors than "You did it" errors in young children's reality monitoring performance contributes to the research surrounding, and furthers our understanding of, children's memory. First, the results of the present study are consistent with and extend those of Ratner et al. (in press). Similar to the present study, Ratner et al. found that children's direct involvement in collaborative tasks led to a greater number of "I did it" errors than "You did it" errors in subsequent reality monitoring tests. However, because Ratner et al. were interested in the facilitative effects of this error pattern, their findings were specific to collaborative tasks involving a "correct" end goal. Therefore, the individual role of planning in producing a more "I did it" errors than "You did it" errors in source monitoring tasks was somewhat unclear. The present study involved collaboration without a "correct" end goal, and points specifically to planning as the root of this error pattern. When children actively plan their partner's actions in collaborative tasks, they are likely to later take credit for those actions.

Second, the finding that planning leads to a greater number of "I did it" errors than "You did it" errors in preschoolers' reality monitoring has important implications for research surrounding the generation effect. Although the generation effect has been found to improve recall memory for self-generated items (Slemecka & Graf, 1978), the findings of the present study suggest that the processing involved in producing the generation effect can actually be a hindrance in certain source monitoring tasks. Recall that Johnson et al. (1981) propose that the cognitive processing required for self-generated events is responsible for producing a better memory for these events than for events generated by external sources. This notion is supported by the findings of the present study. Across all conditions, children correctly identified the farm pieces they had placed on the farm as self-generated, and seldom made errors stating that the experimenter had placed these pieces ("You did it" errors). Thus, the cognitive processing information that generally accompanies self-generated actions facilitated children's source monitoring abilities in the present study. However, this cognitive processing information, when associated with externally derived events (i.e. the experimenter's actions), also increased source confusion.

When making internal/external source decisions, individuals rely on cognitive processing information to signify self-generated (or internal) events (Johnson & Raye, 1981; Johnson et al., 1981). In the present study not only were internally-generated events associated with greater cognitive processing information, but in specific conditions where the children planned the experimenter's actions, externally-generated events contained greater amounts of this type of information as well. In the cases where external events (i.e., the experimenter's actions) were associated with more cognitive information in memory, children incorrectly attributed these events to internal sources. Thus, the cognitive processing that facilitates memory for self-generated events can also work to impede children's memory for source in specific contexts.

Finally, the present findings also provide important information about children's memory. Children's superior source memory for self-generated actions suggest that these actions require significant cognitive processing, and thus contain more cognitive processing information. That children's memory for externally-generated actions varied across planning conditions suggests that children's memory for events generated by external sources depends on their cognitive involvement in those events. If children have significant cognitive involvement in externally-generated events, then these events contain higher amounts cognitive information. If, however, children are not cognitively involved in events generated by external sources, then these events hold lesser amounts of cognitive information.

The specific nature of the "cognitive involvement" that leads to children associating external events with greater amounts of cognitive processing information in memory needs to be further explored. The findings of the present study suggest that planning is one important cognitive process that leads young children to make more "I did it" errors than "You did it" errors. Foley and Ratner (1998) found that asking children to "think about" their partner's actions in collaborative tasks also led to increased cognitive processing, and produced this same error pattern. However, in their dollhouse studies, Ratner et al. (in press) found that simply asking children to name the items of furniture their partners placed in the dollhouse did not require sufficient cognitive processing from children to lead to source misattributions. Future research in this area is necessary to determine additional cognitive processes that lead children to demonstrate specific patterns of source misattributions, as well as to further explore the effects of planning on children's reality monitoring.

A second important research question that remains unanswered is whether planning affects memory encoding or retrieval, or both. An interpretation consistent with the Source Monitoring Model (Johnson et al., 1993; Johnson & Raye, 1981) suggests that children who planned the experimenter's actions *encoded* these actions with more cognitive information, thereby leading to more "I did it" errors than "You did it" errors. However, it is also possible that these children initially encoded the experimenter's actions with more perceptual information than cognitive information. As a result of the planning, they then re-constructed these memories in such a way that they contained more cognitive information during the retrieval process. No source monitoring research to date has addressed precisely when during the memory process source monitoring errors occur, and it is an important research question that merits further exploration.

Additional research is also necessary to investigate the facilitative effects of "I did it" errors. In Ratner et al's studies, children who made more "I did it" errors than "You did it" errors appeared to be facilitated in their ability to correctly re-furnish the dollhouse. It is unclear, however, whether children in the present study would be affected in this same way. In contrast to Ratner et al.'s experiments, in the present study there was no "correct" way for the farm to be constructed; the children and the experimenter were free to place the farm pieces in any location they chose. Examining whether learning has taken place in this context would provide an understanding of children's learning environments. That is, do children gain planning and organizational skills (such as in Ratner et al.'s re-furnishing task) in situations that are not specific to learning, or do such skills only develop when collaborative tasks involve working towards a "right" answer? An investigation of this nature would have strong implications for children's education.

Finally, future examinations of children's planning and reality monitoring abilities need to focus on the planning agents themselves. Two opposing views exist in the developmental literature regarding the benefit of peer interaction on cognitive development. A Piagetian account (see Carpendale, 1997 for a review) suggests that peer interactions are important for cognitive growth, while a Vygotskian position (see Fernyhough, 1997 for a review) stipulates that only interactions with adults and more advanced peers result in cognitive growth through the process of scaffolding. Following a Vygotskian account, a review of the research surrounding children's planning abilities suggests that children collaborate differently with adults than they do with their peers. Children's planning skills appear to be facilitated by collaborative planning only when this collaboration occurs with an adult (Radziszewska & Rogoff, 1988). When children collaborate with a peer, their ability to later perform the task independently does not improve. Ratner, et al. (in press) suggest that it is the pattern of making more "I did it" errors than "You did it" errors that signifies that learning has taken place, through children's appropriation of their partner's actions. It is possible, then, that when collaborating with a peer, children may not show this error pattern. Conversely, it is also possible that when children are explicitly directed to plan their partner's actions within collaborative contexts, they will make more "I did it" it errors than "You did it" errors regardless of their partner's cognitive sophistication, as the cognitive processing associated with a partner's actions should be increased whenever children are cognitively involved in those actions.

In conclusion, the present study has advanced our knowledge of children's source monitoring abilities, demonstrating that preschoolers are generally good at reality monitoring tasks. The majority of children in all conditions in the present study performed above chance on the source monitoring test and made few errors. In addition, the findings of the present study suggest that the *type* of source monitoring errors children make are influenced by factors such as planning. Children who planned their partner's actions tended to later take credit for some of those actions, making more "I did it" errors than children who did not take part in planning. Future research is necessary to further explore the effects of planning on children's reality monitoring errors, as well as to determine other cognitive factors capable of influencing young children's source monitoring abilities.

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