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Reminder and Language Effects on Preschoolers' Memory Reports:

Do words speak louder than action?

by

Faye F. Walkenfeld

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Psychology, The City University of New York.

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Abstract

Reminder and Language Effects on Memory Reports in Preschoolers:

Do words speak louder than action?

by

Faye F. Walkenfeld

Advisor: Professor Katherine Nelson

Research with infants and toddlers has shown that nonverbal reminders are effective at reactivating and maintaining a representation in memory. The question is whether verbal reminders are also effective at maintaining a representation. It was hypothesized that nonverbal reminders would be robust for all preschoolers whereas verbal reminders would only benefit those preschoolers who are more language proficient.

Sixty-nine preschoolers participated in a treasure hunt game in which they visited a make-believe zoo to find a treasure box with a prize. Three weeks later, one group received nonverbal reminders, a second group received verbal reminders and a third group received no reminders. Following another three weeks, all children were asked for a verbal report of the game. Language ability was then measured with the Test of Early Language Development, 2nd Edition (1991).

To determine what affects recall more, chronological age or a particular aspect of language proficiency, the data were analyzed in three ways. First, for condition differences between two different age groups, with age grouped at the median. Second,

for condition differences between two different age groups with the addition of receptive language as a covariate. Third, for condition differences between children of low versus high receptive language scores, with receptive language scores grouped at the median.

Regression analyses and analyses of variance indicate that when recall is tested verbally, nonverbal contextual reminders facilitate recall for older preschoolers, particularly for those with higher receptive language scores. When the group means are adjusted for receptive language ability it becomes evident that younger preschoolers benefit more from verbal reminders. Young preschoolers who received verbal reminders reported about as much as older preschoolers who received verbal reminders.

The data are discussed in the context of different modes of encoding and re-encoding and their impact on verbal recall.

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Table of Contents

List of Tables

List of Illustrations

Chapter 1. Introduction

The question of how people develop narratives about their memories for personally experienced events is an intriguing one. Memories seem to undergo metamorphosis before they become a fluent "story" which is told and retold many times. They go through shaky stages wherein the speaker wonders whether to report, what to report and what to omit, and even in what tone to report. Very often different types of reminders of the event can affect how the story is told at a particular time. Whether or not the event is either re-experienced or discussed may actually affect the telling and retelling of the original story forever. It appears that actively reexperiencing an event as much as mediation by way of discussion, play a role in development of the final narrative. The present study focuses on how two different modes of reminding during a retention interval affect preschoolers' recall for a personally experienced event.

The problem

Researchers studying autobiographical memory have tried to unravel changes in cognition and social experience during the ages of 3 to 5 years, a time for which most adults have their first memories. Adults generally do not have memories for experiences that they had prior to age 3 years, a phenomenon known as infantile amnesia. This phenomenon is anomalous because toddlers and preschoolers seem to have memories for their experience, so why do these memories not persist into adulthood? Nelson (1996) claims that in order for memories to persist, reinstatement[1] of the original event by way of some form of rehearsal must take place.

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[1] The term reinstatement is used by Rovee-Collier (1997) to refer to the external conditions of the original event which are provided at the time of reminding. Nelson (1996) extends the use of this term to include talk and any other form of reminding about the event.

A number of recent memory studies have used re-enactment to demonstrate that infants, toddlers and preschoolers do, indeed, have memories for events. This is particularly true if they have context reminders at the time of recall (Rovee-Collier & Hayne, 1987; Rovee-Collier, 1995; Hudson & Sheffield, 1998; Priestly, Roberts & Pipe, 1999). Context reminders even facilitate recall after the event has been forgotten. The question is whether verbal reminders can have the same effect; can they facilitate recall of the event representation?

To date, the research does not reflect the effects of verbal reminders of the event, only of in-context, behavioral reenactment. Since it is believed that action and verbalization are two psychologically different sorts of activities, the effects of verbalization should be studied as well. This is theoretically important because it addresses the question of when children may cease to rely solely on memory for action and begin to use verbal representations as well. Moreover, at what point does verbal input by others begin to make a difference to memory? At what point do children realize that "words" presented by others are a meaningful representation to be dealt with but not to overpower or overwrite the abstract representation in the child's own mind? Moreover, the question of when "words" become a meaningful representation for children is particularly relevant to today's practical and political controversy over the admissibility of children's testimonies and, in particular, the effects of verbal questioning on their memories and final narratives.

Co-construction of memorial reports

Much research has recently been generated demonstrating that memory reports, or narratives, of young children are affected by social mediation and context. Many of the theorists follow in the tradition of Bartlett (1932) and view memory as a functional tool which is constructed by the person using schemas he or she has learned. Nelson (1993) advocates a functional, social-constructivist explanation for the development of autobiographical memory, maintaining that it is through social interaction and talk with others that children begin to develop the ability to represent events in verbal form, as well as to incorporate another's verbal representation into one's own memory. Prior to age 3, children seem to be developing general event schemas as well as recalling episodic memories (Nelson, 1986, 1993; Fivush, 1990). The autobiographical system, however, which allows children to begin narrating events, generally begins sometime between ages 3 and 4 years. It is only when language is sufficiently established, usually around this age, that children can begin to grasp that what is said by another is a representation of another's knowledge of events. This may also mean that this is the point at which they become most suggestible and influenced by another's questions because they take the other's words into account, whereas children younger than about 3 years do not see another's linguistic representation as relevant to their own remembered experience. Children older than about 4 years, on the other hand, have sufficient exposure with exchanging verbal accounts to differentiate between the other's representation and their own.

In what follows, research on the effects of context reminders is outlined. Then research relevant to Nelson's claim and its implications for the effects of language on children's recall of events will be summarized. This includes how others help to set the context during the event as well as during the interval between the event and recall of the event. This will be followed by research showing that verbal reminders can facilitate recall. This has implications for whether false suggestions or "reminders" can influence memory.

Context reminders: Reenactment

Recent research on infants', toddlers' and preschoolers' capacity for accurate, long-term episodic recall has focused on the effects of post-event information, such as neutral and suggested reinstatement (repetition of some aspects of the event) in the form of re-enactment (partial repetition of the behavior, in context). Nelson (1990) has proposed that reinstatement is necessary for retention of a single episodic memory over an extended period of time. In a similar vein, Ornstein, Larus and Clubb (1991) have stated that information already stored in memory may be altered sometime between the experience of the event and recall, by such factors as trace decay and the effects of reinstatement, as well as other intervening experiences.

To date, reinstatement by way of re-enactment has been found to facilitate later recall in toddlers (Fivush and Hamond, 1989; Sheffield and Hudson, 1993; Sheffield, Hudson and Ryder, 1995), but, except for rare cases (Albert and Ornstein, 1994; Walkenfeld and Nelson, 1995; Jukes, 1997), reinstatement through verbal recall alone has not been studied.

Much of the research on reinstatement in infants has been carried out by Rovee-Collier and her colleagues (Rovee-Collier and Hayne, 1987; Rovee-Collier, 1995). They demonstrate that exposing infants to part of the stimulus or context during the delay between an event and the recall test promotes higher levels of retention than for those children who receive no exposure during this interval. Moreover, if the reinstatement is experienced too soon after the thing-to-be-remembered, recall is no greater than if there were no reinstatement. However, if the reinstatement is presented just before the point of forgetting, recall is greatly facilitated.

Rovee-Collier's research has led others to study the effects of partial re-enactment in toddlers (Fivush and Hamond, 1989; Sheffield and Hudson, 1993). Generally, reenactment has been found to facilitate recall. Fivush and Hamond (1989) found that, reexperiencing an event after a brief time interval has beneficial effects in prolonging 2-year-olds' memories over a three-month interval. In addition, Sheffield and Hudson (1993) demonstrated that 18-month-old toddlers who reenacted an event, recalled significantly more than toddlers who did not reenact the event did. Moreover, those toddlers who reenacted the event after a long delay, either 2 or 8 weeks after the event, recalled significantly more than those who reenacted the event after a short delay of 15 minutes did. So far positive effects of re-enactment have been demonstrated in 18-month-olds with delays of up to sixteen weeks (Sheffield and Hudson, 1993).

Setting the context during the event

For verbal reinstatement to make a difference, a child must be cognitively and linguistically mature enough to internalize another's verbal representation as a mental

representation of an event. This level of verbal representation is believed to be achieved during the preschool years (Nelson, 1996).

Nelson and her colleagues have demonstrated that conversation with adults facilitates both memory for events and language development (Nelson, 1986), indicating that memory for events seems to be socially mediated. According to this theory, objects take on meaning only within events.

In a study reported by Lucariello, Kyratzis and Engel (1984), six mother-child dyads were studied once a week for 6 weeks. The researchers supplied each dyad with various miniature circus props and instructed mother and child to "play circus." The age of the children ranged from 2:4-2:9. The mothers had a great influence on the children's play. In the first few sessions, the mothers play-acted goal-oriented behaviors being performed (e.g., "This is the lion act"). In later sessions, the toddlers took on a more active role in the play-acting, using both examples the mother had given and making up a few of their own. These children, then, began with other-regulated behavior and switched to self-regulated behavior as they became more familiar with the game, demonstrating that they had acquired an organizing structure. The mothers' use of language: to impart knowledge, reference diverse acts and introduce fantasy, is believed to have helped mediate the children's memory and cognitive representation of the circus event. These researchers conclude that in mother-child interaction, the way the mother uses language when referencing event-related objects is important for forming the child's representation for the culturally specified event. Children younger than 3-years-old are able to incorporate language when it is contextualized, using event-related objects.

Rogoff and Mistry (1990), replicating a study by Istomina (1977), have shown that when the goal for remembering is functional, such as remembering items to pack a lunch, parental assistance is not necessary for 4-year-olds' verbal recall because the items become intrinsically meaningful as part of the activity. However, when the goal is nonfunctional for the children, that is, children are simply asked to remember a list of items, parental assistance can improve 4-year-old's performance. Thus, not only is social mediation important for recall, functional context is important as well.

Tessler and Nelson (1994) have found that the mother's style of talk, narrative (using dynamic descriptives) vs. paradigmatic (using static descriptives), is incorporated into the 4-year-old's narrative if it occurs while the event is taking place. In one study, 4-year-olds recalled objects from a visit to a museum only if they had jointly discussed the objects with the mother. If only one member of the mother-child dyad had discussed the object at the museum, this object was not incorporated into later recall with an experimenter. Tessler and Nelson conclude that, based on their studies, "the child's verbalized memory for an experience is strongly influenced in form and content by the way in which the event is talked about during the ongoing experience, as well as after the experience," (p. 319).

McCabe and Peterson (1990) also discuss how parental styles influence preschooler's development of narrative structure. They followed mother-child dyads for over a year, at three different times, and noted how parental questions during the first two interviews provide young children with a skeletal framework of information needed for constructing a narrative report. At the third visit, when the experimenter interviewed the children, the children whose parents had been more persistent in questioning and had

asked topic-extension questions, provided longer narratives than the children whose parents were less persistent and asked less elaborative-type questions.

These studies of the importance of effective talk during an experience suggest that conversations with adults during and after experiencing an event facilitate later verbal recall of the event for toddlers and preschoolers.

Setting the context during the interval between event and recall

Given these effects of talk on the ongoing event the question is raised as to how social mediation after the event affects memory for an event. If others can mediate toddlers' and preschoolers' memories for events and objects within those events, then perhaps when questioning a young child, an adult has the ability to focus and reconstruct certain aspects of the child's memory. This question has been troubling both theorists who study children's thinking and memory, and psychologists who have been called as expert witnesses in trials in which preschool children are asked to testify.

A number of studies with mother-child dyads, studying children between the ages of 2½ - 3 years of age, have demonstrated some effects of multiple post-event interviews (Fivush and Hamond, 1989, 1990; Fivush, 1994; Hudson, 1990a,b). For the most part, it seems that information provided by mothers during a recall session does not affect a later recall session for children of about 3 years (Fivush, 1994). In other words, the child does not incorporate the new information added by the mother to the narrative told to the experimenter. Fivush (1994; Fivush and Hamond, 1990) has demonstrated that 2½- to 3½-year-olds report a greater number of units of information over recall sessions, but they do not report the same units across sessions. Fivush and Hamond (1990) speculate that this may be a result of the extensive cueing these young children depend on when

reporting their memories. If the cueing were inconsistent across sessions, it would elicit different pieces of information at different sessions. Older children and adults, however, can be more consistent because they have an internalized structure for what a narrative should consist of and they do not need to rely upon another person setting the structure.

Other possibilities for the inconsistency in content reported might be that 2 ½- to 3 ½ -year-old children will differentiate between what they will tell their mothers as opposed to what they will tell another adult (Fivush & Hamond, 1990). Additionally, children might differentiate between someone with whom they experienced the event (mother) compared to someone with whom they did not (researcher).

It should be noted that though Hudson (1990a, b) found improvement in structure but not in content across sessions for 2-year-olds, there were individual differences in negotiation with the mother over content. In some cases, the child's and mother's version differ, but over time the child comes to incorporate the mother's version into her own. On the other hand, in other cases the child steadfastly denies the mother's version across sessions (see Table 7 8 in Hudson, 1990a).

The aforementioned studies have demonstrated how mothers guide structure and content and how that affects toddlers and preschool children's development of narrative structure. Whether this effect is unique to mother-child interactions or whether other adults can also affect structure and content of the child's report for a single, controlled event is an open question.

Comparing reenactment and verbal reinstatement

Albert and Ornstein (1994) found that partial reenactment of a medical check-up, as well as verbal reinstatement after a 6-week-delay, promoted greater recall 12 weeks

after the event for 3- and 5-year-olds, when compared with control groups. However, 5-year-olds demonstrated greater interference effects than 3-year-olds when shown a reenactment video of another child having a medical check-up which included some of the same procedures that had been performed on the participant as well as extra features that had not been performed on the participant. They speculate (Baker-Ward, Ornstein and Principe, 1997) that this is because the older children had developed more elaborate and interconnected representations of their original experience in the doctor's office Thus, when shown the video, the video re-activated related medical experiences they may have had, and they incorporated information from the video. For younger children who had not constructed as elaborate representations, the video was not in danger of re-activating interfering events and therefore they were less likely to incorporate outside information.

In Albert and Ornstein's study, however, the verbal interview was all-inclusive, meaning the children were probed for all the features that were present in the medical exam as well as for features which were not present in that particular child's medical exam. It could be argued, therefore, that this was more of a rehearsal type of interview as opposed to reinstatement because all features that had been present in the targeted event were included in the reinstatement interview.

Suggestibility

More than ever, preschool children are being called upon to testify in legal cases of abuse and divorce, and it is yet unclear under what circumstances they can be relied upon as witnesses. Though it has already been established that toddlers and preschoolers

are capable of episodic recall (Fivush and Hudson, 1990), there is debate over the effects of questions, particularly suggested questions, posed by people who investigate children's memory for an experience prior to their testimony.

How do another's questions affect a memory representation? Does a misleading reinstatement cause a false recall report? Attempts at determining the effects of suggested questioning have yielded varying and, at times, conflicting results (See Ceci and Bruck, 1993a for full review). Nevertheless, it is agreed that preschoolers' memories can be accurate for events that are important to them. In the face of mild suggested questions, children will recall correctly. When pressured, however, they will tend to "give in" and accept the suggestion as a memory (Goodman and Clarke-Stewart, 1991). The dilemma is this: do the children accept the suggestions because they have reconstructed their memories in some vital way, or are the suggestions accepted either to stop the badgering by the interviewer or to win social approval (Zaragoza, 1991)? Researchers are trying to define the circumstances under which children are suggestible.

Despite some limitations in individual suggestibility studies, some important conclusions can be gleaned from the literature (Ceci and Bruck, 1993a). First, memory skills seem to improve with age. In addition, even 2- to 3-year-olds can recall accurately after a long delay if the information to be recalled makes sense to them and if the thing to be recalled is either a salient action performed by the child or a personally meaningful event. Preschoolers are also more likely to recall physical activities, especially if they have participated in the event.

Another important factor related to memory evaluation is knowing what relevant prior knowledge children bring to the interview session. Prior knowledge has been

shown to affect how information is encoded, stored and retrieved. Moreover, it is possible that with time the specifics of an event may be forgotten and a child will reconstruct the memory to fit an existing script (Brainerd and Ornstein, 1991; Hudson, 1986).

Suggestibility studies can be said to use a verbal form of reinstatement since they are introduced linguistically and after the event. Therefore, ideally, if one wants to compare the effects of reenactment versus reinstatement, one might try to compare the aforementioned reenactment studies with suggestibility studies. Unfortunately, it is unclear whether the comparisons can be made due to different methodologies used. Some of the paradigms testing the two are qualitatively different.

Studies which have a delay between reinstatement and recall may be more effective at parsing whether it is the memory trace which is affected or whether suggestibility effects are due to social pressures, than studies which offer suggestions at time of recall test. In many suggestibility studies with young children, erroneous suggestions are presented during the actual recall test and often in the form of forced choice recognition questions (see Goodman and Clarke-Stewart, 1991 for summary of these studies). However, in the reenactment paradigm (Fivush and Hamond, 1989; Sheffield and Hudson, 1993), there is a substantial delay between discussion and recall, and recall is not constrained by forced-choice questions. Thus, between reenactment and recall there is time for the child either to reconstruct the memory to fit the interviewer's suggestion or to retain the original representation of the event. If the recall test is conducted with neutral questions, one would expect that the social pressure to accept the suggestion is alleviated. In addition, as Fivush (1994) has also pointed out, most

suggestibility studies are, in fact, recognition tests not recall tests. Perhaps children would be less susceptible in recall. This latter point may account for the findings in Walkenfeld and Nelson (1995) in which 3½- to 5-year-olds were tested with recall and demonstrated no misleading suggestibility effects.

Repeated Questioning

A concern when interviewing toddlers and preschool children is the effect that repeated questioning has on the quality of their answers. Repeated questioning within the same session may make young children feel that their first answer was inadequate or incorrect, causing them to answer differently the second time, thereby decreasing their level of consistency and confidence. However, repeated questioning across sessions after a lengthy interval may have positive effects on the recovery of information. Some researchers have found that repeated questioning across sessions facilitates memory (Baker-Ward, Hess and Flannagan, 1990; Hudson, 1990; Fivush, 1994) or leads to false memory (Ceci and Bruck, 1993).

Though repetition and testing are generally considered facilitators for memory, there are some "intervening activities" which may lead to memory distortions. For example, someone unsure about the details of a given event is more likely to "buy into" another account of the story than someone who accurately recalls the details of that event. In fact, researchers studying the effects of misleading post-event information conclude that very young children's memory, for which the initial encoding system is presumed to be less rich than for adults, is easily distorted when faced with misleading questions (Brainerd and Ornstein, 1991). Thus, one can assume that if preschoolers are unsure

about the details of an event, they would be more likely to accept erroneous accounts of an event than if they were sure of the details for that event. Nonetheless, Fivush (1994) argues that before researchers can talk about how misleading information reconstructs memory it is important to establish how repeated discourse reconstructs memory.

Language and Memory

Post-event experience relevant to memory can be introduced in different modalities. The point of this study is to isolate one of those modalities, language, to determine whether it serves as sufficient reinstatement to induce reactivation of an event memory in preschoolers. In action-related reinstatement, or reenactment, the post-event experience is a repetition of, or reexposure to part of the context or the action. The preschooler is reexposed to the action, either by redoing it herself or by watching it enacted by others. Interaction with another person is not necessary for the reenactment. Language accompanying the action may be superfluous and not necessarily attended to by the child. On the other hand, language-only reinstatement, or "neutral interviews" as they are commonly called, makes language the focal point of the task at hand, and is inherently a shared experience between child and researcher. Thus, mediated speech and verbal scaffolding can have a greater effect on the child's verbal representation, thereby affecting later narratives by the child.

Interested in the effect language level has on event memory, Bauer and Wewerka (1995) wondered whether memory for an event over a delay (1 - 12 months) could be predicted by verbal ability at the time the event was encoded for 1- to 2- year-olds. Is

language ability at the time of encoding related to nonverbal, in-context memory (proportion of individual target actions produced)?

To obtain a measure of language competence, they also tested the toddlers on the MacArthur Communicative Development Inventory (MCDI), a test of productive language. The MCDI was not predictive of nonverbal memory as tested by enactment, nor was it predictive of spontaneous, non-memory-related verbalizations. It was, however, predictive of memory-related verbalizations, explaining 26% of the variance. Moreover, the nonverbal memory measure was moderately, albeit significantly, (r = .33, $p < .05$) related to verbalizations indicative of memory but not to verbalizations not indicative of memory.

Bauer and Wewerka (1995) argue that children with better language ability are better able to comprehend the narrative provided by the experimenter during exposure to the lab events. In addition, they speculate that more verbal children may have been able to produce a script on their own which complemented the one provided by the researcher. Consequently, because they had more modalities available to them, they could be more involved with the events which may have led to "greater elaboration of the experience, and thereby, better recall," (p. 492).

In a study very similar to the one to be presented here, Jukes (1997) investigated the relative effectiveness of age versus language ability in predicting recall after having had partial verbal reinstatement. Fifty-nine preschoolers were tested on the British Picture Vocabulary Scale and then watched a video enacting a story. The next day, some children were questioned about the first half of the video, some were questioned about the second half of the video and some were asked questions about unconnected events.

An additional three days later, children were interviewed about the video via free recall followed by direct questioning.

Jukes found that the half of the video discussed during the interval is the one that was recalled better. Moreover, the second half of the experience was generally recalled better than the first half. Free recall scores showed that only the children with high verbal ability benefited from discussion. Discussion did not significantly affect recall for children with low verbal ability. However, direct, probed, questioning showed no developmental difference. All language levels and all ages benefited from discussion when asked specific questions about the video.

Thus, the research demonstrates that reenactment during a retention interval facilitates recall of the original event in infants and toddlers. In addition, it is apparent that talk about an event either during the event, during the retention interval or at just the end of the retention interval, has the potential to affect a representation for the event. A preliminary study was designed to investigate whether a verbal reminder could reactivate a representation for preschoolers as re-enactment does for toddlers. Moreover, would verbal reminders with false suggestions lead to incorrect or less recall?

Preliminary study

An initial study was conducted with 28 preschoolers ranging in age from 3; 5 - 4; 11 (Walkenfeld and Nelson, 1995) to determine whether verbal reinstatement had a general facilitative effect, as well as whether there were differences between neutral and suggested probes. Children played a treasure hunt game in which they visited five stuffed Sesame Street characters in a specific sequence until they found the prize.

One week later, two-thirds of the children were taken to an "interviewing area" and asked to recount the details of the hunt. The other one-third of the children, the Control group, was not interviewed.

Half of the children interviewed at the second meeting were asked to recount what had occurred during the first visit, when the game was played. When a child in this group had difficulty remembering, the experimenter used neutral probes to elicit more information.

The other half of the children interviewed were part of the "Suggested" group in which they, too, were asked to recall what had occurred during the first visit, when the game was played. However, in addition to neutral probe questions, two suggested questions or remarks were also used (researcher suggested that a character which had not been present, was present).

The Control, or no-reinstatement, group was included as a comparison.

After an additional two weeks all children were interviewed with neutral probes to obtain recall.

The main questions addressed are:

1. Would there be a verbal reinstatement effect?

2. Would there be a negative reinstatement effect created by false "verbal reinstatement"? That is, would children who receive verbal reinstatement with suggested (erroneous) probes remember less at a follow-up recall session than those reinstated with neutral probes?

3. Would the errors of children who receive false verbal reinstatement reflect the false suggestions they had been given?

A significant effect of verbal reinstatement was found between the Neutral Reinstatement group and the Control group for overall recall of the game. The Suggested group did not differ significantly from either the Neutral or the Control groups. Children who received erroneous suggestions at the second meeting for the most part denied the suggestions and did not report them at recall. The suggestions were offered tentatively by the interviewer, and there is little quantitative evidence that they affected the children's memory in any way. In fact, intrusions did not occur more frequently for the suggested group than for any other group. Because only some of the children produced intrusions, these errors may be more a result of individual differences than of condition differences.

One problem that emerged with the paradigm used in the Walkenfeld and Nelson study is that, although the Sesame Street characters were exciting for the children, many participants confused characters with similar names or characters who were the same color. Therefore, a pilot study was carried out to see whether children would react as enthusiastically to the game when more typical stuffed animals were used (Walkenfeld, Goldstein and Nelson, 1995). The children did enjoy the game with the new characters.

In addition, Walkenfeld, Goldstein and Nelson (1995) used a different reinstatement protocol. In order to more closely resemble the partial reinstatement being used in reenactment studies. Instead of all possible units of information being probed, only a subset of the units was probed in active recall. Because it would be difficult to ensure that all children would recall the same target units, after children finished recalling spontaneously, the researcher probed for some specific items and then simply repeated

the items in the subset to be reinstated. In this way, all children received relatively equal re-exposure to all the requisite items.

The proposed study: Reenactment and reinstatement Study

The study to be reported here sought to further the scope of the Walkenfeld and Nelson (1995) findings by investigating age differences, effects of a longer retention interval, partial verbal reinstatement as opposed to exhaustive verbal reinstatement and effects of different modes of reinstatement. Moreover, the present study was designed to test Nelson's (1990, 1996) proposal that children with greater language ability ought to benefit more from verbal input than children with less language ability.

Developmental differences in the effects of reinstatement are an important issue both for the theorists studying the development of thought and language as well as for researchers studying the accuracy of testimony of children of different ages (see Ceci and Bruck, 1993a for review of evidence). According to Nelson's (1990) theory of reinstatement, two-year-olds and younger three-year-olds should be minimally affected by verbal reinstatement because they are not yet capable of incorporating another's verbal report into their own memory. Older three-year-olds and four-year-olds are more likely to incorporate verbal reinstatement because they can take into account another's verbal knowledge, but are not yet able reliably to separate the verbal source and their own real experience. At five years of age, children have attained enough cognitive and linguistic maturity to differentiate what they experienced and what someone else experienced or said (Nelson, 1996). An action representation may be easier for a 3-year-old to incorporate than a verbal one. Thus, 3-year-olds may not benefit from verbal

reinstatement as much as 4-year-olds might. It is important to note that these ages are approximations based on normative data on language development and research on memory with mostly middle class children of these ages.

It should be noted that the focus when comparing the two different reinstatements is on how different experiences during a retention interval affect a later time of reporting. In the present study, it is presumed that different children have encoded the event differently although all are presented with the same verbal framing during the event, but that is not the main focus. The focus is on how that representation is reorganized as a result of different modes of reminders during the retention interval. Do verbal reminders at reinstatement in some way reactivate and/or reorganize information in the mind of the child and is this different than for reenactment?

In Walkenfeld and Nelson (1995), the event was relatively simple. The study focused on objects: the Sesame Street characters, the envelopes, their locations and the prize. Although there was some action linking all the characters together, all the characters performed basically the same action, they each had an envelope that told the subject where to go next. Only the "action" of the character with the prize was different. The present study uses the basic paradigm of the previous one but with a more elaborate and cohesive event. More complexities have been built into the game, which may allow for a more salient experience. The more complex event might be especially pertinent to applied settings in which children are generally asked about details of complex events.

The present study differs from the prior literature in a number of ways. First, whereas the "event" used in some reenactment studies (Fivush and Hamond, 1989; Sheffield and Hudson, 1994; Sheffield, Hudson and Ryder, 1995) is made up of arbitrary

encapsulated units of information, the event used here is made up of units of information each of which is contingent on another (e.g., to get to the lion you have to feed the animal before it with a specified food and then open its envelope). Additionally, this study compares different modes of reinstatement, and only reinstates part of the event, not the entire event. Moreover, the researcher converses about a controlled event as opposed to a parent talking about an event the researcher has not experienced.

It should also be noted that unlike many other reenactment studies, none of the recall measures in the present study include nonverbal memory. In this study, nonverbal reenactment is an intervention, not a recall measure, and the reenactment group is later tested on its verbal recall based on this intervention. So for the reenactment group the question is, having had a nonverbal reminder, or elaboration, do preschool children exhibit better verbal recall than a control group, and how do these preschoolers compare with a group that has received verbal elaboration as its intervention?

Research Questions

1. Is there a reactivation effect for a partial reminder, contextual or verbal?

Research on reenactment (Rovee-Collier, Fivush and Hudson) has demonstrated that a partial reexposure to action at the point of forgetting facilitates recall. In addition, full verbal rehearsal, albeit with some extra features, also facilitates recall (Albert & Ornstein; Walkenfeld & Nelson).

Does this study repeat the facilitative effects of partial, in-context re-enactment on memory and does a partial verbal reminder facilitate recall of the entire event at a later time or only of the reinstated units of information?

2. Is there a developmental difference between reenactment and verbal reinstatement?

a. By chronological age?

b. By language proficiency?

Do preschoolers, regardless of chronological age, benefit more from verbal reinstatement if they have a higher "language age" as assessed by a standardized language test? Is the developmental difference, either by chronological age or by "language age", greater for verbal reinstatement than for action?

It would be expected that preschoolers who are more proficient language users would be more likely to benefit from the reinstatement intervention than preschoolers who are less verbal would. There is expected to be less of a developmental difference for reenactment, since reenactment has been shown to work well with nonverbal infants and toddlers.

3. What aspect of language is most influential in recall? .

Since expressive language is most important for retelling stories and for conveying information, and the recall task is a "retelling" task rather than a "redoing" task, one would expect that expressive language would be most indicative of recall.

4. Is narrative cohesion affected by the reinstatement condition? How?

One would expect that preschoolers who have had experience retelling an event, would present a richer, more coherent narrative than preschoolers who have not had this experience would. Thus, it is expected that preschoolers who have had verbal reinstatement would provide better narratives than the preschoolers who have not, while the reenactment group would perform better than the control group simply because

reexperiencing part of the game and its connections should afford them some benefit over not being reexposed to the game at all.

5. Is narrative cohesion related to contingency scores, since they are both measures of what holds a "story" together?

Contingency scores in this study measure accuracy as well as the relation between elements whereas narrative is primarily a measure of storytelling ability. Nonetheless, one would expect a relationship between contingency scores and narrative scores.

Chapter 2. Method

Participants

Participants were selected from three different but comparable Hebrew Day Schools in New York City and Long Island. The preschoolers are of similar socioeconomic background. Male and female 3- and 4-year-old children were recruited and there was an attempt to have an approximately equal number of boys and girls per age range, per condition. The children ranged in age from 3; 2 to 5; 3. Only those children who returned signed consent forms were included in the study. There were some children who returned signed consent forms but for one reason or another refused to participate at either the first or second of the four sessions. These children were not included in the study, yielding a total of 69 participants, 26 boys and 43 girls.

The age range was divided at the median age (4; 5), to form two age groups of roughly the same number of participants. The younger group included 35 participants, with 13 boys and 22 girls, with an age range of 3; 2 - 4; 5 and the older group included 34 participants, with 13 boys, 21 girls and an age range of 4; 5 - 5; 3.

Children were randomly assigned (with constraints on age and gender) to three treatment groups: verbal reinstatement, reenactment and control. Additionally, a few participants were absent at the time of intervention and were reassigned to the control group. This yielded a total of 26 children in the control group, (young control, n = 9 girls, 4 boys; old control, n = 9 girls, 4 boys). The verbal reinstatement group had a total of 22 participants (young RI, n = 7 girls, 4 boys; old RI, n = 6 girls, 5 boys). The physical reenactment group had a total of 21 participants (young RE, n = 6 girls, 5 boys; old RE, n = 6 girls, 4 boys).

The receptive language scores for the younger group ranged from 18-31, with a mean of 24.7. For the older group, the receptive language score ranged from 24-30, with a mean of 27.5. Note that there was a larger range for the younger group than for the older group.

The receptive language scores were divided at the median (26) to form two receptive language groups, a low (score of 18 - 26) and a high (score of 27 - 31), of roughly the same number of participants (low n = 20 girls, 16 boys; high n = 23 girls, 10 boys). Participants in the low group ranged in age from 3; 2 - 5; 1, mean age = 4; 1. Participants in the high language group ranged in age from 3; 10 - 5; 3, mean age = 4; 8.

Design

Table 1
Design of Reinstatement Study

	Event	
	Delay (Three Weeks)	
Physical Reenactment	*Verbal Reinstatement*	*Control*
	Delay (Three Weeks)	
	Verbal Recall	
	Delay (One Day – Three Weeks)	
	Language Test (TELD-2)	

Materials

There were six stuffed animals of about the same size (approximately 12 inches tall), seven different colored envelopes made from construction paper, a key on a small

chain, a treasure box (a decorated metal toolbox) wrapped in a colored plastic bag, a party blower, toy foods, toy plates and toy cutlery.

Before any of the children were seen, the researcher set up the "treasure hunt" in the appropriate room. She then proceeded to take Polaroid snapshots of each of the six animals in their respective locations, and of the treasure box wrapped in a plastic bag, in its location, yielding a total of seven snapshots. Each picture was then placed into its respective envelope. It should be noted that the snapshot of the treasure box and its location was almost identical to the snapshot of the bear (first picture), only it included the treasure box, which was placed very close to the bear's location (e.g., under the bear's chair).

At the second session, the researcher read the storybook, "Whistle for Willy," to the control group. The story did not include any props or animals that were part of the treasure hunt. For the reinstatement group, the researcher set up two chairs outside the "treasure hunt" room and had a prepared sheet which laid out a script of what to say as well as points to check if the child recalled items on his or her own or they had to be reinstated by the researcher (see Appendix A-2, p. 101). For the reenactment group, the researcher set up the treasure hunt room with only the last three animals, their respective envelopes and snapshots, the key, the treasure box wrapped in its plastic bag, but no prize. The researcher had a prepared sheet with a script of what to say as well as points to check if the child reenacted in the appropriate order, made comments, or exhibited other notable behaviors (see Appendix A-3, p. 102).

At the third session, the set-up was similar to that used for the reinstatement group at the second session. There were two chairs outside the "treasure hunt" room and

the researcher had a paper with a set of probe questions to be asked and items-to-be-recalled written down.

At the fourth session the Test of Early Language Development, Second Edition (TELD-2) (Hresko, Reid & Hammill, 1991) was administered to procure language measures for each child. The TELD-2 is an oral language test designed to assess young children's (2; 0- to 7; 11-years-old) knowledge of syntax and semantics in both receptive and expressive language. There are two forms to the test and Form B was used for all children. Each form contains 68 items, some of which are related to pictures in a manual while others are related to either phrases or passages read by the examiner. Items increase in difficulty and there are designated starting points for different ages. The test has been standardized using a sample of 1,329 children ranging from 2-7 years of age. Internal consistency of the items was determined by Cronbach's coefficient alpha and found to be highly acceptable (α = .98). Good test-retest reliability was obtained with 55 students ranging from 6; 5 to 7; 5 years of age (α = .97).

All sessions were audiotaped using a portable tape recorder. The recall tapes were later transcribed verbatim for coding purposes. Tapes of the last session were listened to as needed for clarification in scoring the TELD-2.

Procedures

Prior to any of the experimental sessions, the researcher visited each class at least once, during free play, and was introduced to the class by the teachers. She played with the children and became familiar with them, and also talked to the teachers in front of the children to establish that she was an accepted adult in this environment. Thus, when the

researcher came to take the children out for the experimental sessions, most of them were eager to go and quite comfortable with her.

Session 1

As in the preliminary studies of Walkenfeld and Nelson (1995) and Walkenfeld, Goldstein and Nelson (1995), the child and researcher engaged in a treasure hunt game in which they visited various stuffed animals, each with a clue as to where to go next to find the treasure. In an effort to place the game in more of a story context rather than a series of mini-events, the experimenter framed the game as if the child and experimenter were going to visit a make-believe zoo to find a hidden treasure box with a prize in it.

The researcher began by establishing rapport on the way to the "treasure hunt room". Once they reached the designated room, the researcher first introduced the tape recorder and demonstrated to the child that it records voices. She then requested permission from the child to keep it on while they talked and played so that she could remember what they had done.

The researcher then explained to the child that they were going to visit a make-believe zoo and play a treasure hunt game:

> Well, here's how we play a treasure hunt game. First of all, when you play a treasure hunt game, you're looking for a prize. Ok? But where's the prize? Well, it's hidden in a special treasure box in a make-believe zoo that we're going to visit. The problem is that we don't know where the treasure box is, and even if we find it, it's locked. Do you have

the key to the treasure box? I don't. Someone told me that one of the animals in the zoo has the key and that after we find the key, we can find the treasure box with the prize. Ok?

Now, how will we know which animals to go to help us find the prize? Should I tell you? Well, near each and every animal there's an envelope with a message and the message will tell us which animal to go to next to help us find the prize. Ok? Every animal has an envelope next to it, and in the envelope is a message, a hint, of where to go next to look for the prize.

The only thing is, those animals are very hungry and before they let us look inside the envelopes for the messages, they want you to feed them. Can you do that? Ok. Great!!

So, let's go look for that key in the zoo, so we can get the prize!

[Walk into experimental room.] Now, why don't you open this first envelope that's here on the table and let's see what the first message is.

The child begins by opening the first envelope with a clue, which is on a table as soon as she enters the "zoo". Inside the colored envelope is a picture of an animal, the one to go to for the next clue. When the child finds the animal, she first has to feed the animal. Only then may she look into that animal's envelope to see which animal to go to next to find the key. This process continues until the child finds the animal that has the key in his or her envelope. Then the child can take the key and open the treasure box to retrieve the prize. The treasure box is in another location (in close proximity to the bear's

location), a picture of which is in the same envelope as the key. The sessions were audiotaped and notes of unusual behaviors were recorded at the time of the game or soon thereafter. Children were not asked to remember the event nor were they given any indication that they would be asked to recall the event at a later time. They were asked to please not show the prize to their friends so as to avoid making their classmates jealous (and the teachers frustrated).

Depending upon the school, the room used as the "treasure hunt room" was either the lunchroom, the social hall or the teachers'/music room. In each case, the researcher did her best to ensure that the relative closeness between the stuffed animals and the pattern that the child would have to follow was similar across schools. Of course, the order of the animals and their corresponding envelopes and food-related props remained constant.

Session 2

After a delay of 3 weeks, the event was reinstated (Table 1, p. 25). Each participant was assigned to one of three groups: two reminder groups (one nonverbal, in-context reenactment and the other verbal reinstatement) and one control. For all groups, before starting the researcher asked the child's permission to use the tape recorder.

Reminder 1: Physical Reenactment

One group of participants experienced the re-enactment (RE) condition in which each child returned to the "treasure hunt room" which was set up as the previous time, with only half the items present. The first three animals with their corresponding envelopes, pictures and food were not present. Only aspects of the latter half of the

game, with the last three stuffed animals and the treasure box, were reinstated. The researcher read a prepared script (see Appendix A-3, p. 102, for full reenactment protocol and check-off sheet) explaining that not all the animals could come that day:

> Hi. Today we're going to visit our make-believe zoo again. But only some of the animals were able to come today. I want you to show me how you played the game in the zoo last time I was here.

Children were taken to the tiger, the first animal to be reinstated, and told to begin playing there. For the animals that were present, there was no food, so the children were sometimes baffled because they knew they were supposed to first feed the animal before they could open the envelope. The researcher told them to do their best with what there was and to just play the game as they had last time, to the best of their ability. They did have the corresponding envelopes and pictures present. Another surprise at the end, however, was that when they opened the treasure box, it was empty. There was no party blower / prize because they were not being specifically reminded of what the prize was. Therefore, children were not told what had been there last time though some did spontaneously mention the blower. They were given a sticker for participating. This took between 2-3 minutes per child.

Reminder 2: Verbal Reinstatement

Participants were taken to an area either directly outside or adjacent to the room that had been used for the treasure hunt. There were two chairs set up and the child and

researcher sat down. The researcher, reading from her script (see Appendix A-2, p. 101, for full reinstatement protocol / check-off sheet) explained that she wanted the child to help her retell the story of what they had done the previous time, when they played the game. To keep the task as similar to the physical reenactment task as possible, the researcher said that she would begin, and she began from the tiger so that children in the verbal reminder group would have the "same" starting point as children in the reenactment group were forced to have. Again, only aspects of the latter half of the game, with the last three stuffed animals and the treasure box, were reinstated. As in the physical reenactment group, some children spontaneously recalled animals and other aspects of the game, which were not chosen by the researcher to be reinstated.

> Help me retell the story of what we did the last time I came, when we visited the make-believe zoo. I'll say some and you'll say some. I'll start. The last time I came, we visited a make-believe zoo. Which animals did we see after the tiger?

The child was then asked to continue from there and was prompted with "and then?" when necessary. After the child recalled what she could, to ensure that the child had been reminded of the same elements as the reenactment children, the researcher reviewed the game. She began with the tiger, adding what the child had omitted and not unnecessarily repeating what the child had said. This took between 2-3 minutes per child.

Control

The third group of children, the no-reinstatement/control group, was brought to the interviewing area, which is the same as was used for the verbal reminder group, and read a storybook, "Whistle for Willie" (Keats, 1977). The characters in the story did not resemble any characters in the treasure hunt game. The book reading took approximately 5 minutes per child.

Regardless of condition, children were given a sticker of their choice at the end of the session as a token of appreciation for participating.

Session 3

Three weeks after reinstatement (6 weeks after the event), the researcher returned for a recall interview. The interview was conducted in the designated interview area, either directly outside or adjacent to the "treasure hunt" room that had been used in Session 2 for both verbal reinstatement and the story reading. The interview started out with free recall and then the researcher proceeded to probe. The researcher began by saying that the reason she keeps calling children out is because she is really interested in what children like to do and the games they like to play. She said that she wanted to know whether the game they had played the first time she took him/her out was a good game to play with children of this age. She then asked the child to please tell her whatever he/she remembered about the game. Whatever information the child was able to offer at this time is considered "free recall". However, most children required more specific probes to get them to start talking in sentences. Children were given a sticker of their choice for participating.

Session 4

A standardized language test, the TELD-2, was administered one day to three weeks after the last recall session. Differences in timing are related to different school schedules based on natural occurrences in schools which were out of the researcher's control, i.e., birthday parties, trips, parades, holidays and other vacations.

The TELD-2 was used to procure a measure of language proficiency whereby one could assess whether greater language proficiency correlates with greater recall.

The sessions were audiotaped. At the end of the session, as a gesture of thanks for participation, the researcher took a Polaroid snapshot of each child, which they could take home.

Coding

The measures:

Free vs. probed recall

Recall was only counted as free recall if the child responded when first asked what happened. Though there were instances of spontaneous recall in middle of some interviews, these were not counted as free recall because the statements followed a number of probes. Even if the probes were unrelated probes, it is difficult to sort out whether the probes triggered this talk or whether the child was just insecure earlier.

As is typical of 3- to 5-year-olds, little free recall was forthcoming on initial questioning[2]. Therefore, free and probed recall were collapsed, yielding total scores.

Discrete and Contingent Scores

Recall interviews were coded twice, once for objects, spatial locations and actions to be recalled independent of each other and a second time for how those objects, locations and actions were recalled in sequence and in relation to one another (see Appendix B-1, p. 105, and B-2, p. 106, for discrete and contingent coding tables). In other words, if a child recalled that there was an ice-cream and there was a bear but did not recall these together or as being associated, the child received credit for these objects in the first coding, coding for discrete items. However, if the child recalled that the bear was fed ice-cream, the child received credit for both discrete and contingent items. In all, there were 32 discrete items and 50 contingent items to be recalled, with 30 overlapping items. (For the discrete items there is a 94% overlap with contingent items and for contingent items there is a 60% overlap with discrete items.)

Scores were separated into discrete and contingent because it seemed important to capture both individual facts that children recalled as being present in addition to whether children could recall the relationships between these objects and actions.

Recall of simply <u>what</u> was present is one level of recall whereas being able to connect the objects and actions indicates a verbal ability to tell a more coherent story and

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[2] Interviewing young preschool children is complicated for a number of reasons. Some preschoolers have limited experience in conversing and are not yet comfortable speaking to people they are not very well acquainted with. Thus, if they are unsure of what an interviewer wants, these children may refuse to talk, waiting for more specific probes until they are sure of what they are supposed to say. Other children are easily distracted and think that their personal experiences, which may or not be even tangentially related to the topic at hand, are so fascinating that they ought to be shared during the interview. These children tend to lose focus, possibly since they would much rather tell an exciting story to which the researcher is not privy than recount an event that the researcher participated in. Virtually all participants also expressed that they would like to replay the game, and some seemed frustrated at having to just talk about it.

to understand that the game was made up of a series of connecting mini-events. That the whole is made up of the parts and the parts are interrelated is important for interpretation of events and their recall, and integral to the development of autobiographical recall. If there is a difference in reinstatement type and contingent recall, this would provide evidence about what facilitates memory for making connections and sequencing.

Reliability of coding

The researcher coded all 69 participants on the discrete and contingent items. An additional coder coded 20% of the transcripts for discrete and contingent items to be recalled. An initial coding by the second coder, yielded the following Pearson correlations for inter-rater reliability, .89 for discrete and contingent combined, .87 for discrete items and .88 for contingent items. After discussion changes were made in the final scores. Recomputed inter-rater reliability was determined by a series of Pearson correlations was .91, for discrete and contingent items combined, .92, for the discrete items and .88, for the contingent items.

Reinstated and non-reinstated item scores

Items recalled were further broken down into those that were reinstated and those that were not (see Table 2, p. 37). A small number of items on the coding sheets actually have two parts and the score was split in half. On the coding sheet for discrete items (Appendix B-1, p. 105), one of these split items was recall of the prize and that it was a blower. Only "prize" was reinstated; blower was not. It is this split item that is reflected in some of the non-whole number totals in Table 2 (p. 37).

Table 2

Items-to-be-recalled:

	Discrete	Contingent	Total
Non-reinstated	18.5	26	44.5
Reinstated	13.5	24	37.5
Total	32	50	82

Thus, there are measures for total discrete items (TotD=32), total contingent items (TotC=50), reinstated discrete items (RD=13.5), reinstated contingent items (RC=24), non-reinstated discrete items (NRD=18.5) and non-reinstated contingent items (NRC=26) (see coding sheets, Appendixes B-1 and B-2, pgs. 105 & 106). Essentially, the total discrete score is the sum of the reinstated and non-reinstated discrete items whereas the total contingent score is the sum of the reinstated and non-reinstated contingent items.

Narrative Scores

To obtain a measure of narrative cohesion, two independent raters were asked to rate the interview transcripts for narrative quality. They developed a rating system ranging from 1-3, with 1 indicating the least cohesive and 3 indicating the most (see Appendix B-3, p. 107 for narrative criteria). They then coded all the recall interviews, unaware of whether children were being accurate, and unaware as to the group, age and language score of any individual child.

Reliability of coding

After scoring the interviews, prior to discussion, there was 76% agreement. Then, referring to their set of relevant criteria, the raters discussed and resolved their inconsistencies reaching 100% agreement.

Language Scores

The language scores used were the raw scores obtained from the TELD-2. Based on Section VI, the Diagnostic Profile of the TELD-2 Profile/Record Form, items were divided into those that were receptive and those that were expressive, yielding separate receptive and expressive scores, as well as the total raw score. Based on this record form, the scores were also coded for performance in syntax and semantics. Due to some difficulty in scoring consistently, one item was omitted for all children. All scores were kept in raw form for the analyses.

Preliminary Analyses

Due to the fact that there were slight variations in the number of subjects per group, all ANOVAs and MANOVAs were performed using the general linear model, specifically, the PROC/GLM statement in SAS.

In determining whether to do MANOVAs or ANOVAs it was important to establish which of the recall measures related to each other (Table 3, p. 39).

Table 3

Pearson inter-correlations for recall measures:

	NRD	NRC	RD	RC	NAR
NRD	----	.87***	.32**	.44**	.36**
NRC		----	.31**	.41**	.27*
RD			----	91***	47***
RC				----	.50***

* = p < .05, ** = p < .01, *** = p < .001

Note. NRD = non-reinstated discrete items; NRC = non-reinstated contingent items; RD = reinstated discrete items; RC = reinstated contingent items; NAR = narrative score.

Since the non-reinstated discrete and contingent items are highly related to each other and the reinstated discrete and contingent items are highly related to each other, multiple analyses of variance (MANOVAs) were first performed on the non-reinstated discrete and contingent and then on the reinstated discrete and contingent. These were run on SAS and the printouts also yield individual ANOVAs for each dependent variable entered into the MANOVA. It should be noted that the MANOVA is more conservative than the ANOVA and if there are relatively few subjects per group, it is less likely to yield significance than individual ANOVAs. However, when the MANOVAs were not significant, the Bonferroni adjustment for the significance level of .05 was used to determine whether the individual ANOVAs on the measures being tested were significant. Only ANOVAs with significance of .025 are considered significant. (However, once the more conservative ANOVA is found to be significant, the resulting LSM t analyses may be used at an alpha of .05.)

Relation between independent variables

The variables age, receptive language and expressive language were intercorrelated as illustrated in Table 4.

Table 4

Pearson inter-correlations between age and language measures

	Age	Receptive Language	Expressive Language
Age	----	.62***	.61***
Receptive Lang.		----	.79***

* = $p < .05$, ** = $p < .01$, *** = $p < .001$

A priori differences per condition for age and language score.

There were no a priori differences between condition for either age or receptive language. The ANOVA for age by condition, $F(2, 66) = .32$ is not significant, $p = .73$ (Ms = 4;5, 4;3, 4;5 for the C, RI and RE groups, respectively).

The ANOVA for receptive language by condition, $F(2, 66) = .88$ is also not significant, $p = .42$ (Ms = 26.38, 25.41, 26.43, are the raw scores for the C, RI and RE groups, respectively). When grouped by condition and age, the ANOVA for receptive language , $F(5, 63) = 4.91$ is significant, $p = .0007$, but the main effect is for the age grouping, $p = .0001$, with older children having significantly better receptive language scores than younger children, Ms = 24.67, 27.52 for younger and older across conditions, respectively. The least squares means t analysis shows that for each condition, the older

group outperforms the younger group on receptive language. However, between groups, there are no significant differences.

Between schools performance

A series of ANOVAs comparing school performance on the different recall measures indicated that there were no significant differences between schools on recall.

Gender differences

Gender is not significantly related to any of the recall measures, including narrative cohesion. Moreover, MANOVAs and ANOVAs comparing recall performance of boys and girls yielded no gender difference.

Recall of Food Items:

At the reminding session, food items were not reminded for either of the reminder groups. At recall, there were no significant differences between groups for recall of foods.

Chapter 3. Results

I begin this section with a preview of the results and how they are organized. There were two non-reinstated measures of recall, non-reinstated discrete (NRD) and non-reinstated contingent (NRC), and two reinstated measures of recall, reinstated discrete (RD) and reinstated contingent (RC). The non-reinstated discrete and the reinstated discrete make up the total discrete (TotD) score and the non-reinstated contingent and the reinstated contingent make up the total contingent score (TotC). Additionally, recall of the goal of the treasure hunt was isolated and analyzed to investigate condition differences. Lastly, there was a narrative cohesion measure.

These measures were compared with each other both across and between conditions as well as with chronological age and the language scores. To analyze the effect of age and condition on reinstatement effects and recall, the children were classified as either younger or older, based on the median age of the entire group. The recall measures were first analyzed by age and condition. There were few differences so a series of multiple regressions were run which demonstrated the significance of language, particularly receptive language, for recall. The data were then re-analyzed by age and condition with receptive language as a covariate yielding some interesting findings. When analyzed by age and receptive language the results did not reveal anything new and were very similar to the condition by age analyses. The main issue at hand then is what is revealed in the multiple regressions.

Narrative cohesion scores are then analyzed for their relation to recall of discrete and contingent items and condition differences. Recall of the goal is not significantly better recalled by any particular group.

I. Condition by Age

Recall differences between verbal reinstatement and reenactment groups.

To consider the question of whether there are developmental age differences by condition, the scores were grouped by the median age as either younger or older, and by the three conditions, yielding six groups. The least squares means (LSMs) for discrete items, when sorted by condition and age, are shown in Table 5a (p. 44) and the means for recall of contingent items are shown in Table 5b (p. 45).

II. The Reactivation Issue

Does either reinstatement or reenactment promote recall of the entire event? Are the non-reminded items recalled as well as the reminded items for either of the reminder groups but not for the control group?

Neither reinstatement nor reenactment appears to have had any significant reactivation effect for the non-reinstated items. Paired-comparison t-tests indicate significant differences between the number of reinstated and the number of non-reinstated items recalled within each condition, with the reinstated items being recalled significantly better (Tables 6a & 6b, p. 46). On discrete items, this is also true for the control group which did not receive reinstatement, albeit not at the same level of significance $p < .03$ for the control group and $ps < .0004, .003$, for verbal reinstatement and reenactment, respectively.

Table 5a

Least Squares Means Discrete Recall for Condition by Age

Parentheses indicate standard errors.

		Control	Verbal Reinstatement	Reenactment
NRD	Young	7.44 (.83)	7.14 (.90)	6.64 (.90)
	Old	6.85 (.83)	7.55 (.90)	8.10 (.95)
Total NRD		7.14 (.59)	7.34 (.64)	7.37 (.65)
RD	Young	7.98 (.55)	9.36 (.60)	8.45 (.60)
	Old	9.38 (.55)	10.07 (.60)	10.83* (.63)
Total RD		8.68 (.39)	9.72 (.42)	9.64 (.43)
TotD	Young	15.42 (1.13)	16.50 (1.23)	15.09 (1.23)
	Old	16.23 (1.13)	17.61 (1.23)	18.93 (1.29)
Total TotD		15.83 (.80)	17.06 (.87)	17.01 (.89)

* = Older RE is significantly greater than younger RE, $p < .008$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = total discrete items.

Table 5b

Least Squares Means Contingent Recall for Condition by Age

Parentheses indicate standard deviations.

		Control	Verbal Reinstatement	Reenactment
NRC	Young	6.75 (.90)	6.45 (.98)	5.50 (.98)
	Old	5.58 (.90)	5.14 (.98)	6.90 (1.03)
Total NRC		6.16 (.64)	5.80 (.69)	6.20 (.71)
RC	Young	10.37 (.98)	11.20 (1.07)	10.45 (1.07)
	Old	11.37 (.98)	12.75 (1.07)	14.20 (1.12)
Total RC		10.87 (.69)	11.98 (.75)	12.33 (.77)
TotC	Young	17.12 (1.60)	17.66 (1.74)	15.95 (1.74)
	Old	16.94 (1.60)	17.89 (1.74)	21.10 (1.82)
Total TotC		17.03 (1.13)	17.77 (1.23)	18.53 (1.26)

Note. NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = total contingent items.

Table 6a

Paired Comparison t-test between non-reinstated discrete (NRD) and reinstated discrete (RD) items: differences by condition.

	Mean NRD (MSE)		Mean RD (MSE)		Mean Difference (MSE)	
Control	7.14	(.59)	8.68	(.39)	1.54*	(.65)
Verbal Reinstatement	7.34	(.64)	9.72	(.42)	2.38***	(.56)
Reenactment	7.37	(.65)	9.64	(.43)	2.25***	(.66)

*= $p < .05$, ** = $p < .01$, *** = $p < .001$

For the contingent items, a paired comparisons t-test yielded a significant difference between the reinstated and non-reinstated contingent items for all three conditions at $p < .0001$ (Table 6b).

Table 6b

Paired Comparison t-test between non-reinstated contingent (NRC) and reinstated contingent (RC) items: differences by condition.

	Mean NRC (MSE)		Mean RC (MSE)		Mean Difference (MSE)	
Control	6.16	(.64)	10.87	(.69)	4.70*	(.82)
Verbal Reinstatement	5.80	(.69)	11.98	(.75)	6.18*	(.62)
Reenactment	6.20	(.71)	12.33	(.77)	6.07*	(.84)

* = $p < .0001$

Is there reactivation when grouped by condition and age?

When comparing discrete items between conditions for younger and older children, paired-comparison t-tests indicate that there are significant differences between the number of reinstated and the number of non-reinstated items recalled for each group except for the young control group (Table 7a, p. 47), with the reinstated items being recalled better. This is particularly true for the older verbal reinstatement group, $t = 4.44$, $p = .001$. The rest of the groups that showed significance had ps ranging from .05 - 03 and the ts are as follows: 2.54 for the old control group, 2.24 for the young verbal reinstatement group, 2.33 for the young reenactment group and 2.42 for the old reenactment group.

Table 7a

Paired Comparison t-test between non-reinstated (NRD) and reinstated discrete (RD) items: condition by age.

		Mean NRD (MSE)		Mean RD (MSE)		Mean Difference (MSE)	
Control	Young	7.44	(.83)	7.98	(.55)	.54	(.78)
	Old	6.85	(.83)	9.38	(.55)	2.54*	(1.00)
Verbal Reinstatement	Young	7.14	(.90)	9.36	(.60)	2.23*	(1.00)
	Old	7.55	(.90)	10.07	(.60)	2.52***	(.57)
Reenactment	Young	6.64	(.90)	8.45	(.60)	1.82*	(.78)
	Old	8.10	(.95)	10.83	(.63)	2.73*	(1.13)

*= $p < .05$, ** = $p < .01$, *** = $p < .001$

The young control group, in contrast to the young verbal reinstatement and reenactment groups, did not recall reinstated discrete items better than non-reinstated discrete items. Moreover, the old verbal reinstatement group showed the greatest difference between recall of reinstated versus non-reinstated discrete items.

All paired comparisons t-tests between reinstated (RC) and non-reinstated (NRC) contingent items were significant ranging from $p < .0001$-.003 (Table 7b, p. 48). The ts for each group are as follows: 3.66 (young control), 4.54 (old control), 5.88 (young verbal reinstatement), 10.11 (old verbal reinstatement), 4.51 (young reenactment), 5.9 (old reenactment). Apparently, most participants, regardless of condition, recalled reinstated contingent items better than non-reinstated contingent items. Nevertheless, there is a pattern showing that for both young and old, the verbal reminder and physical reenactment groups perform much better than the control group.

Table 7b

Paired Comparison t-test between non-reinstated contingent (NRC) and reinstated contingent (RC) items: condition by age.

		Mean NRC (MSE)	Mean RC (MSE)	Mean Difference (MSE)
Control	Young	6.75 (.90)	10.37 (.98)	3.62** (.99)
	Old	5.58 (.90)	11.37 (.98)	5.79***(1.27)
Verbal Reinstatement	Young	6.45 (.98)	11.20 (1.07)	4.75***(.81)
	Old	5.14 (.98)	12.75 (1.07)	7.61***(.75)
Reenactment	Young	5.50 (.98)	10.45 (1.07)	4.95***(1.10)
	Old	6.90 (1.03)	14.20 (1.12)	7.30***(1.24)

*= $p < .05$, ** = $p < .01$, *** = $p < .001$

It is disconcerting that older children in the control group recalled reinstated discrete (RD) items significantly better than non-reinstated discrete (NRD) items. It is even more peculiar that all children in the control group recalled reinstated contingent items better than non-reinstated contingent items. The only group that does not show a difference between the reinstated and non-reinstated items is the young control group on discrete items.

Since the contingent scores overlap with their corresponding discrete scores, it is important to know whether a particular group(s) recalled more contingencies than any other group, despite the scores on discrete items. Therefore, ANCOVAs were done on the non-reinstated, reinstated and total contingency scores, controlling for the corresponding discrete scores.

When grouped by condition and age and controlling for discrete items recalled, the ANCOVAs for RC and TotC are highly significant at $p=.0001$, but the main effect is only for the variable controlled, the discrete items, in each analysis. Thus, there would not be a difference between groups on contingent items if not for the discrete items.

For non-reinstated contingent (NRC), the ANCOVA is also highly significant at $p=.0001$, and the main effect, as for reinstated contingent (RC) and TotC is for the discrete items at $p = .0001$.

Due to the extremely high correlation between the non-reinstated discrete and contingent scores (Table 3, p. 39), they were analyzed together in a MANOVA. The same is true for the reinstated discrete and contingent scores as well as for the composite discrete and contingent (TotD and TotC) scores.

A 2 (age groups) X 3 (conditions) MANOVA on recall of the non-reinstated items (NRD and NRC) yielded no significance for condition, or for age or for the interaction of condition by age (Table 11, p. 65). The ANOVAs for non-reinstated discrete and non-reinstated contingent were also not significant (Table 12, p. 66).

A 2 (age groups) X 3 (conditions) MANOVA on reinstated discrete and contingent scores (RD and RC) was not significant for condition or for the condition by age interaction, but was significant for age, Pillai's Trace $F(2, 62)=5.06$, $p=.009$ (Table 11, p. 65). A series of 2 (age groups) X 3 (conditions) ANOVAs on the discrete and contingent items yielded significance only for the reinstated discrete items $F(5, 63) = 3.06$, $p = .02$. The main effect in this analysis was for age, $p < .003$, and there were no significant condition differences (Table 12, p. 66). The older reenactment group performed significantly better than the younger reenactment group on reinstated discrete items (RD), LSMs $t=2.73$, $p < .008$ and on reinstated contingent (RC) items LSMs $t=2.42$, $p=.02$. There is also a great difference on reinstated contingent items (RC) between the performance of the older reenactment and older control groups, with the older reenactment group recalling more RC, LSM $t=1.9$, $p=.06$, albeit not at the .05 alpha level (Table13, p. 67).

Summary: Not one of the condition by age MANOVAs yielded significance for either a difference by condition or condition by age interaction. A difference by age across conditions, however, was significant in affecting recall of reinstated items but not for recall of non-reinstated items. Thus, age, not condition, yielded a difference, indicating that reminders had no significant effect.

III. Correlations of dependent measures and language and age overall.

The variables hypothesized to influence recall were condition, age, receptive language and expressive language. To determine which of the variables, regardless of condition, may be related to the recall measures, Pearson correlations were run (see Table 8, p. 51).

Table 8

Pearson correlations for age, language competence and recall measures:

Overall:

	NRD	NRC	RD	RC
Age	.17	.03	.27*	.20
Receptive Language	.36**	.25*	.45***	.50***
Expressive Language	.36**	.22	.43**	.40**

* = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Note. NRD = non-reinstated discrete items; NRC = non-reinstated contingent items; RD = reinstated discrete items; RC = reinstated contingent items.

The only recall measure with which age is significantly correlated is reinstated discrete items, and that relationship is not very strong given the relatively low correlation. Moreover, receptive language is the only measure correlated with all the recall measures. Interestingly, receptive language is most strongly correlated with the reinstated items. It would seem then, that the independent measure most affecting recall might be receptive language, followed by expressive language.

To further test this, a stepwise multiple regression was performed on the variables.

IV. Stepwise Multiple Regression Analysis

What aspects of language competence affect recall more?

The Pearson correlations indicate a stronger relationship between the language scores and recall measures than between age and the recall measures (Table 8, p.51). Further analyses were done to determine whether age or a particular aspect of language was carrying the load. The raw language scores were first grouped by expressive and receptive language and analyzed by regression analysis. They were then regrouped by semantic and syntax language scores and reanalyzed by regression analyses.

Stepwise regression analyses were performed across conditions, with independent variables age, condition, expressive score and receptive score, in that order. The findings indicate that across conditions, all recall scores, with the exception of NRD (non-reinstated discrete scores), are significantly affected by the receptive language score (see Table 9a, p. 53) and not the expressive language score nor age. When grouped by semantic and syntax scores as opposed to receptive and expressive language scores, the semantic scores are more predictive of recall (Table 9b, p. 54) and not syntax or age.

To see whether there were differences by condition, another series of stepwise regression analyses were performed using the same variables but sorting the participants by condition. Indeed, this set of analyses yielded an interesting pattern (see Tables 10a-c, pgs. 55-57 for receptive and expressive language scores and Tables 10d-f, pgs. 58-60 for results of semantic and syntax scores).

Table 9a

Summary of Stepwise Regression Analyses for Age, Condition, Receptive and Expressive Language Predicting Recall Across Conditions.

Step/Variable	B	SE B	β	Increment in R^2	F	p
NRD						
1. Exprs	.37	.12	.36	.13	10.18**	.002
RD						
1. Recep	.33	.08	.45	.21	16.71***	.0001
2. Condition	.47	.28	.18	.04	2.93	.09
TotD						
1. Recep	.69	.15	.49	.24	20.75***	.0001
NRC						
1 Recep	.27	.13	.25	.06	4.33*	.04
RC						
1. Recep	.62	.13	.50	.25	21.75***	.0001
2. Condition	.71	.46	.16	.03	2.34	.13
TotC						
1. Recep	1.16	.27	.58	.20	17.06***	.0001
2. Age	-.006	.004	-.21	.03	2.41	.13
Nar						
1. Recep	.11	.03	.45	.21	17.30***	.0001

^ = $p < .06$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent; NAR = narrative score.

Table 9b

Summary of Stepwise Regression Analyses for Age, Condition, Semantics and Syntax Predicting Recall Across Conditions.

Step/Variable	B	SE B	β	Increment in R^2	F	p
NRD						
1. Semantic	.25	.07	.40	.16	12.47***	.0008
RD						
1. Semantic	.24	.05	.51	.26	23.14***	.0001
2. Condition	.46	.27	.18	.03	3.02	.09
TotD						
1. Semantic	.49	.09	.54	.29	27.86***	.0001
NRC						
1. Semantic	.29	.11	.41	.07	5.18*	.03
2. Age	-.004	.002	-.23	.03	2.37	.13
RC						
1. Semantic	.51	.11	.65	.27	24.61***	.0001
2. Age	-.004	.002	-.20	.03	2.35	.13
3. Condition	.68	.45	.15	.02	2.26	.14
TotC						
1. Semantic	.81	.17	.64	.23	19.76***	.0001
2. Age	-.007	.004	-.26	.04	3.61^	.06
Nar						
1. Semantic	.05	.02	.34	.20	17.27***	.0001
2. Syntax	.14	.08	.21	.03	2.74	.10

^ = $p < .06$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent; NAR = narrative score.

Table 10a

Summary of Stepwise Regression Analyses for Variables Predicting Recall by Condition

				Control		
Step/Variable	B	SE B	β	Increment in R^2	F	p
NRD						
1. Recep	.48	.24	.38	.15	4.10*	.05
RD						
1. Exprs	.49	.12	.63	.40	15.84***	.0006
TotD[3]						
1. Exprs	.92	.26	.59	.35	13.04***	.001
NRC						
1. Recep	.41	.27	.30	.09	2.42	.13
RC						
1. Exprs	.82	.19	.66	.43	18.42***	.0003
TotC						
1. Exprs	1.16	.33	.59	.34	12.58**	.002
Nar						
1. Exprs	.10	.05	.39	.15	4.23*	.05

^ = $p < .06$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent; NAR = narrative score.

[3] To test for whether more expressive children simply talked more and by talking more gave more information, intrusion errors, or commissions, were subtracted from the overall discrete score [TotD - (Commissions + Tangents)]. This manipulation did not significantly alter the results reported here. As a matter of fact, it slightly increased the increment in R^2 from 35% to 36%, indicating that expressive language is even more predictive of recall for the control group after we eliminate commissions and tangents (non-relevant stories told by the child during recall).

Table 10b

Summary of Stepwise Regression Analyses for Variables Predicting Recall by Condition

Verbal Reinstatement

Step/Variable	B	SE B	β	Increment in R^2	F	p
NRD						
1. Exprs	.51	.18	.59	.12	2.74	.11
2. Age	-.005	.003	-.40	.10	2.53	.13
RD						
1. Recep	.39	.10	.84	.17	3.96^	.06
2. Exprs	-.26	.16	-.54	.10	2.59	.12
TotD[4]						
1. Recep	.87	.21	.83	.19	4.76*	.04
2. Age	-.008	.004	-.56	.17	5.03*	.04
NRC						
1. Age	-.01	.004	-.81	.15	3.65	.07
2. Recep	.66	.28	.61	.20	5.76*	.03
RC						
1. Recep	1.09	.32	1.66	.20	5.06*	.04
2. Exprs	-.53	.30	-.55	.13	3.64	.07
3. Age	-.005	.003	-.40	.08	2.57	.13
TotC						
No variable met the .15 significance level for entry into the model.						
Nar						
1. Recep	.15	.04	.61	.38	12.15**	.002

^ = p < .06, * = p < .05, ** = p < .01, *** = p < .001.

Note. NRD = non-reinstated discrete items; NRC = non-reinstated contingent items; TotD = composite discrete; TotC = composite contingent; RD = reinstated discrete items; RC = reinstated contingent items; NAR = narrative score.

Table 10c

[4] When commissions were subtracted from the TotD score, age was no longer significant for the verbal reinstatement group and receptive language became slightly less predictive of recall, accounting for 18% of the variance with a p of .05.

Summary of Stepwise Regression Analyses for Variables Predicting Recall by Condition

				Reenactment		
Step/Variable	B	SE B	β	Increment in R^2	F	p
NRD						
1. Age	.008	.003	.49	.24	5.97*	.02
RD						
1. Recep	.47	.15	.59	.35	10.16**	.005
TotD[5]						
1. Recep	.86	.27	.59	.35	10.16**	.005
NRC						
1. Age	.008	.003	.51	.26	6.76*	.02
RC						
1. Recep	.84	.26	.59	.35	10.26**	.005
TotC						
1. Recep	1.20	.37	.60	.36	10.76**	.004
Nar						
1. Recep	.12	.04	.59	.34	9.97**	.005

^ = $p < .06$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Note. NRD = non-reinstated discrete items; NRC = non-reinstated contingent items; TotD = composite discrete; TotC = composite contingent; RD = reinstated discrete items; RC = reinstated contingent items; NAR = narrative score.

[5] When commissions were subtracted from the TotD score, receptive language became more predictive, explaining 39% of the variance with an F of 12.30 and a p of .002.

Table 10d

Summary of Stepwise Regression Analyses for Variables Predicting Recall by Condition

Control

Step/Variable	B	SE B	β	Increment in R^2	F	p
NRD						
1. Semantics	.30	.13	.43	.18	5.40*	.03
RD						
1. Semantics	.29	.08	.58	.33	12.00**	.002
TotD						
1. Semantics	.59	.16	.60	.36	13.57***	.001
NRC						
1. Semantics	.27	.15	.35	.12	3.36	.08
RC						
1. Semantics	.50	.12	.63	.40	15.87***	.0005
TotC						
1. Semantic	.77	.20	.84	.37	14.21***	.0009
2. Age	-.009	.006	-.33	.06	2.35	.14
Nar						
1. Syntax	.32	.13	.43	.19	5.60*	.03

` = $p < .06$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent; NAR = narrative score.

Table 10e

Summary of Stepwise Regression Analyses for Variables Predicting Recall by Condition

Verbal Reinstatement

Step/Variable	B	SE B	β	Increment in R^2	F	p
NRD						
1. Semantics	.18	.11	.61	.11	2.44	13
2. Age	-.005	.003	-.44	.11	2.81	.11
RD						
1. Semantics	.10	.06	33	.11	2.47	.13
TotD						
1. Semantics	.28	.14	.69	.17	4.00^	.06
2. Age	-.007	.004	-.44	.12	3.06	.10
NRC						
1. Age	-.006	.003	-.71	.15	3.65	.07
2. Semantics	.35	.18	.49	.14	3.87^	.06
RC						
1. Semantics	20	.13	.34	.11	2.56	.13
TotC						
No variable met .15 significance level for entry into the model.						
Nar						
1. Semantics	.09	.03	.59	.35	10.58**	.004

^ = $p < .06$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent; NAR = narrative score.

Table 10f

Summary of Stepwise Regression Analyses for Variables Predicting Recall by Condition

				Reenactment		
Step/Variable	B	SE B	β	Increment in R^2	F	p
NRD						
1. Syntax	1.63	.65	.50	.25	6.18*	.02
RD						
1. Semantics	.36	.09	.67	.44	15.21***	.001
TotD						
1. Semantics	.64	.17	.65	.43	14.07***	.001
NRC						
1. Age	.008	.003	.51	.26	6.76*	.02
RC						
1. Semantics	.58	.18	.61	.37	11.07**	.004
TotC						
1. Semantics	.85	.25	.62	.39	11.94**	.003
Nar						
1. Semantics	.08	.03	.58	.34	9.58**	.006

` = $p < .06$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent; NAR = narrative score.

For the control group, the reinstated items (RD and RC), as well as the composite scores (TotD and TotC), appear to have been significantly influenced by the expressive language score (Table 10a, p. 55). For reinstated discrete items, expressive language was entered into the model and accounted for 40% of the variance, $F = 15.84$, $p = .0006$. No other variables entered into the model yielded significance. For reinstated contingent items recalled, expressive language was entered into the model and accounted for 43% of the variance, $F = 18.42$, $p = .0003$. Once again no other variables entered into the model yielded significance. For the narrative score, once again expressive language is the only variable entered into the model that yielded significance, accounting for 15% of the variance, $F = 4.23$, $p = .051$. For non-reinstated discrete only receptive language was significant $F = 4.1$, $p = .054$. For non-reinstated contingent items, none of the variables were significant.

The reinstatement group showed the most variability in terms of what the major influence was over the recall measures. The recall measures that are significantly influenced by the variables (TotD, NRC, RC, Nar) are apparently driven by the receptive language score. Total discrete items (TotD) recalled is also affected by age $p < .04$.

For the reenactment group, all recall measures, with the exception of the non-reinstated variables (NRD and NRC) are significantly affected by the receptive language score. The non-reinstated scores are predicted by age.

For the reenactment group, semantics is predictive of all reinstated and composite recall measures but not of non-reinstated recall. Non-reinstated discrete is predicted by syntax and non-reinstated contingent is predicted by age. Narrative cohesion is predicted by semantics.

Summary: These analyses suggest that the main determinant of recall, when there are reminders during the interval, is receptive language. There are, however, differences between conditions, which indicate that different interventions are affected by different language abilities. Thus, for children who did not receive a reminder, those in the control group, better expressive language yielded higher recall scores. This is true for all variables except the non-reinstated ones. Thus, a priori, there may have been a difference between the non-reinstated variables and the reinstated variables. For some reason, the non-reinstated discrete items, for the control group, are most significantly influenced by receptive language, $p < .05$ while the non-reinstated contingent items are not significantly influenced by any particular covariate.

Some recall for the reinstatement group is significantly affected by receptive language, but for certain variables, there appears to be something unaccounted for that is affecting performance.

Recall for the reenactment group is, for the most part, significantly affected by receptive language, indicating that for reenactment to be influential, a child must have sufficient receptive language ability.

V. Is there a reminder difference when controlling for language competence?

The stepwise regression analyses indicated that receptive language is the main carrier for a language effect so receptive language was entered into the model as a covariate. The adjusted LSMs are shown in Appendix C (p. 108).

When receptive language was added to the model as a covariate, and a MANCOVA was performed on the composite discrete (TotD) and contingent (TotC)

scores, there was no significance for either age, condition or condition by age interaction (Table 11, p. 65). However, even after using the Bonferroni adjustment, both ANCOVAs were highly significant. For TotD, $\underline{F}(6, 62) = 4.62$, $\underline{p} < .001$ and for TotC, $\underline{F}(6, 62) = 4.02$, $\underline{p} < .01$. As can be seen from Table 12 (p. 66), the explained variance is much greater for this set of analyses than for the corresponding ANOVAs performed without receptive language as a covariate. The main effect, however, is not for condition or for a condition by age interaction but rather only for receptive language. None of the least squares means $\underline{t}$-tests are significant (Table 13, p. 67).

When receptive language was added to the model as a covariate, and a MANCOVA was run on the non-reinstated discrete (NRD) and contingent (NRC) measures, the results did not reach the alpha level of .05 (Table 11, p. 65). Moreover, the ANCOVAs did not reach significance of .025 as required with the Bonferroni adjustment.

When receptive language was added to the model as a covariate, the MANCOVA for reinstated discrete and contingent scores was not significant for condition, age and the interaction of condition and age (Table 11, p. 65). However, the ANCOVAs for reinstated discrete and reinstated contingent were highly significant (Table 12, p. 66) at or beyond the .025 level of significance as required by the Bonferroni adjustment. For reinstated discrete (RD) items, $\underline{F}(6, 62)=5.10$, $\underline{p}=.0003$, with a main effect of receptive language, $\underline{p}=.0008$ and even for condition, $\underline{p} < .04$. Thus, after the means are adjusted, there is a condition difference for RD items, only. There was no interaction effect. For reinstated contingent (RC) items, $\underline{F}(6, 62)=4.87$, $\underline{p} < .0004$, with a main effect for receptive language, $\underline{p}=.0001$. There was no interaction effect.

To further explore the only statistically significant condition difference in all these analyses, that for reinstated discrete items (RD), the Least Squares Means ts were examined. They showed that the condition difference evident for RD items is primarily between the young verbal reinstatement and young control groups, with the reinstatement group recalling more than the control group, LSM t=2.6, p < .01 (Table 13, p. 67). However, there is also a trend for a difference between the young verbal reinstatement and young reenactment groups, p < .07. A difference between younger and older children in the reenactment group also yielded a difference short of significance, p < .07.

Summary of MANCOVAs-ANCOVAs: Thus, when receptive language is accounted for, there is some evidence that the mode of reminding makes a difference. This is particularly true for the reinstated discrete items in which the young verbal reminder group performed significantly better than the young control group.

Table 11

Table comparing MANOVAs-MANCOVAs

		TotD[6]-TotC	NRD-NRC	RD-RC
Condition x Age	df	F	F	F
Condition	4, 126	.89	.42	1.41
Age	2, 62	2.90^	2.33	**5.06****
Condition x Age	4, 126	.79	1.21	1.41
Condition x Age: Receptive Language				
Condition	4, 124	1.28	.57	1.73
Age	2, 61	1.16	2.02	1.77
Condition x Age	4, 124	1.10	1.14	1.55

^ = $p < .06$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent.

[6] Subtracting commissions from TotD did not significantly change the results reported here.

Table 12

Table comparing ANOVAs-ANCOVAs[7]

	Condition x Age			Condition x Age: Receptive Lang.		
	F (5, 63)	r^2	Main Effect	F (6, 62)	r^2	Main Effect
Composite Recall Measures						
TotD	1.33	.10	age < .056	**4.62*** **	.31	recep < .0001
TotC	.97	.07		**4.02** **	.28	recep < .0001
Non-reinstated Recall Measures						
NRD	.34	.03		2.19^	.17	recep < .001
NRC	.58	.04		1.83	.15	recep < .007 age < .07
Reinstated Recall Measures						
RD	**3.06***	.20	age < .003	**5.10*** **	.33	recep < .0008 conditn < .04
RC	1.90	.13	age < .02	**4.87*** **	.32	recep < .0001

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent.

[7] Using the Bonferroni Adjustment, only those F values less than .025 may be considered significant. ^ = < .035, * = p < .025, ** = p < .01, *** = p < .001. Also, only significant or marginally significant main effects are reported here.

Table 13

Least Squares Means t-tests Between and Within Conditions[8]

	Condition x Age		Condition x Age: Receptive Language	
	Between Conditions	Within Conditions	Between Conditions	Within Conditions
Composite Recall Measures				
TotD			Yng C & RI < .09	
			Yng RI & RE < .08	
TotC			Old C & RE < .09	
Non-reinstated Recall Measures				
NRD				
NRC				
Reinstated Recall Measures				
RD	Yng C & RI < .09	**RE < .008****	**Yng C & RI < .01****	RE < .07
	Old C & RE < .09	C < .08	Yng RI & RE < .07	
			Old C & RE < .09	
RC			Old C & RE < .06^	

^ = p < .06, * = p < .05, ** = p < .01, *** = p < .001.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent; Yng = young; C = control group; RI = verbal reinstatement group; RE = reenactment group.

[8] The ts are not included in this table for those Fs which were found to be non-significant. This includes the non-reinstated measures.

VI. How does grouping the recall scores by language score as opposed to age, affect differences in recall between groups?

If receptive language is the main determinant of performance, regrouping by receptive language (high receptive language scorers and low receptive language scorers) might reveal differential effects of conditions. Thus, children's recall scores were regrouped by receptive language score, irrelevant of age, and reanalyzed. The findings, however, are very similar to those found for the original condition by age grouping. This probably occurred because the variance in receptive language scores was lost when split at the median and made into a binary variable. The means and analyses are reported in Appendix D (p. 110).

VII. Measure of cohesion: Are they related and are there condition differences?

Two measures of cohesion of recall were analyzed. One measure, the contingency scores, takes into account accuracy and specific connections between the actions and objects whereas the other, narrative cohesion, is a measure of "does the story sound good?", are there connectives, sentences, fewer probes, etc. The first question is whether these two measures are related to each other.

The means for the contingency measures have already been presented (Table 5b, p. 46). The mean scores for narrative cohesion are presented in Table 14 (p. 69).

Table 14

Narrative Least Squares Means by Condition

Parentheses indicate least squares means standard errors.

	Control	Verbal Reinstatement	Reenactment
Nar	1.65	1.77	1.67
	(.75)	(.75)	(.66)

Narrative Cohesion Score Least Squares Means: Condition x Age

		Control	Verbal Reinstatement	Reenactment
Nar	Young	1.54	1.45	1.64
		(.20)	(.21)	(.21)
	Old	1.77	2.09	1.70
		(.20)	(.21)	(.22)

Narrative Cohesion Score Least Square Means: Condition x Age with Receptive Language as a Covariate

		Control	Verbal Reinstatement	Reenactment
Nar	Young	1.62	1.76	1.74
		(.18)	(.21)	(.20)
	Old	1.62	1.94	1.50
		(.19)	(.20)	(.21)

Narrative cohesion is related to the reinstated contingent (RC) measure for all groups, but to the composite contingent (TotC) measure only for the control and reenactment groups. Narrative cohesion is not at all related to the non-reinstated contingent (NRC) measures (see Table 15, p. 70).

However, cohesion is also related to the discrete recall measures. Narrative cohesion relates to the composite discrete (TotD) measure for all groups, the reinstated discrete (RD) measure for the control and reenactment groups and the non-reinstated discrete (NRD) measure for only the reenactment group (see Table 15, p. 70).

More interestingly, cohesion related most strongly to the recall measures for the reenactment group, next for the control group and least for the verbal reinstatement group (see Table 15, p. 70).

Table 15

Correlations for Narrative Cohesion with contingent measures by condition.

	Control			Verbal Reinstatement			Reenactment		
	NRC	RC	TotC	NRC	RC	TotC	NRC	RC	TotC
Nar	.21	**.48****	**.43***	.26	**.45***	.39	.41	**.61****	**.61****

Correlations for Narrative Cohesion with discrete measures by condition.

	NRD	RD	TotD	NRD	RD	TotD	NRD	RD	TotD
Nar	.33	**.47****	**.48****	.32	.37	**.42***	**.46***	**.59****	**.62****

* = $p < .05$, ** = $p < .01$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent.

When grouped by condition and age, it becomes evident that the contingency and narrative cohesion measures are related to each other only for the younger children (Table 16a, p. 71). However, this relationship is strongest for the reenactment group, then the control group and then the verbal reinstatement group.

Nevertheless, since the discrete recall is also related to narrative cohesion the narrative relationship with contingent scores is probably not a special phenomenon shared between two types of "cohesion" scores.

Though it may seem as though there ought to be an age difference, the age by condition ANOVA is non-significant as is the ANCOVA controlling for receptive language. Apparently, though, the high correlation for younger preschoolers indicates that for them narrative cohesion is related to amount recalled.

Table 16a

Correlations for Narrative Cohesion with contingent measures: Condition by age.

	Control			Verbal Reinstatement			Reenactment		
	NRC	RC	TotC	NRC	RC	TotC	NRC	RC	TotC
Nar									
Yng	.33	**.71****	**.60***	.41	**.62***	.55	**.66***	**.83****	**.89*****
Old	.17	.26	.30	.42	.24	.37	.13	.34	.29

* = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Note. NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent.

Table 16b

Correlations for Narrative Cohesion with discrete measures: Condition by age.

	Control			Verbal Reinstatement			Reenactment		
	NRD	RD	TotD	NRD	RD	TotD	NRD	RD	TotD
Nar									
Yng	.46	**.68****	**.63***	.26	.47	.42	.45	**.85*****	.77**
Old	.27	.23	.33	.44	.19	.40	.56	.31	.58

* = p < .05, ** = p < .01, *** = p < .001.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete.

Given the importance of language in answering interview questions and forming a narrative, one might expect narrative cohesion to be related to language measures. Correlations comparing narrative cohesion with the language measures (Table 17) show that syntax as measured by the TELD-2 is related to narrative cohesion for both the control group and the reenactment group but not for the reinstatement group.

Table 17

Correlations for narrative cohesion by language measures.

	Control	Verbal Reinstatement	Reenactment
		Narrative	
Receptive	.24	.61**	.59**
Expressive	.39*	.58**	.41
Syntax	.43*	.36	.51*
Semantics	.28	.59**	.58**

*= p < .05, ** = p < .01, *** = p < .001

Across conditions, for younger children, narrative cohesion is related to all the language test scores, as well as to total recall on both discrete and contingent items. For older children, narrative cohesion is not related to any language test scores or to total recall of contingent items. It is only marginally related to total recall of discrete items.

The stepwise regression analyses on narrative with age, condition, expressive language and receptive language (Tables 10a-c, pgs. 55-57) show that for the control group, expressive language is predictive of narrative cohesion, accounting for 15% of the variance, whereas for both reminder groups, RI and RE, receptive language was most predictive of cohesion accounting for 38% and 34% of the variance, respectively.

Stepwise regressions with age, condition, syntax, and semantics showed syntax to be predictive of narrative for the control group, accounting for 19% of the variance. For the reminder groups, semantics carried the load, accounting for 35% of the variance for RI and 34% variance for RE.

So, for the control group, expressive and syntax are about equally predictive and for the reinstatement groups, receptive and semantics are about equally predictive of narrative cohesion.

An ANOVA run for condition by age yielded no significance for narrative but the ANCOVA for condition by age with receptive language as a covariate, yielded $\underline{F}(6, 62) = 3.29$, $\underline{p} < .007$, with a main effect for receptive language at $\underline{p} < .0006$. An ANOVA run for condition by receptive language did not yield significance, $\underline{F}(6, 62) = 1.23$, $\underline{p} < .30$, with a main effect for the receptive language difference at $\underline{p} < .03$, probably because the receptive language scores lost their strength when made into a binary variable, low or high.

VIII. Recall of the goal.

To assess whether there is a difference by condition in recall of the hierarchical structure of the game, a preliminary analysis of who recalled the goal of the game was performed. In this analysis, older children recalled more. Moreover, the reenactment group recalled the goal better than the verbal reinstatement group, which recalled the goal better than the control group.

Table 18

Proportion of preschoolers who recalled the goal: Condition by age.

	Control	Verbal Reinstatement	Reenactment
Young	2/13	2/11	4/11
Old	7/13	8/11	7/10

A chi-square by condition demonstrated no condition differences for either younger or older children. Thus, who remembered the goal depends upon some other factor.

Recall of the goal is not related to any of the other recall measures but is related to language measures for the control and reenactment groups (Table 19, p. 75).

Table 19

Correlations between language measures and goal recall by condition.

	Goal		
	Control	Verbal Reinstatement	Reenactment
Narrative	.61***	.30	.38
Receptive	.26	.29	.47*
Expressive	.48**	.30	.42*
Syntax	.44**	.14	.47*
Semantics	.32	.30	.48*

IX. Intrusions

The verbal reinstatement group had the most commissions (errors) and told the most stories (non-relevant intrusions either prior to or after the actual recall session) whereas the control group had the most tangents (non-relevant intrusions during recall).

Though the verbal reinstatement group produced the most commissions and unrelated stories, none of these intrusions seem to be related to recall. The type of intrusion that most impacted on recall is tangents. For both the control and the reenactment groups, the more tangents a child produced the less discrete (Table 21a, p. 76) and contingent (Table 21b, p. 77) recall was given.

However, the impact of these intrusions was non-significant. When commissions and tangents were subtracted from TotD scores, the regression analyses were the same as when the intrusions were not accounted for.

Table 20

Mean Intrusion Errors at Recall: Condition

	Control	Verbal Reinstatement	Reenactment
Commis	1.69 (2.02)	3.00 (3.37)	1.43 (2.44)
Tangent	.96 (1.78)	.73 (1.39)	.76 (2.41)
Stories	.42 (.64)	1.05 (1.29)	.76 (.89)

Note. Commis = commissions.

Table 21a

Correlations for Intrusion Errors and Accuracy on Discrete Recall: Condition

	Control			Verbal Reinstatement			Reenactment		
	NRD	RD	TotD	NRD	RD	TotD	NRD	RD	TotD
Commis									
	-.40*	-.14	-.36	.18	.07	.17	-.04	-.35	-.22
Tangent									
	-.36	**-.40***	**-.46***	.09	-.17	.001	.09	**-.43***	-.18
Stories									
	-.38^	-.0003	-.27	.18	.21	.24	.08	-.12	-.01

* = $p < .05$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; Commis = commissions.

Table 21b

Correlations for Intrusion Errors and Accuracy on Contingent Recall: Condition

	Control			Verbal Reinstatement			Reenactment		
	NRC	RC	TotC	NRC	RC	TotC	NRC	RC	TotC
Commis									
	-.32	-.27	-.36	.16	-.02	.09	-.03	-.39	-.29
Tangent									
	-.26	**-.44***	**-.43***	-.04	-.04	-.04	-.11	**-.44***	-.36
Stories									
	-.43`	-.0003	-.26	.22	.21	.24	-.13	-.08	-.11

` = $p < .06$, * = $p < .05$.

Note. NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent; Commis = commissions.

To conclude, a condition difference was found between the young control and verbal reinstatement groups for reinstated discrete items. On most measures, however, the verbal reinstatement group and the reenactment group recalled the same amount and neither was significantly superior to the control group. Across conditions, there was an age difference but when analyzed by condition, age was only significant for the reenactment group. Language skill, especially receptive language, accounted for most of the variance in recall for the verbal reinstatement and reenactment groups while expressive language was more important for the control group. The next section will consider these findings and their implications.

Chapter 4. Discussion

The goal of the present study was to examine the issue of reminders and how reminders in different modalities affect a memory representation in preschoolers, specifically when probed via verbal recall. The researcher played a treasure hunt game with each child and then, midway through a 6-week-delay interval, presented children with either verbal reminders or the opportunity for contextual reenactment. Both the verbal and reenactment reminders targeted the same aspects/features of the game.

This discussion addresses the research questions first by summarizing the findings from the results section. The format is similar to that of the results section beginning with the reactivation issue and then discussing developmental differences by age, the regression analyses findings pointing to receptive language as the most predictive factor for recall, differences by age with receptive language accounted for and differences by receptive language score. The findings are then elaborated on and discussed with an attempt to explain the interaction between different forms of reminders and their impact on verbal recall.

I. The reactivation issue.

Is there evidence for reactivation for both contextual reenactment and verbal reinstatement?

The first question posed was whether a partial reminder could reactivate an entire memory. Based on the current literature it was expected that non-verbal reminders during a delay would reactivate the entire memory representation for both younger and less language proficient children as well as older and more language proficient children. Moreover, it was expected that children with better language would encode the verbal

reminders effectively and therefore recall more than children with less language proficiency.

The scores were first analyzed by condition and age differences. Based on the fact that the control group as well as the reminder groups recalled the reinstated items better than the non-reinstated items, there is a question of whether the enabling relations were stronger and more salient for the reinstated items, a priori. This is possible given that only the end of the game was reinstated and the end might be less arbitrary and more memorable because it included the climax. It is also evident that the reminder groups did not benefit from reactivation by the fact that the MANOVAs and ANOVAs on non-reinstated items yielded no significance, indicating that there was no difference between the groups.

It is possible that there was no reactivation due to the time delay between the reinstatement session and the recall session. In infant and toddler research, the standard optimal delay between reminder and recall is about 24 - 72 hours for younger infants and 1 - 4 hours for older infants (Rovee-Collier and Shyi, 1992, cited in Priestly, Roberts and Pipe, 1999). This ensures that recall is not so soon after the reminder that reactivation has not yet taken place and not so far removed that reactivated memory has been once again forgotten. Apparently, reactivation takes longer for younger infants than for toddlers.

The time-delay for children beyond their toddler years has not yet been established. Some researchers studying preschoolers (e.g., Albert and Ornstein, 1994) use the same delays as those used in the present study, a three-week-delay between reminder and recall. Others like Pipe and her colleagues (Priestly, Roberts and Pipe,

1999) use delays of 24 hours, but have found that as children grow older they may actually need less time for the memory to reactivate. In fact, for 5- to 7-year-olds, presenting the context reminder during the verbal recall session is as effective in reactivating a memory as is a 24-hour-delay. The results in this study suggest that forgetting over the subsequent delay after reminder diminished any possible effects of reactivation.

It should be noted that Priestly, Roberts and Pipe used a context reminder (the room and props), not a verbal reminder, whereas Albert and Ornstein used verbal reminders of the entire event and video reminders with some false information. Both the video and verbal reminders were found to facilitate later recall, although the video reminder did cause the 5-year olds and not the 3-year-olds to add false information. More important, though, by Rovee-Collier's (1997) definition of reactivation, only a partial reminder presented at the end of a retention interval, which allows for later full recall, can be considered to reactivate a memory. Full reinstatement as was done by Albert and Ornstein (1994) and Walkenfeld and Nelson (1995), does not test reactivation since there was nothing further to reactivate. Every aspect of the event was reminded.

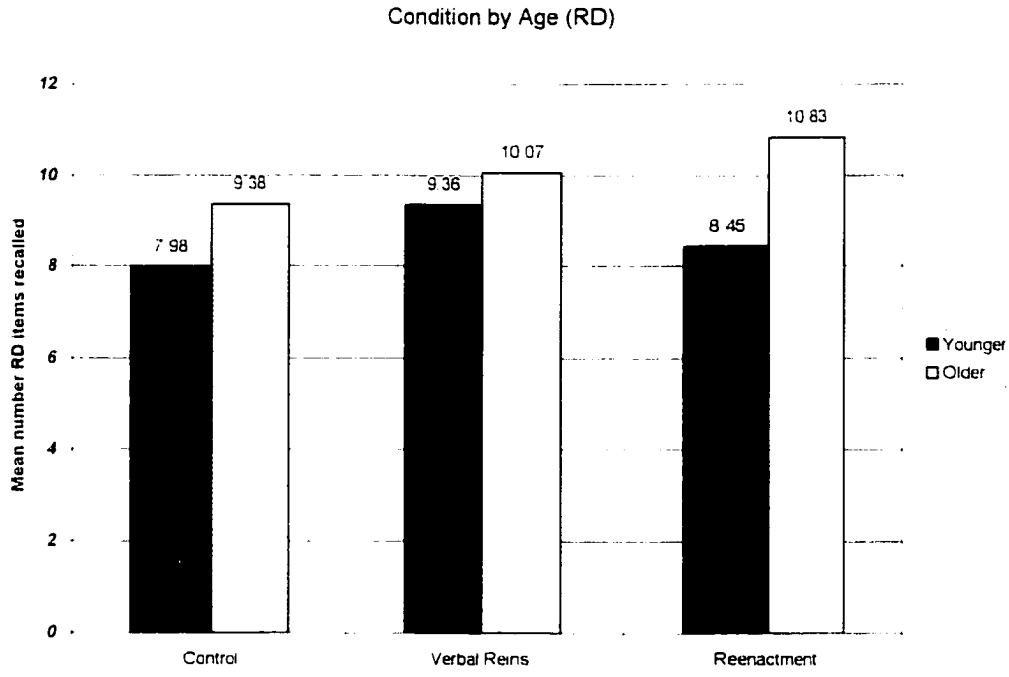
Given the findings by Priestly, Roberts and Pipe (1999), and the findings of no reactivation in the present study, the next step in research should be to test whether partial verbal reminders are more effective at reactivation within a 24-hour-delay for preschoolers.

II. Is there a developmental difference between reenactment and verbal reinstatement by age?

What is a more effective mode of reminding, verbal or reenactment? Based on the initial results, reminding in either mode seemed to make little or no difference. When grouped by condition and age and analyzed for differences in condition, age and the interaction between condition and age, only age made a difference.

It is intriguing though that the age difference shows up primarily for the reenactment group. Older children who reenacted part of the event recalled significantly more than their younger counterparts (see Figure 1, pg. 82, $p < .008$). Why is this so? What about reenactment produces an age difference, whereas for verbal reinstatement and control there is no significant age difference? This is particularly intriguing given that even infants and toddlers have demonstrated benefits of reenactment on recall. Therefore, we expected less of a developmental difference for the reenactment group. Moreover, given Nelson's theory it was predicted that there would be an age difference for the verbal reinstatement group, specifically that older children who are more language-competent would show a developmental difference when compared with younger children who are less language-competent. Both reenactment groups were hypothesized to perform similarly whereas the verbal reinstatement groups were hypothesized to show a difference. In fact, the opposite of what was expected was found (see Figure 1, pg. 82).

Figure 1. Mean reinstated discrete (RD) items recalled by condition and age groups. The difference in recall between young and old children in the reenactment group is significant at $p < .008$. For more detailed comparisons see either Table 13 (p. 67) or Table D7 (p. 117).



III. Although there are no condition differences by age, recall that according to Nelson's theory of verbal reinstatement, developmental differences would be accounted for by differences in language sophistication. In order to comprehend the verbal reminder, it is presumed that one must comprehend language. But what aspect of language is most predictive and most useful for recall with reminders?

Stepwise regression analyses run on the entire group of participants indicate that verbal recall is not significantly predicted by age in most instances. It is, rather, predicted

by language scores (Tables 9a and 9b, pgs. 53-54). Moreover, it is the receptive language and semantic portions of the TELD-2 that proved most predictive of recall, particularly for the reminder groups (Tables 10a-10f, pgs. 55-60). Expressive language, though for the most part not predictive of recall, did emerge as the most predictive factor of recall for the control group. Nevertheless, because expressive language was, in general, not predictive of recall, most of the analyses were performed controlling only for receptive language and not expressive language. Semantics and syntax, though interesting and meaningful were not of primary concern in these analyses. Therefore, they were not included in the MANOVAs and ANOVAs.

IV. The effects of receptive language on analyses for condition by age.

When receptive language was controlled for as a covariate, it emerged as either the only or the strongest significant factor in the age by condition comparisons (Table 12, p. 66).

MANCOVAs were not significant and individual ANCOVAs were only significant for partialling out receptive language. The only condition difference found was for reinstated discrete (RD) items (Table 12, pg. 66), and this was primarily between the young verbal reinstatement and the young control groups, with the young verbal reinstatement group recalling significantly more (Table 13, pg. 67).

Why does adjusting the means for receptive language strengthen the condition difference between the young verbal reinstatement and young control group (and the young verbal reinstatement with the young reenactment group at marginal significance)

and weaken the difference between the young and old reenactment groups? Moreover, why is the condition difference evident for RD and not for RC?

The above findings seem to indicate that the verbal reminder condition really does have a facilitative effect on recall for the younger group which is obscured by group differences in receptive language (see pgs. 40-41 for no a priori biases on receptive language between groups).

These differences are evident for discrete and not for contingent items perhaps because the young children do not yet include contingencies in remembering or reporting a story and do not encode these meaningfully.

V The effects of receptive language as a developmental factor.

Is there a developmental difference between groups based upon receptive language? Do children benefit more from verbal reinstatement if they have a higher "language age" as assessed by a standardized language test?

In general, grouping the children by language score yielded similar results as when grouping children by chronological age. However, since the regression analyses point to language score as the predictive factor and not age, it is worth repeating the differences in recall discussed within the context of language as the developmental, predictive, factor.

Overall, regardless of chronological age and condition, children recall better if they have a higher receptive language score. It was hypothesized that the higher language scoring children would benefit more from verbal reminders and the lower language scoring children would. Verbal reinstatement was expected to make a

difference only when children are at the point at which they realize language is a mode of communication and representation of (a possible) reality. In fact, those children in the verbal reminder group who scored lower on receptive language recalled about as much information as did the higher receptive language scorers who received verbal reminders (see Figure 2, p. 86).

Conversely, higher receptive language scorers benefited from reenactment while lower receptive language scorers did not for both reinstated discrete (see Figure 2, $p < .01$) and reinstated contingent items (see Figure 3, $p < .008$). The reenactment difference may be attributable to the fact that recall was verbal and the representation needed to be recoded or "translated" in order to be reported at recall.

Figure 2. Mean reinstated discrete (RD) items recalled by condition and receptive language score. The difference in recall between the low and high scoring children in the reenactment group is $p < .01$. The difference between the low scoring children in the verbal reinstatement and control groups is $p < .07$. The difference between the high scoring children in reenactment and control groups is $p < .07$. For more detailed comparisons see Table D7 (p. 117).

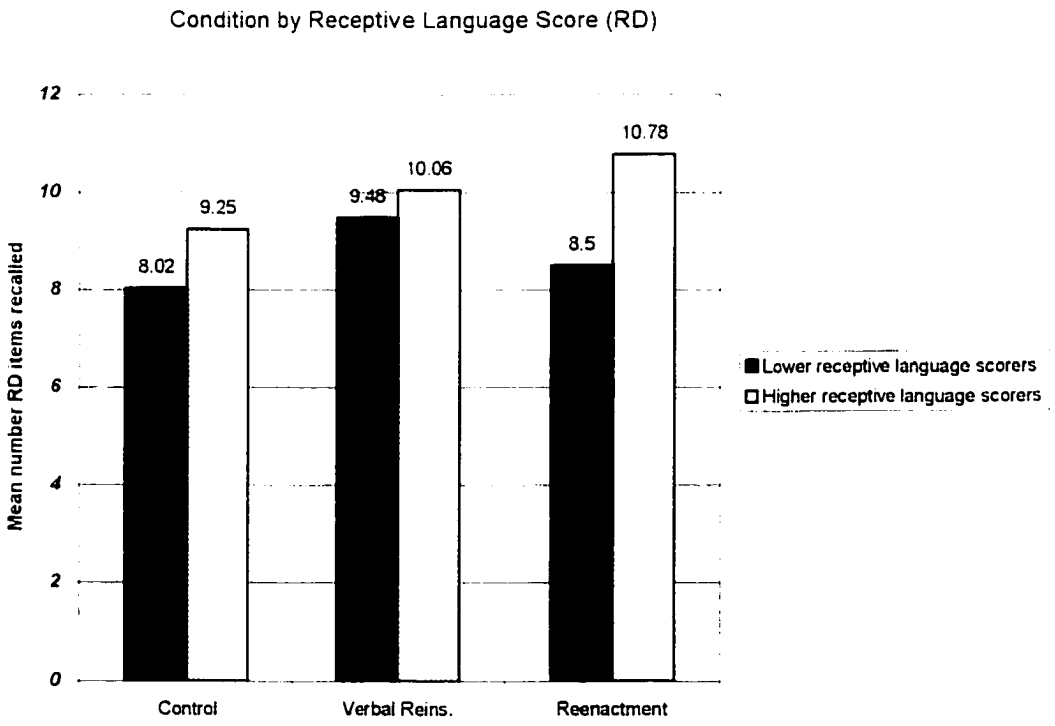
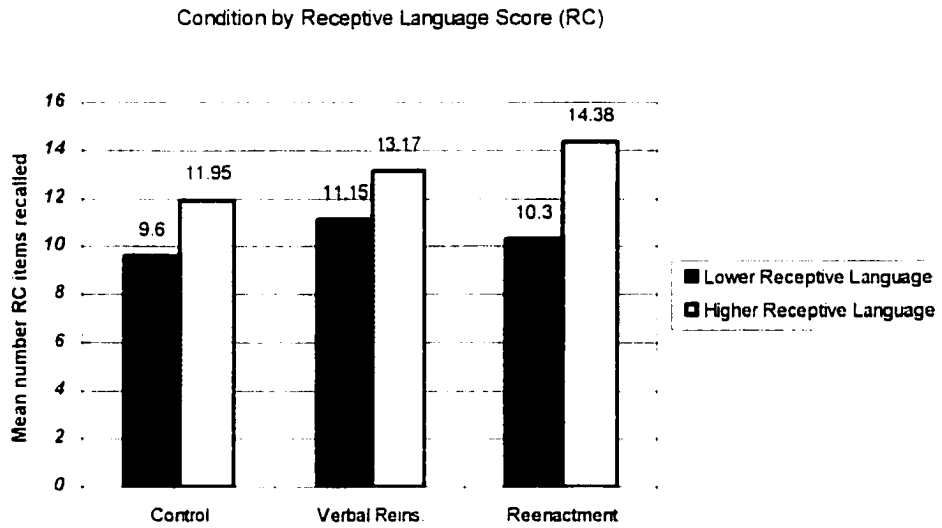


Figure 3. Mean reinstated contingent (RC) items recalled by condition and receptive language score. The difference in recall between the low and high scoring children in the reenactment group is $p < .008$. For more detailed comparisons see Table D7 (p. 117).



The hypothesized age at which one should have trouble encoding another's words as representations is 3-years-old to low 4-years-old. In this study, when grouped by age, the median age was in fact older than that, at 4 years and 5 months while the mean age was 4 years and 4 months. The mean age per group is 3 years and 11 months for the younger group and 4 years and 10 months for the older group.

The TELD-2 does not have equivalency ages for the receptive and expressive or semantic and syntax language breakdowns. The tables only convert full raw scores. Therefore, since the test is constructed of about an equal number of receptive and expressive questions (35), to obtain equivalency ages, the receptive raw scores were

doubled. They were then converted to TELD-2 language ages using Table E in the manual.

The mean language age for the low group is 4 years and 3 months while the mean language age for the high group is 5 years and 10 months. The overall mean language age is 5 years and 5 months, which is older than the chronological age of any of the children in the sample. In fact, all the "language ages" are proportionately higher than their corresponding chronological ages and they also have large ranges. Based on the great variability of chronological age when equated with a particular language age, and based on the fact that language age is more indicative of recall, it might be more appropriate for researchers to discuss their developmental theories in reference to language ages rather than chronological ages. This is particularly true when trying to make a case for the development and impact of abilities and there is a clear ability index but a very variable age index.

It is possible that the high language scores here reflect a sample that is above average on verbal skills. Thus, even the "low" group would not be at a level where they would have difficulty utilizing verbal input. This would account for the fact that the projected age by condition interaction was not found therefore.

VI. Are recall of contingencies and narrative cohesion related to each other and are they affected by condition? How?

None of the condition by age ANOVAs and ANCOVAs on contingent scores yielded significant condition differences (Table 12, p. 66). Thus, neither reenactment nor verbal reminders facilitated the recall of contingencies.

An ANOVA on narrative cohesion for condition by age did not yield significance. However, an ANCOVA for condition by age, controlling for receptive language, did yield significance - for receptive language. (The ANOVA for condition by receptive language was also not significant (Appendix D, p. 110).) Thus, there were no significant condition differences for narrative cohesion.

Nevertheless, the ability to tell a more cohesive narrative related most to the recall measures for the reenactment group, then for the control group and least for the verbal reinstatement group (Table 15, p. 70).

On regression analyses, narrative cohesion is predicted by expressive language and syntactic knowledge for the control group but receptive language and semantics for both reminder groups (Tables 10a-f, p. 55-60).

VII. Exploring the hows and whys of receptive and expressive language and their differential impact on recall.

In this section I will attempt to make sense of the aforementioned findings and to place them within a theoretical context. In regression analyses performed across conditions, with the variables age, condition, expressive and receptive language, the only case where condition had an even marginal effect is for reinstated discrete items and that was still not nearly as strong as the effect of receptive language (Table 9a, p. 53). Based on the condition stepwise analyses in Tables 10a-f, a simplified table was constructed for illustrative purposes (Table 22, p. 91).

Table 22 (p. 91) suggests that non-reinstated (NRD and NRC) and reinstated (RD and RC) items require different processes regardless of whether they are for discrete or

contingent recall (see Table 22, p. 91), particularly for the control and reenactment groups.

For a child who does not receive reminders, expressive language and semantics are most predictive of recall, particularly for the latter half of the game which we presume is more salient (RD and RC). However, for the beginning of the game which we presume has less salient enabling relations (the non-reinstated items), receptive language is most predictive. Expressive language and syntax scores predict narrative cohesion for a child who does not receive reminders.

For a child who receives verbal reminders, items that are more salient because of enabling relations as well as because they were reinstated (RD and RC), require receptive language and neither syntax nor semantics impact upon this recall. For non-reminded discrete (NRD) items or facts, no single aspect of language, or age, is predictive of recall but for non-reminded contingencies or connections (NRC), receptive language is predictive and semantics is marginally predictive (Table 22, p. 91). Narrative cohesion depends upon receptive language and semantic knowledge.

For a child who reenacts part of an event, recall is highly dependent upon semantics and receptive language for more salient and reminded items (RD and RC), and age and syntax for non-reminded discrete (NRD) and only age for non-reminded contingent (NRC) (see Table 22, p. 91 or Tables 10c and 10f, pgs. 57 and 60). Receptive language and semantic knowledge best predict narrative cohesion.

The reenactment group is the only group for which age predicted recall of non-reinstated items. It would be informative to parse out what cognitive ability age is tapping into that the language measures are not for these non-reminded items.

Table 22

Profiles based on stepwise regressions for both receptive-expressive and semantics-syntax scores, each with condition and age included:

		Predictive variables	
Condition:	Control	Verbal Reinstatement	Reenactment
NRD	Receptive / Semantics	--- / ---	Age / Syntax
NRC	--- / ---	Receptive / Semantics^	Age / Age
RD	Expressive / Semantics	Receptive^ / ---	Receptive / Semantics
RC	Expressive / Semantics	Receptive / ---	Receptive / Semantics
TotD	Expressive / Semantics	Receptive, Age / Semantics^	Receptive / Semantics
TotC	Expressive / Semantics	--- / ---	Receptive / Semantics
Nar	Expressive / Syntax	Receptive / Semantics	Receptive / Semantics

--- = no significant factor; ^ = marginally significant at $p < .06$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent; NAR = narrative score.

What differentiates the groups to produce these differing patterns? Why is expressive language more predictive for the control group, why is receptive language

more predictive for the reenactment group and why is receptive language moderately, albeit significantly, predictive for the verbal reinstatement group?

Limitations of the study

It is important to recognize that the findings in this study are limited due to the small sample size.

Because of the small sample size that the age groups were split at the median age, 4 years and 5 months, as opposed to an age that would be more appropriate according to the theoretical literature, closer to 4 years. If the groups had been split at younger than 4 years and 5 months there would have been less than ten children in some of the groups and statistical analyses would have been problematic.

Another limitation is the fact that children appeared to be too advanced in language to test the original hypothesis concerning whether children who are relatively unsophisticated language users would benefit from verbal reinstatement.

In addition, as mentioned above, the finding of no reactivation is possibly due to stronger enabling relations for the reinstated items than for the non-reinstated items. It may also be due to forgetting since the reminder was more than 24 hours prior to recall.

The relation of receptive and expressive language to memory

One of the functions of human memory is to encode and represent information in a form in which it can be understood by a particular person and subsequently be available to him or her in memory.

In order to acquire and comprehend information, a person must at some point translate that information into his or her own inner language. This intrasubjective language, or "inner speech" as Vygotsky would refer to it, may differ for different people. Some people are more inclined to represent or encode information verbally while others are more inclined to represent information pictorially (MacLeod, Hunt & Mathews, 1978). Where there is a perfect fit of the mode of representation and the mode of recall demanded by the recall situation, less processing is necessary than when there is an imperfect fit. Hence, if the information was verbally presented in the first place and the recall situation demands verbal expression, the encoding or representation matches. However, if the information was originally presented pictorially or schematically, the representational process requires an extra step, a translation process, to be encoded verbally (MacLeod, Hunt & Mathews, 1978; Kail, 1986). This ability to translate perceptual representations into verbal representations develops as children become more cognitively and linguistically sophisticated (Nelson, 1986, 1996; Pillemer, 1998). The capacity to verbally represent incoming information is, at least in part, what speech and language pathologists refer to as receptive language.

Research by information-processing theorists on the process of encoding has shown that given enough time, there is a tendency to represent (or encode) simple visual stimuli in verbal terms (Posner and Keele, 1967; Kail 1986). Moreover, when a visual stimulus has not been encoded in verbal terms upon its initial presentation, it later requires more time to negate or accept a verbal description of that visual stimulus (MacLeod, Hunt & Mathews, 1978).

This is similar to the transfer-appropriate processing proposed by Morris, Bransford and Franks (1977). They extend the theory that memory depends upon depth of processing and claim that it also depends upon how similar the conditions are in which the information was originally learned and then tested. By the same token, Rovee-Collier and her colleagues (Rovee-Collier and Hayne, 1987; Rovee-Collier, 1995) have found that recall via reinstatement and reactivation is affected by the similarity of a reminder-item to the original item-to-be-recalled. Thus, it makes sense that if asked at a reminder session to verbally express an event, verbal recall at a later time would be superior when compared with a group that was never required to verbally express this experience.

With regard to the present data, if the event experience is encoded as an action representation only, then the child will lack a separate verbal representation. Preschoolers who are more verbally proficient might spontaneously "translate" the initial representation into a verbal representation (e.g., Nelson, 1989). Nelson (1996) has pointed out that representing an event in verbal form enables it to be retained for a longer period. The children with more expressive language who did not receive reminders in this study may have been able to provide this verbal support for themselves. If there is no prior verbal representation of the event, then at recall the child must decode the action representation and transform it, or encode it, into words.

The preschooler who has the capacity to represent information verbally is more ready to take advantage of the mediation provided by the imagistic cues in reenactment and to represent it as inner speech. The reenactment speaks to him within the limits of his zone of proximal development. When later asked to verbally recall the information the child needs only to access the already verbally represented information.

In the present study, the child who is weaker in receptive language, cannot as easily verbally represent the reenactment. The ability to benefit from the imagistic cues provided by the reenactment operates at a level beyond his zone of proximal development (for verbal representation). Later, when the child is asked to verbally recall the information, he cannot just access it. The child needs, at that time, to try to represent the information verbally. This is very difficult for young children to do so long after the occurrence of the initial event and without the benefit of interim review and reorganization. The earlier reenactment thus failed to enhance the resultant expressed memory.

Let us review the process for the reminder groups. The event information was initially represented in memory either in the form of images or words, depending on the receptive language proficiency of the child. The information was later further reorganized at the reminder session. In both reminder conditions the former representation had to be retrieved from a latent memory state into conscious awareness. In reenactment, the child redid part of the game in context. This mediation forced the child to reorganize the previous information. It did not, however, provide the child with any verbal mediation. In reinstatement, the researcher provided the verbal mediation necessary for the child to put the items-to-be-reinstated into words.

In reenactment, those children who were better able to form verbal representations, as reflected by their receptive language scores, were better able to recall the event.

In reinstatement, less encoding processing was necessary to form verbal representations of the event because children had received extensive verbal mediation

during the reminder session. As the results indicate, for the reinstatement condition, both the low and high receptive language groups performed similarly (see Figures 2 & 3 for performance on RD & RC items). Therefore, the data suggest that the child's individual ability to form verbal representations appears to matter less when verbal mediation is provided prior to recall.

The present study is similar to Jukes's (1997) reinstatement study in that he also reminded preschoolers of part of an event and then tested full recall after a delay. Moreover, he compared the amount recalled with language scores. In both studies, whatever was discussed during the interval was recalled better. Moreover, in both studies the second half of the experience was generally recalled better than the first half. Jukes's finding that probed questioning showed no developmental difference is similar to the present finding of no group differences because in the present study all recall was probed. Since the recall scores in the present study include free recall and probed recall, perhaps the fact that there are few group differences can be understood in the context of Jukes's finding. Moreover, in Jukes's study, all language levels and all ages benefited from discussion when asked specific questions about the video. This is similar to the present finding that the reinstatement group showed no developmental difference in recall.

Practical considerations

The most important effect observed in the present study is the effect of receptive language on children's recall performance. The fact that verbal reminders can increase the recall report of younger children, particularly those with low receptive language, has practical applications both for educating children with low receptive scores and for cases

of preschooler's testimony. One can only speculate at the difficulty which pre-schoolers who have not verbally represented events upon their occurrence might have when they need to describe these events verbally at a later date.

With regard to education, it seems that educators might want to take into account the relationship found between receptive language and memory by structuring curricula in a way that takes advantage of this knowledge. Moreover, this research demonstrates that preschoolers who are less able to form verbal representations as measured by receptive language, can benefit from discussing important information in a coherent framework with a more knowledgeable person.

In addition, contrary to popular opinion, it is possible that reexperiencing abuse or being a repeated witness to an event would not necessarily make a young preschooler, particularly one with poor receptive language, produce a more cohesive or more accurate narrative. Rather, having talked about the event or even having heard about it, would make for a more cohesive narrative and a more accurate one, at least if no false information is offered.

Directions for Future Research

As a follow-up study it would be useful to have a recall session using physical reenactment as one measure of recall and comparing it with verbal recall. This could help to unravel the issue of whether 3-year-old children with high scores on receptive language would perform better on a reenactment recall or a verbal recall. Moreover, would children low on receptive language who reenact the event during the retention

interval, later recall more via another full reenactment than children low on receptive language who had reenactment during the retention interval and then a full verbal recall?

It is possible that just playing the game would force certain appropriate behaviors that seem like memories but are in fact forced by the situation. Therefore, a control group would be needed to first play the game at recall so that the researcher may look for differences in the amount of time it takes for a child to re-enact the game when compared to a child playing the game for the first time.

In addition, to better address the issue of reactivation it would be useful to present the reinstatement session after a retention interval that is longer than three weeks, and then to test recall within twenty-four hours after reinstatement.

Conclusions

This study did not show a reactivation difference between children who received reminders and children who did not. Receptive language was demonstrated to be very important for children who experienced reminders to be able to report what they recalled. This is particularly true for older children who re-experienced part of the event. Moreover, there were between-condition differences only when receptive language was accounted for. Contrary to what was expected, the younger children who received verbal reminders were able to benefit from the verbal reminders.

Appendix A-1

EVENT SCRIPT

or

HOW WE PLAY THE GAME

E: Hi. I'm _____. What's your name?

Today we're going to visit a make-believe zoo and we're going to play a treasure hunt game. Have you ever played a treasure hunt game before? No? Ok. Well, I'll explain how we play. First, do you know what a tape recorder is?

What does it do?

Well, it [also] listens to our voices and makes a copy of them so that if we want to, we can hear them again later. Do you want to see how it works? ok.

[turn on tape recorder]

Let's talk. What's your name?

How old are you?

[shut recorder, rewind, listen with child.]

Did you hear? It listened to what we said and kept it so we could hear it again. Was that fun? ok. So may I keep this on while we play so I can hear how we played the game later?

Well, here's how we play a treasure hunt game. First of all, when you play a treasure hunt game, you're looking for a prize. Ok? But where's the prize? Well, it's hidden in a special treasure box in a make-believe zoo that we're going to visit. The problem is that we don't know where the treasure box is, and even if we find it, it's locked. Do you have the key to the treasure box? I don't. Someone told me that one of the animals in the zoo has the key and that after we find the key, we can find the treasure box with the prize. Ok?

Now, how will we know which animals to go to help us find the prize? Should I tell you? Well, near each and every animal there's an envelope with a message and the message will tell us which animal to go to next to help us find the prize. Ok? Every animal has an envelope next to it, and in the envelope is a message, a hint, of where to go next to look for the prize.

The only thing is, those animals are very hungry and before they let us look inside the envelopes for the messages, they want you to feed them. Can you do that? Ok. Great!!

So, let's go look for that key in the zoo, so we can get the prize!

[Walk into experimental room.] Now, why don't you open this first envelope that's here on the table and let's see what the first message is.

ahhh, what's it a picture of?

C: a monkey.

E: a monkey, good. Ok. Let's put this picture back into the envelope so we don't lose it. [Put envelope back in place.] And do you see a monkey anywhere in this room? Look around. Maybe it has the prize. Great! You found it! Now let's feed the monkey so he'll let us look inside his envelope. [Allow child a little time to play with character and E may join in play.] Here's an envelope. What message does it have for us? Is it the key? [child opens envelope] Ah, what's it a picture of?

C: a tiger.

E: a tiger. Do you see a tiger in this room? It's someplace here. You've gotta find it. Maybe it has the prize.

C: I found it!

E: you found it! Well, let's see what it has for us. Oh, well, it doesn't have the prize but it is telling us to go visit a different animal. Which of her friends is she telling us to go to now?

C: camel

E: the camel. Hmmm. Do you see the camel?

[continue (elephant, giraffe) till animal 6 (bear)].

E: What does the bear have for us? Oh, wow! Yes! that's the key! And there's also a picture of where the treasure box is. Can you find the box?

[Child looks for box.]

E: that's great, [child's name]. You found the box. Now, let's see if you can open that with this key. [Child opens box and finds prize.] Wow! You got the box open and found the prize! What's the prize?

C: A _____

E: A party blower. You found a (color) party blower. Thanks a lot for visiting the zoo and playing the game with me. Bye.

Appendix A-2

Verbal Reinstatement Protocol

Name:_____ School:_____ Subject #:_____

Narrative Reinstatement: the researcher asks all the questions with neutral probes and encourages dialogue. Then ends with the Narrative statements and a recap of the unmentioned target items.

Help me retell the story of what we did the last time I came, when we visited the make-believe zoo. I'll say some and you'll say some. I'll start. The last time I came, we visited a make-believe zoo. Which animals did we see after the tiger?

The animals were in different places in the zoo. Where were these animals in the make-believe zoo?

We went from animal to animal. How did we know which animal to visit next? Each animal gave us an envelope with a picture of which animal to go to for the next hint/message.

Which animal did we go to after the [tiger? after the giraffe? after the elephant]?

We went to the zoo for a special reason. What was it? Why did we need to visit them in the zoo? We were looking for a treasure and we visited with different animals that tried to help us find it.

Do you remember what the last animal/elephant shows you? Did the last animal/elephant have a key? What was the key for? By the last animal we found the key to the treasure box and a picture of where to find the box.

And where was the box?

#5___	#6___	#7___
TIGER___	GIRAFFE___	ELEPHANT___
UNDER TABLE___	AGAINST TABLES WALL___	ON TABLE___
PIC OF GIRAFFE___	PIC OF ELEPHANT___	PIC T.B. LOC___
		& KEY___

#8___

TREASURE BOX___ ENVELOPES___

ON FLOOR/AGAINST POLE WITH BEAR___ PICTURES___

TREASURE___

NOTES:

Appendix A-3

Reenactment Protocol

Name:_____ School:_____ Subject #:_____

Physical reenactment: the child goes through the partial protocol on his/her own.

"Hi. Today we're going to visit our make-believe zoo again. But only some of the animals were able to come today. I want you to show me how you played the game in the zoo last time I was here." Enter room. Walk child to tiger, "Let's start here, with the tiger." Child should open envelope to go to giraffe (fifth animal)...till elephant (sixth animal) in sequence. In elephant's envelope there will be the key and picture of location of treasure box. However, when child opens the treasure box, there is no treasure. Then the researcher says, "Oh, no! There's no treasure today. Well, thanks for playing with me, anyway. Here I've got something else for you this time." Give child sticker.
Child's sequence of actions:
opens tiger's env.___ goes to giraffe___

opens giraffe's env.___ goes to elephant___

opens elephant's env.___ pulls out picture___ and key___

goes to t.b. loc.___ lifts bag___ sticks key into box___

opens box___

NOTES:

Appendix A-4

RECALL SESSION

E: Hi, what's your name again?

E: (repeat child's name). My name's _____. [reintroduce tape recorder and ask permission to use it.]

Today we're going to talk about the first time I played with you.

Could you please tell me about it?

Do you remember the game we played?

Can you tell me everything that you remember about the game, please? Please tell me everything.

What was the game about?

What were we trying to do?

Well, what did we call it?

Can you tell me what we did?

What were we trying to do?

How did we do it?

Do you remember there were animals?

Can you tell me which animals were here?

And what were we doing with the animals, why were they here, what were they helping us do?

Did the animals have anything next to them / was there anything near the animals? What? Why were they there?

Was anything else near the animals? What? Why?

When we first started, when we first came into the room, what's the very first thing we found? And which animal did we go to first?

How did we know to go to him/her first?

And where was it?

What did we feed it?

Where did it tell us to go?

To whom did we go next?

Where was it?

What did we feed it?

and then? where? and then? where? and then? where? anyone else?

So to whom did we go last?

And what did s/he have for us?

What else?

Did you find something?

What did you find?

Where? Who had it? and where did she have it?

Target items for recall:

"Zoo"

Animals

Envelopes (and their colors)

Pictures

Key

Treasure Box

Treasure / Prize / Whistle-Blower

Location

Sequence

Appendix B-1

Coding sheet for discrete items recalled

Goal = To find prize / key / box					
OBJECT (animal)		**INPUT (food/candy)**		**LOCATION (zoo)**	
1st Envelope		Bear Picture		Window sill near door	
Bear		Ice-Cream		On chair near coffee table	
Camel		Eggs		On sink counter	
Monkey		Pink Donut		In a cubby on a shelf	
Tiger		Spaghetti & Meatball Sauce		Under chair In cage	
Giraffe		French fries		Window sill near coffee table	
Elephant		Waffle		On table	
Treasure Box		Key/Lock		Floor under bear's chair	
				In Bag	
Prize		Picture of treasure box location			
Blower					
Envelopes		Fed because hungry			
Pictures					
Total #					
Total %					

Coding: Correct = 1.0; Incorrect = 0; If line divides cell, each item = .5

Appendix B-2

Coding sheet for contingent items recalled

For contingency items, if child knew bear was first but forgot how he knew, just mark one by 1st env. for info, not for object or anything else.

OBJECT		INPUT		LOCATION		ENV	PIC	INFORMATION (what did it tell us?/told us where to go)	
1st Env.				Window sill near door				Bear	
Bear		Ice-Cream		On chair near coffee table				Camel	
Camel		Eggs		On sink counter				Monkey	
Monkey		Pink Donut		In a cubby on shelf				Tiger	
Tiger		Spaghetti, Meat Sauce		Under chair, In cage				Giraffe	
Giraffe		French fries		Window sill near coffee table				Elephant	
Elephant		Waffle		On table				Pic. of Box Loc.	
								Key	
Treasure Box		Key		Floor under bear's chair				Prize / Blower	
				In bag					
Total #									
Total %									

Coding: Correct = 1.0; Incorrect = 0; If line divides cell, each item = .5

Appendix B-3

Criteria for coding narratives.

The criteria were constructed and used based on comparisons among children in the entire sample. Ratings ranged from 1-3, where 3 was the highest score and 1 was the lowest.

	1	2	3
Quality	Absence of narrative, off-task answers, incoherent structure.	there is a narrative structure but it is undeveloped. More than a list, with some grammatical errors, not yet a coherent narrative.	good presentation of content that allows for reader to understand what happened in the event. Full sentence with subject, verb and object. Use of subordinate and coordinate clauses.
Quantity	one or two word utterances or list type utterances, with no connectives.	presence of some connectives such as because, when, as, etc.	use of connectives.

Appendix C

Table C1

Least Squares Means Discrete Recall for Condition by Age with Receptive Language as a Covariate

Parentheses indicate standard deviations.

		Control	Verbal Reinstatement	Reenactment
NRD	Young	7.76 (.78)	8.34 (.91)	7.05 (.85)
	Old	6.25 (.79)	6.96 (.85)	7.32 (.91)
Total NRD		7.01 (.55)	7.65 (.60)	7.18 (.61)
RD	Young	8.20 (.51)	10.20* (.60)	8.74 (.56)
	Old	8.97 (.52)	9.66 (.56)	10.28 (.60)
Total RD		8.59 (.36)	9.93* (.39)	9.51 (.40)
TotD	Young	15.97 (1.00)	18.54 (1.18)	15.79 (1.09)
	Old	15.23 (1.02)	16.63 (1.11)	17.60 (1.17)
Total TotD		15.60 (.71)	17.58^ (.77)	16.70 (.79)

* = Greater than corresponding control group, $p < .01$; ^ = Greater than corresponding control group, $p < .06$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete.

Table C2

Least Squares Means Contingent Recall for Condition x Age with Receptive Language as a Covariate

Parentheses indicate standard deviations.

		Control	Verbal Reinstatement	Reenactment
NRC	Young	7.05 (.86)	7.57 (1.01)	5.88 (.94)
	Old	5.03 (.88)	4.60 (.95)	6.18 (1.01)
Total NRC		6.04 (.61)	6.08 (.67)	6.03 (.68)
RC	Young	10.82 (.88)	12.90 (1.03)	11.04 (.96)
	Old	10.53 (.90)	11.93 (.97)	13.10` (1.03)
Total RC		10.67 (.62)	12.41` (.68)	12.07 (.69)
TotC	Young	17.87 (1.43)	20.47 (1.68)	16.92 (1.56)
	Old	15.56 (1.46)	16.52 (1.58)	19.27 (1.68)
Total TotC		16.71 (1.01)	18.50 (1.11)	18.10 (1.12)

` = Greater than corresponding control group, $p < .06$.

Note. NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent.

Appendix D

Analyses for condition by receptive language score

How does grouping the recall scores by language score as opposed to age, affect differences in recall between groups?

If receptive language is the main determinant of performance, regrouping by receptive language (high receptive language scorers and low receptive language scorers) might reveal differential effects of conditions. Thus, children's recall scores were regrouped by receptive language score, irrelevant of age, and reanalyzed. The means are recorded in Tables D1 and D2 (pgs. 111 & 112).

A 2 (language groups) X 3 (conditions) ANOVA on the difference between recall of reinstated and non-reinstated discrete items was not significant.

A series of paired comparisons t-tests grouped by condition and receptive language score, on the difference between reinstated and non-reinstated discrete items recalled was run. In these analyses, lower and higher language scorers in the control group did not recall significantly more reinstated than non-reinstated discrete items (see Table D3 for paired comparison t-tests). This regrouping also demonstrated that the difference for the higher language scorers on discrete scores in the reenactment condition fell just short of significance $p = .06$. The other reminder groups recalled significantly more reinstated than non-reinstated items at $ps = .01, .006, .03$ for low scoring verbal reinstatement, high scoring verbal reinstatement and low scoring reenactment groups, respectively.

A 2 (language groups) X 3 (conditions) ANOVA on the difference between recall of reinstated and non-reinstated contingent items was not significant.

Table D1

Least Squares Means for Recall for Discrete: Condition x Receptive Language Score

Parentheses indicate mean standard errors.

		Control	Verbal Reinstatement	Reenactment
NRD	Low	6.21 (.83)	6.81 (.80)	6.32 (.87)
	High	7.95 (.77)	8.11 (.96)	8.45 (.91)
Total NRD		7.08 (.57)	7.56 (.63)	7.38 (.63)
RD	Low	8.02 (.58)	9.48 (56)	8.50 (.61)
	High	9.25 (.54)	10.06 (67)	10.78* (.64)
Total RD		8.64 (.40)	9 77 (44)	9.64 (.44)
TotD	Low	14.23 (1.12)	16.29 (1.08)	14.82 (1.17)
	High	17.20 (1.04)	18.17 (1.30)	19.23* (1.23)
Total TotD		15.71 (.77)	17.23 (.84)	17.02 (.85)

* = Older RE is significantly greater than younger RE, $p < .01$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete.

Table D2

Least Squares Means for Recall of Contingent: Condition by Receptive Language Score

Parentheses indicate mean standard errors.

		Control	Verbal Reinstatement	Reenactment
NRC	Low	5.33 (.93)	5.92 (.90)	5.23 (.97)
	High	6.88 (.86)	5.61 (1.08)	7.20 (1.02)
Total NRC		6.10 (.64)	5.77 (.70)	6.21 (.71)
RC	Low	9.60 (.99)	11.15 (.95)	10.30 (1.03)
	High	11.95 (.91)	13.17 (1.14)	14.38* (1.08)
Total RC		10.78 (.67)	12.16 (.74)	12.34 (.75)
TotC	Low	14.94 (1.60)	17.08 (1.54)	15.52 (1.67)
	High	18.82 (1.48)	18.78 (1.85)	21.58 (1.75)
Total TotC		16.88 (1.09)	17.93 (1.20)	18.55 (1.21)

* = Older RE is significantly greater than younger RE. $p < .008$.

Note. NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent.

A series of paired comparisons t-tests grouped by condition and receptive language score, on the differences between reinstated and non-reinstated contingent items recalled, yielded significance for all six groups, ps ranging from < .0001-.002 (Table D4, p. 114). As concluded in a previous section, most participants recalled significantly more reinstated contingent items than non-reinstated contingent items, regardless of condition.

Table D3

Paired Comparison t-test for non-reinstated discrete (NRD) and reinstated discrete (RD) items: condition by receptive language score.

		Mean NRD (MSE)		Mean RD (MSE)		Mean Difference (MSE)	
Control	Low	6.21	(.83)	8.02	(.58)	1.81	(1.00)
	High	7.95	(.77)	9.25	(.54)	1.30	(.89)
Verbal Reinstatement	Low	6.81	(.80)	9.48	(.56)	2.67*	(.89)
	High	8.11	(.96)	10.06	(.67)	1.94**	(.52)
Reenactment	Low	6.32	(.87)	8.50	(.61)	2.18*	(.85)
	High	8.45	(.91)	10.78	(.64)	2.33^	(1.09)

^=.06, *= p < .05, ** = p < .01, *** = p < .001

Table D4

Paired Comparison t-test for non-reinstated contingent (NRC) and reinstated contingent (RC) items: condition by receptive language score.

		Mean NRC (MSE)	Mean RC (MSE)	Mean Difference (MSE)
Control	Low	5.33 (.93)	9.60 (.99)	4.27** (.99)
	High	6.88 (.86)	11.95 (.91)	5.07* (1.29)
Verbal Reinstatement	Low	5.92 (.90)	11.15 (.95)	5.23***(.79)
	High	5.61 (1.08)	13.17 (1.14)	7.56***(.86)
Reenactment	Low	5.23 (.97)	17.08 (1.54)	5.07** (1.10)
	High	7.20 (1.02)	18.78 (1.85)	7.18** (1.26)

*= $p < .05$, ** = $p < .01$, *** = $p < .001$

The MANOVA on TotD and TotC for condition by receptive language showed no significance for condition or for condition by receptive language interaction (Table D5, p. 115). However, the analysis on receptive language was highly significant $F(2, 62) = 5.22$, $p < .01$. For total discrete items recalled, the least squares means indicates that within groups, the higher language scorers in the control (C) group recalled somewhat more than lower language scorers, $t = 1.94$, $p = .06$; in the verbal reinstatement (RI) group, higher language scorers did not recall more for total discrete recall, $t = 1.11$, $p = .27$; and in the reenactment (RE) group higher language scorers recalled significantly more than lower language scorers for total discrete recall, $t = 2.59$, $p = .01$. For the total contingent items recalled, the least squares means indicates that the higher language scorers in the reenactment group recalled significantly more than the lower language scorers in the reenactment group, $t = 2.50$, $p = .02$.

Table D5

Table comparing MANOVAs-MANCOVAs: Includes Condition x Receptive Language

		TotD-TotC	NRD-NRC	RD-RC
Condition x Age	df	F	F	F
Condition	4, 126	.89	.42	1.41
Age	2, 62	2.90^	2.33	5.06**
Condition x Age	4, 126	.79	1.21	1.41
Condition x Age: Receptive Language				
Condition	4, 124	1.28	.57	1.73
Age	2, 61	1.16	2.02	1.77
Condition x Age	4, 124	1.10	1.14	1.55
Condition x Receptive Language				
Condition	4, 126	1.10	.69	1.30
Receptive Language	2, 62	5.22**	4.32*	5.74**
Condition x Receptive Language	4, 126	.43	.83	.62

^ = $p < .06$, * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent.

Table D6

Table comparing ANOVAs-ANCOVAs: Includes Condition x Receptive Language

	Condition x Age			Condition x Age: Receptive Language			Condition x Receptive Language		
	F (5, 63)	r^2	Main Effect	F (6, 62)	r^2	Main Effect	F (6, 62)	r^2	Main Effect
Composite Recall Measures									
TotD	1.33	.10	age < .056	**4.62*** **	.31	recep < .0001	2.63'	.17	recep < .002
TotC	.97	.07		**4.02** **	.28	recep < .0001	2.13	.14	recep < .006
Non-reinstated Recall Measures									
NRD	.34	.03		2.19'	.17	recep < .001	1.27	.09	recep < .02
NRC	.58	.04		1.83	.15	recep < .007	.73	.06	
						age < .07			
Reinstated Recall Measures									
RD	**3.06***	.20	age < .003	**5.10*** **	.33	recep < .0008	2.67'	.17	recep < .007
						condtn < .04			
RC	1.90	.13	age < .02	**4.87*** **	.32	recep < .0001	**2.90***	.19	recep < .001

Note[1]: Using the Bonferroni Adjustment, only those F values less than .025 may be considered significant. ' = < .035, * = p < .025, ** = p < .01, *** = p < .001.

Note[2]: Only significant or marginally significant main effects are reported here

Table D7

Least Squares Means t-tests Between and Within Conditions: Includes Condition x Receptive Language

	Condition x Age		Condition x Age, Receptive Language as covariate		Condition x Receptive Language	
	Between Conditions	Within Conditions	Between Conditions	Within Conditions	Between Conditions	Within Conditions
Composite Recall Measures						
TotD		RE < .04	Yng C & RI < .09			C < .06^
			Yng RI & RE < .08			RE < .01**
TotC	Old C & RE < .09		Old C & RE < .09			RE < .02*
Reinstated Recall Measures						
RD	Yng C & RI < .09	RE < .008**	Yng C & RI < .01**	RE < .07	Lo RI & C < .07	RE < .01**
	Old C & RE < .09	C < .08	Yng RI & RE < .07		Hi RE & C < .07	
			Old C & RE < .09			
RC	Old C & RE < .06^	RE < .02*	Old C & RE < .06^		Hi RE & C < .09	C < .09
						RE < .008**

Note. NRD = non-reinstated discrete items; RD = reinstated discrete items; TotD = composite discrete; NRC = non-reinstated contingent items; RC = reinstated contingent items; TotC = composite contingent; Yng = young; C = control group; RI = verbal reinstatement group; RE = reenactment group.

For non-reinstated discrete and contingent items, there are no condition differences or interactional condition by receptive language score differences on the MANOVAs but there is a difference on the MANOVA for receptive language, Pillai's Trace F(2, 62)= 4.32, $p < .02$ (Table D5, p. 115). The significance is particularly evident for non-reinstated discrete items across conditions, where the receptive language difference is significant, LSM $t = 2.45$, $p < .02$. For non-reinstated contingent items across conditions there is no significant difference.

The MANOVA for reinstated discrete and contingent items recalled indicates a receptive language effect, with Pillai's trace $F(2, 62) = 5.74$, $p = .005$. Across conditions, there was a receptive language effect for both reinstated contingent and discrete items. An LSM t-test for reinstated contingent items between low and high language scorers, across conditions, yielded significance at $t = 3.38$, $p = .001$ (LSMs, MSEs = 10.35, .57; 13.16, .61), and for discrete items, $t = 2.78$, $p = .007$ (LSMs, MSEs = 8.67, .34; 10.03, .36). Thus, receptive language makes a difference in a child's ability to make connections in recalling an event and its specifics. A least squares means analysis also indicated within condition differences. High receptive language scorers in the reenactment group, recalled significantly more than low receptive language scorers in the reenactment group on both reinstated discrete items recalled, $t = 2.59$, $p < .01$ (LSMs, MSEs = 8.5, .61; 10.78, .64) and on reinstated contingent items recalled, $t = 2.73$, $p < .008$ (LSMs, MSEs = 10.30, 1.03; 14.38, 1.08). Thus, receptive language proficiency apparently makes a difference for how effective reenactment is on reinstated items.

On the other hand, for both the verbal reinstatement and the control groups, receptive language proficiency makes more of a difference for reinstated contingent items

than for reinstated discrete items, but still not near significance. Interestingly, though, for the verbal reinstatement group on discrete items, the higher and lower language scorers perform almost exactly the same (see Figure 2, p. 86).

Thus, receptive language proficiency makes a difference for the reenactment group but has no impact on either the reinstatement group or the control group. (These results are very similar to those found when grouped by chronological age which yielded a trend for the reenactment condition and no difference for either the control or verbal reinstatement conditions.)

Summary: A series of ANOVAs performed with condition, receptive language, and the interaction of condition and receptive language as independent variables indicated significant differences for recall of total discrete items, reinstated discrete items and reinstated contingent items (see Table D6, p. 116). For each of these measures, there was a main effect for receptive language. Each of these measures indicated within condition differences for the reenactment group, with the high receptive language scorers in the reenactment group recalling significantly more than the low receptive language scorers (see Table D7, p. 117).

The individual ANOVAs for all recall measures except RC were not significant, though TotD and RD came close (see Table D6, p. 116). Apparently, the reason condition by receptive language MANOVAs and even ANOVAs are generally not significant and have lower r^2s than condition by age with receptive language as a covariate, is because in forming two groups based on receptive language, the scores were flattened into two scores, either low or high, reducing the variability and the receptive language effect is not felt as strongly.

Once again, to test for whether there is a particular group(s) that recall(s) more in contingent than would be reflected by discrete alone, ANCOVAs were performed on the contingent measures while controlling for the corresponding discrete measures. When grouped by condition and receptive language, the ANCOVAs for RC, NRC and TotC are highly significant at $p < .0001$, but the main effect is only for the variable controlled, the discrete items, in each analysis. Thus, there would not be a difference between groups on contingent items if not for the discrete items.

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