An Examination of Children's Memory for Instances and the Effects of Mental Context Reinstatement

by

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Ethics Statement

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Abstract

Complainants of repeated child sexual abuse (CSA) are often directed to recall a time that was different, the first time, and/or the last time. Mental context reinstatement (MCR) may also be used to facilitate recall of discrete acts. The present research examined the effects of these techniques on children's recall of instances of a repeated event. Younger (kindergarten/Grade 1; $n = 172$) and older (Grades 3/4; $n = 176$) children participated in five magic shows. All shows followed the same general script, with options of details that varied in each show. In the middle show, something surprising occurred (i.e., a deviation). After a one-week delay to the target instance, children were asked to recall one of the following instances: the first time, last time, or a time that was different or surprising. Some children also received MCR. Children recalled the first instance most accurately and recalled the last instance more accurately than the time that was different or surprising. MCR had a negative effect on children's recall of the first instance such that MCR increased the number of details children reported from non-target instances. A broad definition of accuracy that included all experienced details showed that MCR increased the number of experienced details younger children reported across instances. It appears that MCR may serve to activate children's memory for the script. Implications to children's memory for instances of a repeated event and charging repeated CSA as a continuous offense are discussed.

Keywords: repeated event; memory; deviations; script memory; investigative interviewing; mental context reinstatement

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Glossary

Cognitive Interview (CI)	A forensic interviewing protocol developed by Geiselman et al. (1984) and modified into the Enhanced CI (ECI) by Fisher and Geiselman (1992). The technique advises interviewers to build rapport, describe the ground rules of the interview, and transfer control to the interviewee during the interview. It is based on empirically supported memory principles and includes the following prompts: 1) (mental) context reinstatement, 2) report everything, 3) change perspective, and 4) change temporal order.
Deviations	Unpredictable changes in an event; also referred to as atypical details
Deviation instance	An instance that included predictable details (e.g., details that are fixed or variable) and a deviation. The predictable details in the deviation instance are the details of interest; deviation details are not included.
Distinctiveness heuristic	Stimuli that are distinct or temporally spaced will facilitate recall by enabling a monitoring process at retrieval that relies on the distinctiveness of features at encoding
Encoding specificity	A memory principle by Tulving and Thomson (1973) which states that recall is facilitated when the information at retrieval and encoding match. This principle forms the basis for the mental context reinstatement and report everything mnemonics of the CI.
Encoding variability	Similar to varied retrieval in that encoding contexts contain differences; those that contain distinct differences in context or are spaced will be more likely to be accessed by a variety of retrieval cues
Fixed details	Details that are the same in each experience of a repeated event and are always experienced in the same way (e.g., during the magic show, the magician always wear a hat)
Instance of a repeated event	A particular episode of a repeated event; also referred to as “episode” or “occurrence”
Mental context reinstatement (MCR)	A component of the Cognitive Interview in which witnesses are instructed to visualize an event with respect to time, place, self- performed and other-performed actions during a forensic interview.
Predictable variation	Details that are common, or typical, across instances of a repeated event (i.e., variable details)

Repeated event	An event experienced multiple times for which a person has prior experience (e.g., going to the grocery store); also referred to as a “routine,” “familiar,” and “scripted” event in the literature
Single event	An event experienced one time for which a person has no prior experience (e.g., a single laboratory event); also referred to as a “novel” and “unique” event in the literature
Spacing effect	Instances will be encoded more effectively when there is more time between instances (spaced presentation) than when there is less time between instances (massed presentation)
Unpredictable variation	Details that are not common to the event and cannot be predicted based on prior knowledge (i.e., deviations)
Variable details	Details that are the same in each experience of a repeated event with associated options that vary across instances (e.g., a magic word is always stated during the magic show, but the magic word differs during each instance)
Variable options	The options of a variable detail (e.g., the magic word is Hocus Pocus one day, Bippity Boppity Boo the next, etc.)
Varied retrieval	Similar to encoding variability. There are likely multiple paths to a memory so employing techniques that access different paths to the encoded event will facilitate retrieval (the basis of the change perspective and change temporal order prompt of the CI).

Chapter 1.

Introduction

In many cases of child abuse and domestic violence (e.g., Connolly & Read, 2006; Sas & Cunningham, 1995; World Health Organization, 2002), the abuse is repeated rather than singular. Due to laws in most countries, the likelihood that a prosecutor will exercise their discretion to proceed to trial on an allegation of repeated abuse often depends on a complainant's ability to describe in detail one or a few individual instance(s) of the repeated abuse (e.g., Guadagno, Powell, & Wright, 2006; *Podirsky v. R*., 1990; *R. v. B. [G.]*, 1990; *S. v. R.,* 1989). These laws, commonly referred to as particularization requirements, outline that a crime must contain sufficient material facts to specify the particular charge such that the facts for a particular charge go beyond general information (see Woiwod & Connolly, 2017 for review). For example, in *People v. Bailey* (2015), the Michigan Court of Appeals upheld Bailey's previous conviction of four-counts of criminal sexual conduct in the first-degree for sexually abusing his three nieces. For child A. B., Bailey was convicted of a single count of criminal sexual conduct in the first-degree. As stated in the appellate court's decision, A. B. testified to the following:

> the first sexual incident with defendant occurred during the summer of 2003, while staying overnight at a relative's house. She said that she and [the] defendant wound up sleeping next to each other that night, that he came over to her, and put his hands down her pants and into her vagina. According to AB, the assaults continued after returning home [the defendant and A. B. lived in the same house] and occurred *daily* until she left for boarding school in August 2008.

> She said it happened the *same way every time* but in *different* settings, including [the] defendant's room at her house (para. 7, italics added).

As is evident in A. B.'s description, particularization is a difficult task because individuals who have experienced a repeated event generally know what happened across instances (e.g., experienced details such as the alleged perpetrator always gave them some kind of gift as part of the act), but they tend to be confused about when specific details occurred (e.g., which gift was given on which occasion; for review, see Roberts, 2002).

In response to this, some jurisdictions in the United States and all provinces in Australia have adopted continuous child sexual abuse statutes which effectively reduce or eliminate the requirement for complainants to particularize each discrete act of repeated abuse; repeated abuse is charged as a continuous offense rather than discrete acts (e.g., Woiwod & Connolly, 2017). Under continuous abuse statutes, the victim may describe what typically occurs in the abuse and only needs to provide some details that differentiate between at least two discrete acts over the period of time required under the statute (e.g., 30 days; see Woiwod & Connolly, 2017 for descriptions of differences across jurisdictions). It is likely that A. B.'s testimony described above would have been sufficient for a charge of continuous child sexual abuse in jurisdictions where a continuous child sexual abuse charge is available. Although repeated child sexual abuse may be charged differently depending on the jurisdiction, the interviewing techniques are consistent across jurisdictions—regardless of whether discrete acts or continuous abuse is charged, the forensic interview is designed to facilitate particularization of instances.

To particularize an allegation of repeated abuse, a forensic interviewer will direct the interviewee to a specific instance and then ask what occurred during that time (e.g., the exact gift received during that instance). Some forensic interview protocols (National Institute of Child Health and Human Development [NICHD] Protocol: Lamb, Orbach, Hershkowitz, Esplin, & Horowitz, 2007) recommend that interviewers ask complainants to report “the time that is remembered best.” If a complainant is unable to self-nominate an instance, he or she will be directed to the first instance, the last instance, or the time in which something different occurred. Support for directing complainants to the first or last instances comes from research on primacy and recency effects which suggest the first and last instance should be recalled well (e.g., Powell, Thomson, & Ceci, 2003). Additionally, research on deviations (i.e., unexpected event changes, as would happen in a time that was different) has found that deviation details are recalled with a high rate of accuracy among younger and older children (e.g., Connolly, Gordon, Woiwod, & Price, 2016). These verbal labels to an instance (the first, last, time that was different) may also be combined with other cognitive interviewing techniques that help focus the interviewee on the unique details of the target instance. Cognitive interviewing techniques designed to reinstate the context of the to-be-recalled event are effective across a wide age range, from young children to adults, but the positive effects of cognitive interviewing techniques increase with age (Memon, Meissner, & Fraser, 2010). Additionally, most research on the effects of cognitive interviewing techniques have been applied to memory for single events rather than instances of a repeated event.

To my knowledge, no research has directly compared the accuracy of reports when cognitive interviewing techniques are combined with prompts to report the first, the last, or the time that was different. Most repeated event memory researchers ask interviewees to describe one pre-determined instance (e.g., Connolly & Gordon, 2014; Connolly & Lindsay, 2001; Powell & Thomson, 1996, 1997a, 1997b, 2003; Price & Goodman, 1990) rather than asking about multiple instances. The present research attempts to fill this gap in the literature by directly comparing the efficacy of cuing interviewees who have experienced a repeated event to the first, the last, or a time that was different. This will enable a test of which instance is remembered best so forensic interviewers can cue complainants to that instance. For some, these verbal labels will also be paired with cognitive interviewing mnemonics to ascertain if distinct retrieval cues facilitate retrieval of an instance of a repeated event. The instance that is remembered best and the effects of forensic interviewing techniques may vary across the developmental span so younger and older children will be tested.

How Repeated Events differ from Single Events

I will refer to multiple episodes of a similar event as a "repeated" event and, I will refer to one particular episode of a repeated event as an "instance." To describe an event that has been experienced once, I will use the term "single" event. For the sake of clarity, definitions of key terms discussed in this section are provided in the Glossary. For purposes of this literature review and the present research, a repeated event is one in which there are three or more similar instances of an event; instances of the event are perceived to be similar because they share common goals, actors, actions, and objects (Hudson & Mayhew, 2009). For example, most people have gone to a restaurant several times and have an expectation about the temporal order of the event and generally what will happen (patrons are greeted, sit down, order something from the menu, eat, and pay for the meal; Hudson, Fivush, & Kuebli, 1992).

Across instances of a repeated event, details can be *fixed* or *variable* (see Glossary for a brief overview). *Fixed* details are experienced in the same way during each instance. *Variable* details have associated options that change across instances; these options are ways the variable detail has been experienced in the past. Fixed and variable details are typical and predictable. Fixed details are predictable because they are consistent across instances and, therefore, are expected to occur. Variable details contain predictable changes because children and adults learn to expect that the way the detail is experienced will change across instances. I will provide an example of these details in the context of repeated magic shows because my colleagues and I often use magic shows as the repeated event in our research with children. In our research, a magician performs four or five similar magic shows for children. Each show contains fixed details (for example, the magician wears the same purple cape in each magic show). Each magic show also contains variable details with options that change across shows. For example, children always begin the show with a warm-up exercise (variable detail), but the type of warm-up exercise varies in each show (e.g., one day the warm-up exercise is stretching, the next day it is running in place, and so forth—these are options of a variable detail).

Although both fixed and variable details are predictable, memory for fixed and variable details is not equivalent. In comparison to children and adults who have experienced a single event, individuals who have experienced a repeated event and are asked about one instance report more correct fixed details and fewer correct variable options (Connolly & Lindsay, 2001, see Fivush, 1997 for a review). These patterns hold regardless of age (even preschoolers show this effect), although older children remember a greater number of correct details overall than younger children (e.g., Brubacher, Glisic, Roberts, & Powell, 2011; Connolly & Lindsay, 2001; Powell, Roberts, Thomson, & Ceci, 2007). Given that most events are not experienced in the same way each time (i.e., all details are not fixed across instances) research should focus on understanding the circumstances under which variable details can be accurately assigned to instances of a repeated event. Additionally, findings in the literature of impoverished memory for instances of a repeated event relative to a single event may be attributable to the fact that most researchers have used events that vary in predictable ways (i.e., variable details).

Instances of a repeated event contain predictable variation (variable details), but one or more instances may also vary in ways that are unpredictable (deviations). Unpredictable changes in an instance are changes that are inconsistent with previous experience and cannot be predicted based on prior experience. We refer to unpredictable event changes as *deviations*. A deviation violates one's expectations of what will occur in an instance of a repeated event. For example, during a magic show containing variable details, a confederate interrupts the magic show. The confederate needs the magician's help because he cast a disappearing spell on himself and needs the magician to administer the antidote. After the magician administers the antidote, the show continues as expected. When instances also contain predictable variation as in the current research, memory for the unpredictable and predictable changes in the instance can be observed separately to ascertain if the deviation details are remembered well and if predictable details in the instance in which the deviation occurred are remembered well (hereafter referred to as the deviation instance). Research on deviations will be further reviewed in the section on deviation research.

Memory for the First and Last Instances of a Repeated Event

Research on adult's recall of text has shown a U-shaped serial position curve in which items that are presented at the beginning and at the end of the series are recalled better than those in the middle. However, primacy effects (superior memory for items at the beginning of a series) are stronger and last longer than recency effects (superior memory for items at the end of a series) among adults (e.g., Craik, 1970; Glanzer &

Cunitz, 1966) and children (e.g., Somerville, Haake, & Wellman, 1984). Most research examining primacy and recency effects has used word or picture lists and these types of tasks may not generalize to memory for a repeated, live event. Accordingly, Powell, Thomson, and Ceci (2003) examined 4- to 5- and 6- to 8-year-old children's recall of a 6-session, laboratory event across different retention intervals. In a between-subjects design, children were asked to recall either the first or last instance at a 1- or 6- week delay (Experiment 1). Older children remembered the first and last instances equally well at the short delay, but fewer details were recalled about the last instance than the first at the long delay. Younger children did not show any differences in recall of the first and last instances at the short delay but showed a decline in memory for both the first and last instances at the long delay. Among older children, Powell et al.'s Experiment 1 data are consistent with previous research using more basic tasks with children and adults; albeit the authors did not compare the first and last instances to the middle instance to directly test primacy and recency effects. Thus, in Experiment 2, children were asked to sequence the options that occurred in the first, middle, and last instances (within-subjects) at either a 3-day or 3-week delay (between-subjects). The findings were similar to Experiment 1: at the short delay, older children were superior at sequencing the options in the first and last instances than the middle instance; at the long delay, older children's sequencing of the first instance was superior to their sequencing of the middle and last instances. For the younger children, a significant primacy and recency effect was only evidenced at the long delay, but the means showed a similar U-shaped pattern at the short delay.

The findings of Powell et al. (2003) suggest that (1) children who have experienced a repeated event show primacy and recency effects; (2) primacy effects are stronger and last longer than recency effects; and (3) primacy and recency effects may only apply consistently to older children. However, Hudson (1990) found that 4- to 5-year-olds who participated in four workshops and were asked about the first and last instances recalled more about the first than the last instance after a 4-week delay. Overall, research that has examined serial position effects in the repeated event literature suggests that the first and last instances of a repeated event are remembered better than the middle instances, but superior memory for the last instance of a repeated event is only evidenced at a short delay. The findings of research on primacy and recency effects to date support the recommendation of interview protocols to cue complainants of repeated abuse to the first instance and the last instance if the interview is conducted shortly after the alleged offense; and to cue complainants to the first instance after a lengthy delay.

As noted earlier, forensic interviewers may attempt to help children recall an instance of a repeated event by directing them to the first instance, the last instance, or an instance that was different from the others. It is unknown if memory for a deviation instance is comparable to memory for the first and last instances of a repeated event. In the repeated-event literature, primacy and recency effects have been demonstrated when all instances are highly predictable and similar throughout the repeated event. It is possible that the primacy and recency effects will not be observed if a middle instance contains a deviation and the deviation enhances memory for all details that occurred in the deviation instance. Depending on how deviations are represented in memory, a deviation may facilitate recall of the entire instance in which the deviation occurred. Theories that have been applied to memory for repeated events make different predictions about the circumstances under which memory for instances may be retained and the effects of a deviation on memory for instances. I will now discuss two theories (script theory and fuzzy-trace theory) and one framework (source monitoring) that have been applied to memory for instances of repeated events. My discussion will focus on how deviations are represented in memory.

Script theory

Schema theory purports that people form a general mental representation, or a schema, for categories of various things (Bartlett, 1932). Script theory is a subtype of schema theory that claims that memory for routine events become organized into a particular type of memory representation called a script (Schank & Abelson, 1977). Scripts are canonically-ordered knowledge structures that include information about the typical actions, actors, and objects that fulfill certain goals in a particular context (Hudson & Mayhew, 2009; Schank & Abelson, 1977). The script contains details that have been experienced in the past and provides a knowledge structure that guides comprehension and provides expectations for future encounters with the event (Alba & Hasher, 1983; Nelson, 1986; Nelson & Gruendel, 1981). Scripts are formed upon the first experience with an event and become stronger with repeated experience (Fivush, 1984). Generally speaking, the script strengthens faster for older children and adults than younger children, but the development of scripts have been documented throughout preschool and adulthood; the formation of script memory seems to be developmentally invariant (Hudson, 1986).

Fixed details (those that are the same across instances) and variable details (details with associated options that change across instances) are contained in the script. The options associated with variable details are represented as lists that are linked to the variable detail in the script and are not tightly linked to instances. Each time a variable detail is experienced, the options are integrated into the list of options associated with the variable detail. The list provides expectations for possible options during future encounters (Fivush, 1984; Nelson, 1986). Although a new option of a variable detail will be more tightly associated with the list of previous options than with the instance, memory for the instance is not presumed to be permanently inaccessible. However, script theory does not clearly explain how instance memory is retained or how it is associated with script memory.

If children and adults are asked to recall what happened immediately after an instance, their report will likely contain specific and accurate details; Slackman and Nelson (1984) argued that immediately after an experience, recall is reproductive in that it is simply reproduced as a veridical memory. However, instance memory becomes less particular and includes a greater number of general event details as delay-to-recall increases. In other words, memory for the instance declines after a delay and increased reliance on the script leads to reports that are more general. Therefore, children and adults are more likely to describe what generally occurs across instances than what occurred in a particular instance if there is a delay to test. A precise forgetting curve has not been established, but research suggests that memory for an instance typically begins to show significant declines after a three- to four- day delay at which point recall becomes more reconstructive than reproductive due to the dominance of the guiding script[1] (Slackman & Nelson, 1984). Given that most forensic interviews occur after a lengthy delay (perhaps weeks, months or years after the alleged crime occurred), recalling an instance is expected to be a reconstructive process. This reconstructive process is likely to result in recall errors of the options associated with variable details, called internal intrusions which are intrusions from the script. For example, a forensic interviewer may ask a complainant of repeated abuse to recall the type of gift her alleged

[1] The pattern described is based on published research to date. Future research that manipulates the nature of the event, the number of instances, or the delay between instances and recall may reveal different patterns.

abuser gave her during the last instance, but she recalls the gift she received during the second instance (an internal intrusion). The complainant may also report options of a variable detail that are consistent with the script, but were not experienced, for example, reporting that the gift was a necklace when a necklace was never offered (an external intrusion error). External intrusion errors are less common than internal intrusions (Woiwod, Fitzgerald, Sheahan, Price, & Connolly, revised and resubmitted).

Schank and Abelson's (1977) "script-pointer-plus-tag" (SP + T) hypothesis purports that deviation details are remembered well at short delays because they are tagged in memory as distinct details. The memory advantage of deviation details at a short delay is not expected to facilitate memory for predictable details that occurred in the deviation instance. Script theorists purport that deviation details are linked to memory for the script rather than the instance in which they occurred so deviation details in a predictable instance of a repeated event do not preserve memory for the entire instance (e.g., Fivush, Kuebli, & Clubb, 1992; Graesser, Gordon, & Sawyer, 1979; Hudson, 1988; Schank & Abelson, 1977). Schank (1982) noted, "… episodes that differ from the script partially are attached to the part of a script that they relate to" (p. 23). I will describe this using an example provided in Schank and Abelson (1977). The act of going to a restaurant involves entering, ordering, eating and exiting; these scenes occur in a causal chain to fulfill the pleasure goal of going to a restaurant to eat. If something unexpected occurs during one of these scenes (e.g., the burger and fries the customer ordered are cold), the deviation will be linked to that particular sequence in the restaurant script (the eating scene). Because deviations are linked to the script, the deviation may not be correctly attributed to the instance in which it occurred. This effect will be more pronounced over time as the relative strength of the script increases.

A novel episode in the context of a repeated event is the only circumstance in which script theorists purport memory for the episode may remain intact over time. For example, Fivush, Hudson, and Nelson (1984) examined children's reports of a class trip to an archaeological museum. All children had been to museums before, but none of the children had been to an archaeology museum. After a six-week and one-year delay, children retained memory for the trip to the archaeological museum because they accurately reported specific details that occurred. Although children's reports of specific details declined at the one-year delay, there was still evidence that children remembered the class trip to the museum of archaeology when psrovided with specific retrieval cues (i.e., tell me what happened when you went to the archaeology museum). The authors concluded that if an episode itself is a novel deviation from the routine (e.g., a trip to an archaeological museum), the specific episode may be tagged in memory and may be accessed by distinct retrieval cues.

One objective of the current research is to study cues that may help children to recall an instance of a repeated event. To distinguish from Fivush et al. (1984) discussed above, in the present research, the instance itself is not entirely novel from the routine (e.g., a visit to a restaurant is typical other than a deviation in which the food is cold; the instance itself is not novel from the restaurant script). Recall that both variable details and deviation details can make a time different. However, variable details are not likely to act as a distinct retrieval cue because they occur in similar ways across instances and over time, the options are linked to the category detail in the script rather than the instance. Script theorists have tested temporal prompts in an attempt to guide retrieval of instances, but this research suggests that temporal retrieval cues are not effective for young children (e.g., tell me what happened yesterday, the first time, the last time; Hudson & Nelson, 1986) so more distinct cues may be necessary to facilitate recall of the details that occurred during one instance of a repeated event. Research has not compared the effects of cuing children to a time that was different with temporal information and mnemonics during recall of a routine instance of a repeated event. Based on script theory, a deviation instance that is labeled at retrieval (e.g., tell me about the time that was different) may be an effective cue to the deviation details because this type of cue identifies the unique characteristics of the deviation. When this verbal cue to the deviation instance is provided in conjunction with other contextual cues, the presence of multiple, distinct cues may lead to an accurate report about the deviation details; this effect may be particularly evident at a short delay. Enhanced memory for the deviation details in the presence of distinct retrieval cues is only expected to improve memory for deviation details and not memory for the routine details in an instance because deviations are linked to the script—not the instance.

Fuzzy-trace theory

Fuzzy-trace theory (FTT: e.g., Brainerd & Reyna, 2002) purports that memory for an event is stored as two separate memory traces: a verbatim trace and a gist trace. The verbatim trace contains the surface structure of an event, which encompasses the exact details. The gist trace contains memory for the general meaning of the event. Verbatim and gist traces are distinct and independent memory traces and they are retained in parallel. During retrieval, either the verbatim or the gist trace will be accessed. The likelihood of retrieving the verbatim trace depends on the specificity of the cue at retrieval (it must be particular enough to activate verbatim memory) and the relative strength of the verbatim and gist traces at the time of retrieval.

Verbatim memory decays more quickly than gist memory, and it has been speculated that verbatim memory may begin to fade immediately with the biggest declines happening within a short time after the event (for review, see Brainerd & Reyna, 2012). Younger children's (i.e., preschool and early childhood years) verbatim traces decay faster than older children's and adults' (Brainerd & Reyna, 1998; Brainerd, Reyna, & Forrest, 2002; Brainerd, Reyna, Howe, & Kingma, 1990; Brainerd & Reyna, 2012). Accordingly, older children and adults should be better than younger children at accessing the verbatim trace and recalling the corresponding variable details (and deviation details if they are present) if the delay-to-test is short.

Fuzzy-trace theory is not a theory specific to memory for repeated experiences, but it has been used to explain memory for repeated events (e.g., Brubacher et al., 2011; Connolly & Price, 2006; Price, Connolly, & Gordon, 2006; Roberts, 2002; Roberts & Powell, 2007). Each time an instance of an event is experienced, a new verbatim trace is formed. If instances of an event are highly similar, a new experience will activate the same gist trace, thereby strengthening the gist and the likelihood of retrieving the gist memory trace during recall. Therefore, the likelihood of retrieving the gist trace is greater during recall of an instance of a repeated event than a single event even when the delay-to-test is short.

In the context of a repeated event, the likelihood of retrieving the verbatim trace of an instance may increase if the instance is distinct from other similar instances. According to the distinctiveness model, events that are distinct are remembered better than events that are common or typical (Howe, 2006). An event will be perceived as distinct only if it differs from a typical context (Howe, 2006). In a routine context (such as a repeated event), a deviation would make an instance distinct from the other instances. Therefore, the verbatim memory trace of the instance in which a deviation occurred should be stronger than the verbatim traces for the typical instances. However, whether the verbatim memory trace for the deviation episode will be accessed will depend on the precision of the match between the retrieval cue and the deviation instance. If the retrieval cue is specific enough to enable retrieval of the verbatim trace for the deviation instance, recall of that instance should be quite accurate. Fuzzy-trace theory would hypothesize that labeling the deviation instance as a time in which something different occurred and providing other contextual cues to the instance will increase the likelihood of retrieving the verbatim trace of the deviation episode, if the verbatim trace has not decayed.

Source-monitoring framework

The source-monitoring framework does not make predictions about whether entire instances are available in memory, but rather describes the process of attributing memories to their source (i.e., under what circumstances was this memory formed?). The source-monitoring framework (e.g., Johnson, Hashtroudi, & Lindsay, 1993) built upon the ideas of the reality-monitoring framework (Johnson & Rae, 1981). The reality-monitoring framework described the process of determining the original source, or context, of one's memories as externally derived (real) or internally derived (imagined). For example, a person may wonder if they actually locked the door or just thought about locking the door after leaving home. The source-monitoring framework elaborated on the internal-external discrimination process described in the reality-monitoring framework to include internal-internal discriminations (e.g., did I think this or say it?) and external-external discriminations (e.g., did Bob tell me this or did Bruce tell me this?).

The source-monitoring framework asserts that externally generated memories (e.g., memories for events) contain more perceptual, sensory, affective, and contextual details and fewer cognitive operations than internally generated memories (e.g., dreams). These details act as source cues that enable source attributions. Examples include the sound of someone's voice (perceptual), the smell (sensory), the emotional experience of an event (affective), the location and time of an event (contextual), and the effort involved in organizing and retrieving an event (cognitive operations). The characteristics of external and internal memories tend to differ in distinct ways. Thus, compared to discriminating between two internal memories, the process of identifying the source of a memory as externally or internally generated is more likely to result in an accurate attribution even if made rapidly and non-deliberatively. However, accurately attributing the source of multiple externally generated memories may be more difficult and require more deliberative processes because the contextual details are similar. This process will be particularly difficult when similar experiences are instances of a repeated event because source cues are similar and there may be few distinct contextual cues that enable source discrimination between experiences. A single event will be perceived as distinct, but something different must occur in an instance of a repeated event to make it distinct from the others.

A deviation in an instance of a repeated event can facilitate accurate source decisions by enhancing encoding variability between the ordinary experiences and the deviation instance. Variability in encoding will be enhanced when learning contexts contain differences, which increases the probability of accurate recall under various retrieval conditions (Martin, 1968). According to the distinctiveness heuristic (Schacter, Israel, & Racine, 1999; Underwood & Freund, 1968), source decisions will be easier if decisions rely on the distinctiveness of features at encoding (e.g, Schacter et al., 1999; for review, see Gallo, 2006; Schacter & Wiseman, 2006). Deviation details in a repeated event are distinct; therefore, it is reasonable to expect that the unique perceptual features of the deviation will elicit the use of a distinctiveness heuristic at test and increase accurate source attributions of the deviation details to the instance.

Deep levels of processing can elicit a distinctiveness heuristic, thereby enhancing the accuracy of source decisions (Gallo, Meadow, Johnson, & Foster, 2008). This depth-of-processing account comes from research on word lists (e.g., Craik & Tulving, 1975), but can be applied to memory for repeated events. When details are highly similar across experiences (e.g., variable details), they may be processed at a shallow level (for a related hypothesis, see discussion on schema-confirmation deployment hypothesis in the section on deviation research below); therefore, it will be difficult to distinguish memory for one instance from memory for another instance. The expected shallow level of processing for variable details may be modified in the presence of distinct information. Distinct information (e.g., a deviation) in an instance of a repeated event encourages deep processing at encoding because the distinct information heightens arousal and attention to details. Neuroimaging research suggests that deep processing promotes the binding of details, thereby increasing the accuracy of source decisions about the details that occurred in the instance (see Mitchell & Johnson, 2009 for review; Shimamura, 2002, 2011; Shimamura & Wickens, 2009). Given that distinct information (e.g., deviations) may facilitate deeper processing, the binding of other event details (e.g., variable details), and the use of a distinctiveness heuristic at retrieval, it is reasonable to assume that source decisions about variable and deviation details will be more accurate in an instance that contains a deviation than an instance that does not contain a deviation. Additionally, a deviation instance will not only contain cues that are distinct, but it will contain more source cues than a predictable instance. Accurate source attributions are more likely in the presence of multiple source cues that are distinct, as would occur in a deviation instance.

The finding that source-monitoring errors are more likely for events that are similar rather than dissimilar is particularly evident in young children (e.g., Lindsay, Johnson, & Kwon, 1991). Source-monitoring skills improve throughout the preschool years into adulthood (e.g., Lindsay et al., 1991). In sum, the source-monitoring framework would hypothesize: 1) that source-monitoring errors will be likely when trying to identify the source of highly similar, variable details and this effect will be especially pronounced in young children; and, 2) source monitoring will improve in the presence of distinct information, particularly among older children.

Deviation Research

It has been proposed that deviations presented in the context of a repeated event are isolated from the typical background actions, causing them to stand out and be recalled better than typical details (i.e., an isolation, or von Restorff effect; Bower, Black, & Turner, 1979; Davidson, 2006; Wallace, 1965). Contrary to the SP + T hypothesis (Schank & Abelson, 1977) discussed earlier which states that all deviations are tagged similarly in memory and are remembered well following a short delay but not following a long delay, more recent research has shown that not all deviations are tagged in memory with the same strength. For example, a deviation that is bizarre (a cat eating a pickle in a story about a trip to a movie theatre; Davidson, Malmstrom, Burden, & Luo, 2000) or disrupts the goal of the event (Davidson, 1994; Davidson et al., 2000) will be remembered better than typical details even after a delay. Disruptive deviations that are relevant to the goal are recalled better than disruptions that are irrelevant to the goal in both children (e.g., Hudson, 1988) and adults (e.g., Bower et al., 1979; Davidson, 1994), a finding termed the “disruption effect.” For example, in a story of a trip to a restaurant, a waiter spilling on a customer (relevant disruption) is recalled better than a customer noticing that the menu is in a legible fancy font (irrelevant disruption; Bower et al., 1979). Disruptive deviations that are relevant to the event goal are more causally connected to other actions, and actions with more causal connections are recalled better than those with fewer causal connections (Hudson, 1988; Trabasso & van den Broek, 1988). For example, a waiter who spills on a customer may make the customer uncomfortable when eating (the eating scene of the restaurant script) which causes the diner to leave the waiter a smaller tip (the exiting scene of the restaurant script) whereas a customer noticing the menu is in a legible fancy font does not have consequences that are causally connected to the pleasure goal of going to a restaurant to eat.

A relevant disruption that is also vivid will be remembered particularly well because the consequences of the disruption will appear richer and more severe. This is particularly true if the consequences of the disruption evoke emotion (e.g., dropping a carton of eggs at the store may make someone upset, but dropping an apple will not; Davidson & Jergovic, 1996). The perceived consequences of the deviation on other instance details may affect recall of variable details. For example, Davidson and Jergovic (1996) found that a particularly vivid disruption with more perceived consequences (dropping eggs in a story script about going to the store) resulted in poorer recall of other story actions than a less vivid disruption with fewer consequences (dropping an apple at the store); this effect may occur when the deviation itself is so memorable that the experience becomes about the deviation rather than an instance of the routine (Hudson, 1988).

Based on the aforementioned research from story studies, it is clear that deviations presented in the context of a repeated event are remembered well, but research on the effect that deviations have on memory for typical details of the instance that contained the deviation is unclear. It is important to note that the events used in story studies were events for which participants were already familiar (e.g., going to a restaurant, going to the movies, going to school). Therefore, memory for the predictable details in the story may be derived from past knowledge rather than memory for the details in the instance. The findings from story studies may not generalize to memory for a deviation instance in the context of a participatory, repeated event for which participants have no prior experience (e.g., a set of magic shows created in the laboratory).

Some early research examined memory for an unfamiliar, participatory event that contained a deviation episode (Farrar & Boyer-Pennington, 1999; Farrar & Goodman, 1990, 1992). In these studies, participants engaged in an event for which they had no prior experience (making magic with an adult "wizard": Farrar & Boyer-Pennington, 1999; playing animal games with an unknown adult: Farrar & Goodman, 1992) and were interviewed one week after the last episode. In Farrar and Goodman (1992), 4- and 7-year old children participated in one, two, or four sessions. Children in the four-session condition experienced three standard episodes (each episode contained the same fixed details) followed by one deviation episode (the deviation episode contained a few variations of the standard episode). Children in the single-event condition experienced either the standard or deviation episode. Children in the two-session condition experienced both the standard and deviation episode. Those in the single-session and two-session conditions recalled more details overall about the deviation episode than children in the four-session condition, but recall for the standard event indicated a U-shaped pattern in which the single event and four-session children recalled more details than the two-session children. Children in the four-session condition recalled more details about the standard event than the deviation event. This can be explained by the fact that the standard event contained the same fixed details across sessions; thus, those with repeated experience engaged in rehearsal of the standard event but not the deviation event. Of particular relevance to their developing hypothesis, schema-confirmation deployment hypothesis, (discussed below) was the ability of children in the four-session condition to keep the standard and deviation instances separate. Although younger children tended to include deviation details in their reports of the standard episode and standard details in their reports of the deviation instance, older children were better able to distinguish the two. Importantly, both younger and older children in the two-session condition were more likely to confuse the standard and deviation episodes than children in the four-session condition, suggesting a script for the event had not yet formed for children in the two-session condition.

In a similar study, Farrar and Boyer-Pennington (1999) used magic as the theme for their event and had an adult play a “wizard.” Four- and 7-year-old children experienced a standard event twice or four times followed by a deviation episode (3- and 5-event conditions, respectively) or they participated in either a standard or deviation episode (single-event condition). Each instance contained seven activities: four activities were identical across all instances (e.g., the children said “hello”) and three activities varied across standard instances (e.g., the child drew a different picture). During the deviation instance, some of these details changed whereas others remained the same as in the standard episodes. The changes that occurred during the deviation instance were either typical (e.g., children played with paint) or atypical (e.g., children had a snack with the wizard). One week after the last or only event, children were interviewed about the standard and deviation instances. Farrar and Boyer-Pennington analyzed memory for activities that occurred in the standard and deviation instances (recall that some activities were the same in both activities) and the number of atypical and typical details that were recalled correctly as having occurred in the deviation instance and incorrectly attributed to the standard activity. Older children recalled more standard and deviation activities than younger children, and the patterns were similar for the single, 3- and 5- event conditions. Children in the single- and 5-event conditions recalled more standard and deviation activities than children in the 3-event condition. Of particular relevance for the current research is repeated-event children's memory for the changes that occurred during the deviation instance. The patterns for 4- and 7-year-old children differed. Four-year-olds with three experiences could not recall typical or atypical changes as having occurred in the deviation instance only; with five experiences they recalled atypical changes as having occurred in the deviation instance, but not typical changes. Seven-year-olds with three experiences recalled atypical changes, but not typical changes, as having occurred in the deviation instance; with five experiences they were able to recall both typical and atypical changes as having occurred in the deviation instance. In Experiment 2, a simplified event was used; the data from 4-year-olds in this study were similar to the data from 7-year-olds in Experiment 1.

The findings from Farrar et al.'s studies provide support for the schema-confirmation-deployment hypothesis (Farrar & Goodman, 1990, 1992), which purports superior memory for change when a script has been confirmed and deployed. According to this hypothesis, two information-processing stages occur when an event is encountered: schema confirmation and schema deployment. When an event is encountered, children will first search for a relevant schema. If a schema does not exist, as would occur with a single event, preference will not be given to atypical details or deviations because pre-existing knowledge about the event does not direct attention. If a schema for the event exists, confirmation of the schema will lead to more attention and better recall for schema-consistent information (e.g., variable details) than schema-inconsistent information (e.g., deviations). If the relevant schema is strong, this process occurs very quickly. Once a schema is confirmed, the episodic framework for the event is activated. At this point, schema deployment occurs and information that is inconsistent with the schema receives more attention than information that is consistent with the schema. Only if an event has a relevant schema that is deployed, will greater attention be allotted to atypical rather than typical details. In addition to the two studies just discussed, support for greater attention being allotted to deviation details comes from research examining eye fixations in pictures for familiar events which found that schema-inconsistent items receive more attention than schema-consistent information (Friedman, 1979; Loftus & Mackworth, 1978) and research employing stories of familiar events showing that schema-atypical information is recalled more accurately than schema-typical information at a short delay (Graesser et al., 1979).

The schema-confirmation-deployment hypothesis suggests that when a schema exists for a repeated event, memory for deviation details in an instance of a repeated event will be allotted more attention than typical details so memory for atypical details will be stronger than memory for typical details. However, this effect will vary with the strength of the script. After a few experiences, older children will be better at identifying deviations than younger children because older children develop scripts more quickly and enter the deployment phase after fewer experiences than younger children. Consistent with this notion, Farrar and Goodman (1992) found that 7-year-olds were able to accurately attribute atypical details to a deviation instance after three prior experiences with a similar fixed event whereas 4-year-olds confused details between the fixed event and the deviation instance with the same amount of experience.

It is important to note that the schema-confirmation deployment hypothesis and the research designed to test this hypothesis explains memory for unpredictable change, and not memory for an entire instance that contained a deviation. Additionally, the operational definition of a deviation used by Farrar and colleagues is quite different than that used in the earlier story studies. In their research, the deviation episode contained predictable variations of the previous episodes (Farrar & Goodman, 1990, 1992) or new details that did not disrupt the goal of the event (Farrar & Boyer-Pennington, 1999). Deviations that are unpredictable and are causally related to the goal of the event will likely be remembered well. For example, on a trip to the grocery store, the wheel of the shopping cart broke and rolled away (Davidson, Larson, Luo, & Burden, 2000). More importantly, a disruptive deviation may have consequences on and be causally connected to other routine details such that memory for other details are affected.

Deviation Research with Connolly and colleagues

The focus of the present research and my previous research with Dr. Deborah Connolly and colleagues is to examine the effects of a disruptive deviation on memory for an instance of a repeated event (Connolly et al., 2016). Thus far, we have conducted three experiments with children and each has followed a similar methodology with a delay-to-test of 1-2 days. Children experienced four magic shows and a deviation occurred in the last instance (hereafter referred to as the deviation instance). In Experiments 1 and 3, the magic shows consisted of variable details with options that changed across sessions (predictable variation; for example, children always did a warm-up exercise, but the warm-up exercise was jumping jacks one day, stretching the next, etc.). In Experiment 2, only fixed details were used (e.g., the same warm-up exercise was done during each magic show). During the deviation instance, a confederate interrupted the show (unpredictable variation). The confederate exclaimed the magician stole her things (Experiments 1 and 2) or that she needed the magician's help because she had cast a disappearing spell on herself (Experiment 3). The magician then assisted the confederate and resolved the dispute or administered the antidote to break the spell and was given an invitation to the confederate's party. In the first two experiments, 8-year-old children watched one (single-event or SE condition) or four magic shows (repeated-event or RE condition) that either contained or did not contain a deviation at the end of the target show. In these two experiments, the magician also wore a bowtie during the last instance and called it “Bowtie Magic Time” to differentiate it from the other instances. We were interested in children’s memory for the target instance (the instance that contained a deviation for some children but not for others). SE children recalled more about the target instance than RE children. Importantly, RE children who received a deviation recalled more variable details about the deviation instance than RE children who did not receive a deviation.

In the third experiment, we were interested in the influence of different types of deviations on younger and older children’s recall of *each* instance of a repeated event (age range: 6- to 11-years). In this study, all children actively participated in four magic shows and were assigned to one of the following conditions: no deviation, discrete deviation, or continuous deviation. In both deviation conditions, at the beginning of the last magic show, a confederate interrupted the show because she had cast a disappearing spell on herself and needed the magician to administer the antidote. In the discrete condition, the show proceeded as normal and the predictable, variable details were experienced in the same manner as the previous shows. We operationally defined a continuous deviation as one with more consequences and causal connections to the predictable, variable options in the event. In the continuous deviation condition, the confederate’s interruption caused the magician to be frustrated and fumble throughout the remainder of the show. For example, the magician dropped props, forgot how to perform the magic trick, apologized for being clumsy, and claimed she was acting clumsily because her friend’s interruption threw her off schedule. Across conditions, all of the variable details were the same. We omitted the bowtie and did not label the last instance “Bowtie Magic Time.” Because we asked children about all instances, children were cued to each instance using the name of the particular magic trick learned in the show. In this study, we did not find an isolated effect of the deviation on memory for the deviation instance. Rather, compared to the no deviation condition, the continuous deviation led to an improvement in recall of details from all instances. The discrete deviation condition was intermediate and did not differ from the other two conditions. Across conditions, there was a significant primacy and recency effect: children remembered instances 1 and 4 better than other instances.

In Experiments 1 and 2, children who received a discrete deviation recalled more about the target instance than children in the no deviation condition while in Experiment 3, only children in the continuous deviation condition recalled more details than children in the no deviation condition and the improved memory was observed for all instances. The discrepant findings between Experiments 1 and 2 with Experiment 3 could be due to the following: 1) the bowtie used in Experiments 1 and 2 acted as a continuous deviation, 2) the unique bowtie was a more discriminative cue than the name of the magic trick, and 3) we did not ask about all instances in Experiments 1 and 2 so we cannot rule out the possibility that the deviation affected recall of all instances. Taken together, the findings from all three experiments suggest that a deviation that is causally connected to the options in an instance may facilitate recall of all instances, but a deviation that is merely a new detail with no causal connections to the options of a variable detail will not.

To date, my research with Connolly and colleagues has demonstrated that a deviation does not have a targeted effect on memory for the deviation instance, but improves memory for all instances, perhaps because it acts as a rehearsal for all experienced options that are accessible in memory. This suggests that a deviation is linked to memory for the general event, as suggested by script theory. Fuzzy-trace theory purports that, as long as the verbatim trace has not decayed, an appropriate cue will access the verbatim memory for the instance (for a similar idea, see the encoding specificity principle by Tulving & Thomson, 1973 described in the Cognitive Interview section below). Although our findings thus far are consistent with script theory, we have not provided an adequate test of the divergent theoretical predictions of script and fuzzy-trace theories. Specifically, we have not adequately tested the effects of cues that are distinct and specific to the deviation instance. It is possible that more specific cues at retrieval will facilitate retrieval of the deviation instance and lead to a targeted effect. According to source-monitoring theory, the presence of multiple cues will help source attributions. I speculate that cuing an interviewee to an instance using an appropriate label (e.g., the first, last, time that was different) and simultaneously providing contextual and perceptual cues to the instance will result in greater recall of an instance of a repeated event when compared to a standard cuing condition (i.e., a group that receives a label to the instance without additional context cues). However, an effect of contextual cues on recall of instances of a repeated event will depend on the strength of the memory for the instance and if contextual cues serve to reinstate the context of the target instance, the deviation in a deviation instance, or memory for details that occurred across instances of the repeated event. I will now discuss research that has found a beneficial effect of providing self-generated contextual cues to child and adult witnesses, as advocated in the Cognitive Interview.

The Cognitive Interview

There has been a substantial amount of research on the Cognitive Interview (Fisher & Geiselman, 1992). As of 2010, approximately 65 experiments had been published examining the Cognitive Interview (Memon, Meissner, & Fraser, 2010). The original Cognitive Interview (CI) was developed over 30 years ago (Geiselman et al., 1984) and advised that interviewers follow these techniques sequentially: 1) the *mental* *context reinstatement* prompt in which witnesses are instructed to visualize the event with respect to time, place, self- performed actions, and other- performed actions; and, think of sensory and emotional experiences during the event, 2) ask witnesses to report everything they can, even if they only recall partial details (the *report everything* prompt), 3) recall the incident from self- and other- perspectives (the *change perspective* prompt), and, 4) recall the event in a different temporal order, for instance from the end to the beginning (the *change temporal order* prompt). All four of the CI techniques are based on empirically supported memory principles. *Mental context reinstatement* and the *report everything* mnemonics are based on the principle that retrieval is more effective if the features of the encoding and retrieval contexts overlap (i.e., encoding specificity: Tulving & Thomson, 1973). The *change perspective* and *change temporal order* prompts are based on the principle that there are numerous neural pathways to a memory and that memory retrieval is facilitated by employing cues that access different retrieval paths to the to-be-recalled event (e.g., varied retrieval: Tulving, 1974).

The original CI was developed in consultation with law enforcement. Later research with U.S. (Fisher, Geiselman, & Raymond, 1987) and U.K. police (George & Clifford, 1992) revealed that police tended to dominate interviews by interrupting witnesses and employing specific and leading questions that were determined a-priori rather than guided by witness statements. Based on results from field research, Fisher and Geiselman (1992) redeveloped the CI into the Enhanced Cognitive Interview (ECI) to incorporate additional methods for rapport building, establishing the rules and aims of the interview, and transferring control from the interviewer to the interviewee. At the onset of the interview, the interviewer attempts to build rapport by using the witness' name, asking the witness if he/she is comfortable, and using open-ended questions about neutral topics. The interviewer then advises the interviewee of the goals of the interview and introduces the ground rules in which the interviewee is instructed to concentrate on their memory for the event, not to guess, and only report details that they actually remember. To transfer control to the interviewee, the interviewer reminds the witness that he/she has no knowledge of the incident and uses open-ended questions to ensure the witness leads the conversation. The interviewer then introduces the first two CI techniques: *mental context reinstatement* and *report everything* followed by free recall questions, open-ended prompts, pauses between questions, and no interruptions. The interviewer continues with the free narrative questioning style during implementation of the last two CI techniques: *change perspective* and *change temporal order*. At the end of the interview, the interviewer reviews the report with the witness, thanks the witness, reintroduces a neutral topic, and discusses future procedures in the investigation process.

A meta-analysis by Memon et al. (2010) demonstrated that the CI yields more correct information from witnesses than a control interview and the effect is larger for young adults (d = 1.20) than children (d = 0.91). When the CI is used there is also a slight increase in incorrect information reported for both young adults (d = 0.29) and children (d = .07). Memon et al.'s meta-analysis found no differences in the effect sizes obtained when different versions of the CI were employed (e.g., original CI or ECI) or when the characteristics of the control interview varied (untrained or structured interview).

The CI was originally developed for use with adult witnesses; not all of the techniques advocated in the CI may be suitable for use with children. The full CI may be too long (Holliday & Albon, 2004) and difficult for young children to understand (Saywitz, Geiselman, & Bornstein, 1992). Accordingly, some researchers have modified the CI for use with children. In many of these modified versions, the *change perspective* prompt

(Davis, McMahon, & Greenwood, 2005; Hayes & Delamothe, 1997; Holliday, 2003a, 2003b; Memon, Holley, Wark, Bull, & Köhnken, 1996) and the *change temporal order* prompt (Davis et al., 2005; Memon et al., 1996) are removed. One CI mnemonic, mental context reinstatement (MCR), has been shown to be consistently effective across the developmental span and researchers have suggested that MCR is the most effective component of the CI (Memon & Bull, 1991; Milne & Bull, 2002). MCR, when used in isolation or combination with other CI mnemonics, has been shown to elicit more correct information than a standard or control interview with children as young as 4 years (Holliday, 2003a, 2003b; Holliday & Albon, 2004), young adults (Allwood, Ask, & Granhag, 2005; Dietze & Thomson, 1993; Ginet & Verkampt, 2007; Hammond, Wagstaff, & Cole, 2006), and older adults up to 96 years of age (Wright & Holliday, 2007). Several studies have shown that MCR is similarly effective with younger and older children (e.g., Dietze, Powell, & Thomson, 2010; Holliday, 2003a, 2003b). However, Hayes and Delamothe (1997) found that MCR benefited 9- to 11-year-olds more than 5- to 7-year-olds. Although MCR alone increases correct details, MCR has been shown to be most effective with children when used in combination with the *report everything* mnemonic from the CI (4- to 5-year-olds: Holliday & Albon, 2004; 5- to 6-year-olds, 8- to 9-year-olds: Milne & Bull, 2002).

The effectiveness of the MCR prompt with children has also been evidenced in field research comparing MCR to a structured interview protocol, such as the National Institute for Child Health and Human Development (NICHD) protocol employed in many jurisdictions in the U.S. (Lamb et al., 2007). Comparing the CI to a structured interview protocol rather than a standard untrained control group affords experimental control (i.e., the interview is the same as the CI without the four mnemonics). It is important to note that the NICHD interview protocol contains a “tell me everything that happened to you, from the beginning to the end, as best as you can remember" instruction that is similar to the report everything mnemonic from the CI. In two field studies, children (age range: 4- to 13-years) who alleged single and repeated incidents of sexual abuse were interviewed using the NICHD protocol (the quality of the reports depending on event frequency were not examined). In Hershkowitz, Orbach, Lamb, Sternberg, and Horowitz (2001), children either received the NICHD protocol plus MCR instructions or the NICHD protocol only. In Hershkowitz, Orbach, Lamb, Sternberg, and Horowitz (2002), children received physical context reinstatement (i.e., an interview conducted where the alleged crime occurred, MCR instructions, or the NICHD protocol only). Results from these field studies showed that the presence of MCR elicited proportionally more detailed responses to open-ended prompts and fewer details in response to focused prompts when compared to the NICHD control group and physical context reinstatement. Thus, MCR appears to increase both the quantity and quality of reports. The quality improves because responses to open-ended invitations (e.g., "Tell me everything that happened?") are longer and more likely to be accurate than responses to focused prompts (e.g., "Did he touch you?": Dale, Loftus, & Rathbun, 1978; Lamb et al., 1996). Field studies are an essential component of research on the CI because they are ecologically valid. However, base truth cannot be known with absolute certainty; laboratory research provides a test of the effectiveness of CI mnemonics on the accuracy and completeness of reports.

Despite the vast amount of experimental research on the effectiveness of MCR on memory retrieval for single-experienced events, only one laboratory study has examined the effects of MCR on memory for an instance of a repeated event with a child sample (i.e., Drohan-Jennings, Roberts, & Powell, 2010). In Drohan-Jennings et al. (2010), 6- to 7-year-old children participated in four activities that contained variable details with associated options (e.g., children always sat on something, but what they sat on changed during each session). The interview occurred one or four weeks later and children were interviewed with either MCR or a standard interview. During the interview, children in both the MCR and standard interview conditions were asked about the final (fourth) instance in an unbiased and then biased manner. First, participants responded to free recall questions (unbiased manner). Then, children engaged in the biased portion of the interview in which they were asked cued recall questions that referred to true details that occurred during the last instance of the activity (e.g., "did you sit on a garbage bag?") as well as misleading questions that referred to details that were either consistent (e.g., "did you sit on newspaper [flat object on the floor]?") or inconsistent with the activity (e.g., "did you sit on a wooden chair?"). One day after the biasing interview, children answered recognition questions about the last activity. The authors only reported data from the recognition questions. Results from recognition questions pertaining to the biased interview showed that children interviewed with MCR were less suggestible about the false-consistent than false-inconsistent details provided during the biasing interview whereas children in the standard interview condition were similarly suggestible to both types of false details; this effect was only evidenced at the 1- week delay. Given that children are generally more suggestible to details that are consistent with the theme of the event than inconsistent (Connolly & Price, 2006; Roberts & Powell 2006), Drohan-Jennings et al. concluded that MCR has beneficial effects on children's resistance to suggestions related to instances of a repeated event. In the current research, I will study developmental differences on recall for instances of a repeated event in an unbiased interview using free and cued recall. This has not been reported in the literature.

The effects of MCR on adult's memory for instances of a repeated event have recently been examined in field studies (Leins, Fisher, Pludwinski, Rivard, & Robertson, 2014; Rivard, Fisher, Robertson, & Mueller, 2014). Rivard et al. (2014) used interviewers and interviewees from the Federal Law Enforcement Training Center in the US (Interviewees' *M*age = 47.6 years). Interviewees attended between one and five training meetings on different types of operations (surveillance, search warrant, undercover, investigative interviewing) and were interviewed about the contents of one of the meetings. At the onset of the interview, interviewers identified the target meeting for the interviewee by indicating the type of meeting, the trainee group number, the date, and time of the meeting. Participants were interviewed according to the CI protocol or the five-step interview protocol used by the Federal Law Enforcement Training Center. The CI and the five-step interview protocol have considerable overlap, but those interviewed with the CI were given additional retrieval prompts. Specifically, participants in the CI group were given a set of instructions at the onset of the interview: MCR prompt, asked to retrieve details multiple times, sketch the target instance, and narrate while doing so. Rivard et al. found that the CI resulted in an 80% increase in episodic information over the five-step interview and proportionally fewer script details; in other words, the CI apparently enabled interviewees to access memory for the target episode rather than memory for the general event. Importantly, these effects did not vary as a function of the delay to test, which ranged from 3 to 43 days.

Leins et al. (2014) interviewed college students about family events. Family events were defined as those that included at least three participants and at a frequency of less than one time per week. Leins et al. examined the effects of the CI in comparison to a control interview (Experiment 2). In Phase 1, all participants labeled family events (e.g., this family member's wedding that occurred at this location at this exact/approximate time). Interviewers then provided participants with several mnemonics to facilitate recall of additional family events, such as providing a "think again" prompt each time participants claimed their memory was exhausted until 30 seconds transpired and a new event was not reported, asking participants to create a family tree and think about each person in the family tree, and asking participants to create a timeline of family events and fill in any additional events in gaps in the timeline. Participants were also asked to think about normative family events (e.g., birthdays and weddings) and additional events, such as those where they felt happy or sad. Phase 2 occurred two days after Phase 1 and participants were randomly assigned to a CI or control interview. Participants recalled one of the family events the interviewer confirmed occurred within six months of the date of the interview. Participants in the control condition were instructed to freely recall the event in as much detail as they could and received one prompt from the interviewer during free recall (think again and report any more details). Those who received the CI received the same instructions in addition to the following: they possessed all knowledge of the event and would be doing most of the talking (prior to free recall), to close their eyes and take some time to think about any sensory details from a moment randomly selected by the interviewer (MCR; after free recall as an additional prompt), then to provide a sketch on a whiteboard of the location's layout and describe that sketch. Similar to the control group, participants were asked one final time if they could remember any additional details. When free recall was apparently exhausted, all participants answered 12 cued recall questions. The interviewers corroborated the time and location of events with another attendee (95% of events reported in free recall and 92% of events reported in response to mnemonics were corroborated).

Details were coded into one of four categories: setting, people, actions, and conversations. Participants who received the CI provided twice as many details across all categories except setting details which were reported four times more often than control participants. These results suggest that the CI can help witnesses recall details about one time of a family event and perhaps more details related to discrete instances (for similar findings, see Willén, Granhag, & Strömwall, 2016; Willén, Granhag, Strömwall, & Fisher, 2016.

Leins et al.'s (2014) and Rivard et al.'s (2014) findings that CI techniques increased recall of episodic details for an instance of a real-life repeated event has important implications for interviewing complainants of alleged repeated abuse; however, some caution must be taken in generalizing these findings to complainants of repeated crimes. Despite the high ecological validity of Rivard et al.'s study, base truth about the target event was not known; interviewee-reported details were corroborated using supplemental information provided by the Federal Law Enforcement Training Center and only 10% of all reported details were verifiable. Other notable limitations include that participants did not experience the same number of events, were not matched on prior experience with such meetings, and were asked to recall different episodes. Additionally, and possibly most importantly, the characteristics of the events differed across participants. Within each meeting various unique and unpredictable things occurred: different content was learned, the trainees and trainers were not the same across meetings, and the number of people in each meeting was not held constant. It is possible that the event itself (i.e., those particular meetings) was not actually represented as a repeated event in memory; each meeting may have been represented as a novel or single event. Notwithstanding these limitations, this research is encouraging with respect to the use of CI mnemonics to help individuals access memory for an instance of a repeated event. However, there remains one critical possibility that this research does not address—the increase in the number of details participants report when provided with the CI, MCR only, and other mnemonics are details that occurred across instances of the event rather than details that occurred in the target instance only.

Price, Connolly, and Gordon (2016) and Woiwod et al. (revised and resubmitted) argued that defining accuracy for repeated-event children to include reports of all experienced details (i.e., a broad definition of accuracy) is preferred for two reasons. First, it is consistent with how memory for repeated events is stored and recalled based on schema theory. In fact, Woiwod et al. (revised and resubmitted) conducted a meta-analysis on studies in the repeated-event literature and found that when a broad definition was used, repeated-event children were similarly accurate to single event children in both free and cued recall. Second, a broad definition is consistent with jurisdictions where repeated abuse may be charged as a continuous offense because such jurisdictions do not require children to report each instance separately (Woiwod & Connolly, 2017). To date, the repeated-event literature has used a narrow definition of accuracy primarily because jurisdictions where discrete acts of repeated abuse are charged require particularization of instances. If MCR does not increase the number of correct details recalled about a target instance but actually increases the number of details reported that occurred across instances of the event, MCR may only be beneficial when continuous abuse is charged.

There is much support for the efficacy of MCR in helping individuals to recall details of a past event. However, there are inconsistent findings in the literature as to whether the presence of MCR is comparably effective at increasing the accuracy of reports in younger and older children and research on its effectiveness in helping witnesses to recall an instance of a repeated event is still in its infancy. An important objective of the current research is to advance this research and examine the possibility that MCR enhances the number of experienced details reported that occurred across instances rather than details that occurred in a target instance.

The Present Study

The present research aims to address multiple gaps in the literature pertaining to memory for instances of a repeated event, the benefits of MCR on recall of instances, and how these effects vary in younger and older children. Younger and older children participated in five magic shows with a deviation instance in the middle (third) instance. After a one-week delay from the target instance, children were asked to recall the first, deviation, or last instance and answered free and cued recall questions about the target instance as well as cued recall questions about the deviation. Some children also received MCR during recall.

The present research examined four primary questions:

1) *Which instance of a repeated event is remembered best?*
2) *Does the presence of mental context reinstatement facilitate younger and older children's recall of instances of a repeated event?*
3) *Does the presence of mental context reinstatement facilitate younger and older children's recall of a deviation?*
4) *When accuracy is defined broadly to include all experienced details, does the presence of mental context reinstatement increase the number of experienced details reported?*

I hypothesize that older children will provide a greater number of correct details during recall of the target instance (free and cued) and deviation (cued) than younger children.

As previously discussed, there is not enough research to make predictions pertaining to differences in the effects of MCR between younger and older children's recall of a deviation or instances of a repeated event; therefore, I simply ask if MCR has an effect and examine possible age differences.

Method

Participants

The final sample consisted of 348 participants (193 boys and 155 girls) from 32 classes in 6 elementary schools in the Greater Vancouver Area. Participants were 172 younger children (kindergarten/Grade 1: *M*age = 70.31 months, *SD* = 6.79 months; range = 58-85 months) and 176 older children (Grade 3/Grade 4: *M*age = 104.78 months, *SD* = 7.63 months; range = 87-121 months). Of 378 children who signed up for the study, 12 were absent on Wednesday (the deviation instance), 14 were absent on two or more days, 2 were excluded because they could not complete the interview, 1 was excluded because he/she was inadvertently interviewed about a day that he/she was absent, and 1 was excluded for showing a clear "don't know" bias (i.e., the child said "don't know" to 18 out of 19 cued recall questions asked about the target instance and the deviation). Participants who missed one day (n = 9) were included in the study if the one day they missed was not a Wednesday. Participants who missed Wednesday were excluded because previous research has shown that the presence of a deviation enhances memory for all instances (e.g., Connolly et al., 2016) and the deviation in this study always occurred on Wednesday.

Design and Procedure

The design was a 2(Age: kindergarten/Grade 1, Grade 3/Grade 4) x 2(MCR: present, absent) x 3(Instance: first, last, deviation) between-subjects factorial design.

Magic Shows. Each magic show took approximately 15 minutes and was performed in children's classrooms by the same magician, "Dazzling Dylan" (an undergraduate research assistant trained by the author). Magic shows occurred once daily (Monday through Friday for a total of five magic shows). As shown in the far-left column in Table 1, there were 12 variable details with associated options (listed in the next six columns), that changed across instances. Children received one option of the variable detail during each instance for a total of five options presented for each variable detail. Table 1 shows six options for each variable detail because one set of options served as suggestions during a follow-up interview that is not relevant to the present study. There were two option orders to partially counterbalance the presentation order of variable options (children either saw presentation order A, B, C, D, E or presentation order F, C, D, E, B on Monday, Tuesday, Wednesday, Thursday and Friday, respectively).

At the beginning of the show, all children received an admission ticket to the magic show of the day with a unique item on the ticket (pebble, sponge, sand paper, fur, seashell, or pom pom) that they were instructed to touch to feel the texture of the item on the ticket. The magician then prepared to begin the show by removing her (sunglasses, ring, scarf, sweater, gloves, or backpack). Next, the magician instructed the children that they must warm-up for the show and led the children in a warm-up exercise (stretching, jumping jacks, running in place, air punches, hopping on one leg, or arm circles). After the warm-up exercise, the magician put on her "magic hat" for the day (straw hat, cowboy hat, police hat, baseball cap, fireman hat, or chef hat) and gave each child a magic item (handkerchief, bracelet, diamond, wand, fan, or coin). The magician said she had to do a few things before she could show children the trick: she needed a drink of her juice (colored water described as red cherry, yellow lemon, blue blueberry, orange mango, green apple, or pink grapefruit); she had to get out her stuffed assistant to help her with the show (elephant, bear, tiger, horse, gorilla, or cow); she had to put on music to set the stage for the show (drums, trumpet, violin, guitar, piano, or flute); and, she needed the children to help say the magic words of the day aloud while she performed the trick (presto chango, shazam, abra cadabra, hocus pocus, bippity boppity boo, or open sesame). The magician then performed the trick of the day (disappearing ball, mystery box, egg pouch, appearing flower, color blendo, or change bag), which served as a cue to the instance during the recall interview and was not a critical detail. The magician taught the children how to perform the trick and the children were rewarded for being good listeners by getting a sticker from the magician on a different part of his/her body (leg, cheek, hand, shoulder, forehead, or foot). The magician then cleaned up her things and told the children that she wanted to tell them a secret about herself because telling her secret will make her feel better (I did not do very well on a test last week, I lost my Mom's keys, I slept in and missed class, I accidently broke a cup yesterday, I ripped my favorite jeans, or I forgot to do my homework). The magician told the children she felt great, thanked them for listening, and ended the show by performing a special goodbye gesture with the children (wave, curtsey, bow, thumbs up, clap, or spirit fingers). During the show, the magician stated each option of the variable detail three times.

Deviation. All participants received a deviation in the middle (third) instance. During the deviation, a confederate interrupted the show after the warm-up exercise and the following occurred (children's memory for the items presented in italics were tested): 1) The confederate came in carrying a *skipping rope*; 2) the magician stated the *confederate's name*; 3) the confederate claimed to need help because she cast a *disappearing spell* on herself; 4) the magician looked for the magical *necklace* that would help break the spell; 5) the magician found the magical necklace and claimed it was special because it was the color *red*; 6) the magician put the necklace on the confederate and spun the confederate around *three* times in order for the spell to be broken; and, 7) the confederate thanked the magician for breaking the spell by handing her an *invitation to her costume party*. The confederate's interruption made the magician fall behind schedule. The magician became clumsy and forgetful throughout the remainder of the show, thus, changing the way the associated options were experienced. For example, the magician dropped props and forgot how to do the magic trick properly that day. The magician apologized several times throughout the show for her clumsy behavior and noted she was rushing because she was running late after helping her friend.

Interviews. Participants were asked to describe the target instance (the first, last, or deviation instance) and the deviation after a one-week delay from the target instance; therefore, the delay between the deviation and recall of the deviation details differed depending on the condition. As noted in the Glossary, the deviation instance includes the predictable, variable details whereas the deviation details are unpredictable and examined separately. The instance that participants recalled was blocked by classroom. Therefore, all children in a particular classroom were assigned to one of the two presentation orders of magic shows (discussed in the section below). This was done for two reasons: 1) to minimize classroom disruptions during interviews so that all interviews occurred on one day for a given classroom and 2) to control for delay-to-test such that all participants were interviewed one week after the target instance. Participants were randomly assigned to MCR (present/absent conditions). Each participant was interviewed individually by one of several trained research assistants the child had not met. Participants were interviewed about the event in a different location from where they saw the shows (i.e., not in their classrooms) and interviews were either video or audio recorded depending on parental consent and child assent. All participants received an adapted version of the NICHD interview protocol (Orbach et al., 2000) that includes a presubstantive phase before the substantive phase (the full interview protocol is shown in Appendix B). For half the participants, the presubstantive and substantive phases contained the structured interview protocol only; for the remaining participants, these portions also contained MCR instructions adapted from Hershkowiz et al. (2001). Participants answered free recall questions followed by 12 cued recall questions, one for each of the 12 variable details in the target show (e.g., "During the [first time, last time, time that something different or surprising occurred], you did a warm-up exercise. What warm-up exercise did you do?"). Participants were then asked seven additional cued recall questions about the deviation. To help keep children motivated during the interview, each child was given a SFU "super rememberer" certificate with his/her name on it and given the opportunity to choose two stickers to put on his/her certificate (one after completing the presubstantive interview phase and one after completing the substantive interview phase). Upon completion of the interview, children were asked to pick out a special prize (e.g., a pencil valued at about $2).

Presubstantive phase. In accordance with the NICHD protocol, the purpose of the presubstantive portion was to greet the interviewee, explain the purpose of the interview and the importance of telling the truth, provide instructions (referred to as "ground rules"), develop rapport, and practice describing a neutral event (Hershkowitz et al., 2001). The presubstantive phase of the interview also included recent interviewing recommendations for alleged victims of repeated abuse to practice retrieving specific instances of a repeated event (Brubacher et al., 2014). Upon greeting the participant, the interviewer explained that the purpose of the interview was to discuss one of the magic shows. The interviewer began the interview by saying, "I was not there when you learned the magic tricks and I would like to know what happened during one of the magic shows. I have to ask you all of the questions that I brought with me, but I would like to tell you how to answer my questions first. It is important that you tell me the truth and only tell me things that really happened. If I ask a question that you don't understand, just say, 'I don't understand.' If I ask a question, and you don't know the answer, just tell me 'I don't know.' When you don't know the answer, don't guess—say you don't know. But, if you know the answer, be sure to tell me. If I say things that are wrong, you should tell me." After providing the instructions, the interviewer transitioned to the rapport-building phase with the prompt, "I would like to get to know you better" and the interviewer asked the child to tell him or her everything about a favorite place he/she goes with his/her family (this question was asked to avoid TV and fantasy).

Participants then practiced recalling an instance of a neutral, repeated event. Participants were asked to describe the first time/last time/or a time that something different or surprising happened in gym class[2] this year depending on the instance children were assigned to recall during the interview (e.g., "Think hard about what happened the first time/last time/a time that something different or surprising happened in gym class this year and tell me about everything that happened from beginning to end, as best as you can remember"). After the children provided a description, the interviewer provided one follow-up utterance ("Tell me what else you can remember?").

[2] As confirmed by children's teachers, all children in this study participated in gym. When several young children were directed to recall a time in gym glass, some indicated they didn't know what gym class was. The interviewer then referred to "gym" as physical education class. If the child remained unclear about gym/physical education class, the interviewer asked the child to recall a time in art or music class.

Participants assigned to the MCR present condition received the MCR instruction prior to recalling a specific instance at gym. For example, when describing the first time in gym class, participants who received MCR were asked: “Close your eyes and think about the first time in gym class as if you were there again. (Pause). Think about where you were (Pause), think about what was happening around you (Pause), think about all of the things you felt (Pause), think about what special smells you could smell (Pause), and think of what sounds or voices you could hear (Pause). Think about all of the things you did and all of the people who were there (Pause). Open your eyes.”

After the practice phase (approximately 5 minutes), participants were asked to pick a sticker to put on their SFU certificate. Then, participants were guided to the substantive portion of the interview with the prompt “Now that I know you a little better, I would like to talk with you about one of the magic shows you learned with Dazzling Dylan.”

Substantive phase. The substantive portion of the structured interview began with the interviewer reminding the participant to concentrate, to report everything he/she can remember about the show, and the ground rules.

The interviewer proceeded to the free recall portion of the interview using the instance label (the first time, the last time, the time that something different or surprising happened). The interviewer ensured that the participant believed he or she was recalling the correct instance because after the participant was given the instance label, the participant was asked to describe the magic trick learned during that instance. If the child nominated the wrong instance, the interviewer provided the name of the magic trick and asked the child if he/she remembered that instance. The interview continued when the child confirmed he/she remembered the target instance.

Participants were directed to recall everything he/she could remember about the target instance from beginning to end. Those in the MCR present condition, were given MCR instructions prior to being directed to freely recall everything that occurred in the instance from beginning to end. As shown in Appendix B, the MCR instruction began by asking participants to "Close your eyes and think about [the first time, the last time, the time that something different or surprising happened], as if you were there right now…" and proceeded as closely as possible to the MCR instruction participants received in the presubstantive phase.

If participants paused for approximately seven seconds during free recall, a follow-up prompt was provided (there were two follow-up prompts). The first prompt interviewers asked was "I don't want you to leave anything out. Tell me what else you can remember." The second prompt was "You've told me a lot, and that's really helpful. To be sure I understand, please start at the beginning and tell me exactly what happened from beginning to end."

Once the child's memory for the instance was apparently exhausted during free recall (approximately seven seconds of silence), the child was asked 12 cued recall questions about the instance, followed by seven cued recall questions about what happened when the confederate interrupted the show. Participants who received MCR were given the final MCR instruction prior to recall of the deviation that advised participants to "Close your eyes and think about what happened when a different magician interrupted the show, as if you were there right now…" and proceeded similar to the two previous instructions (see Appendix B for the full MCR instruction administered prior to cued recall of the deviation).

If participants paused for seven seconds during cued recall, one prompt was provided per question (e.g., “Try to concentrate”). Participants who provided multiple responses to a cued recall question (e.g., listing multiple options of the stuffed assistant) were asked to pick the one option that occurred in the target instance. Interviews ranged from approximately 10 to 30 minutes. At the end of the interview, each participant was thanked, asked to pick out a sticker to put on his/her certificate, and pick out a prize.

Coding. Responses to free and cued recall questions about the instance were transcribed verbatim from the audio or video recording and coded into one of the following categories.

1) Correct: the option that was experienced during the target instance (e.g., “We got a ticket with a sponge on it”).

2) General: the category name for the detail (e.g., “We got a ticket”).

3) Within-instance intrusion: an option that was experienced during the target instance, but was from a different variable detail (e.g., reporting an option of the magic item when describing what was on the magic show ticket).

4) Internal intrusion: an option that was experienced during a non-target instance (e.g., “We got a ticket with a seashell on it” when the correct answer was “sponge”).

5) External intrusion error: an option that was not experienced during any of the instances (e.g., the magician drank pear juice, but the magician did not drink pear juice in any of the instances).

6) Off-topic: (e.g., talking about something that did not happen at one of the magic shows, such as painting a picture or what the child did over the weekend)

7) Denial: denying that the critical detail had occurred (e.g., in free recall, making a statement such as "During the last time, we did not get a magic show ticket" or stating "We did not get a magic show ticket" when asked what was on the magic show ticket in cued recall).

8) Don't know (e.g., in free recall, the child may say "We got a magic item and I don't know what it was" and saying "don't know" when asked a cued recall question).

Deviation details that were reported during free and cued recall about the deviation were coded following the same criteria with the following modifications. A within-instance intrusion was coded when children attributed an option of a variable detail that occurred in the deviation instance to a deviation detail. For example, this type of error was coded when children attributed the magic item they received during the instance (e.g., a diamond) with what Dazzling Dylan put on the confederate to help break the disappearing spell (i.e., a necklace). An internal intrusion was coded when children reported an option of a variable detail that occurred in any of the other instances (i.e., not the "time that was different or surprising"). For example, an internal intrusion was coded when a child reported that the confederate magician came in carrying a handkerchief during the deviation (an option that occurred in the first instance) when the correct answer was skipping rope.

There were three coders who were trained by the author. One of the three coders, referred to as the primary coder, was involved in the coding of both free and cued recall. The primary coder conducted intercoder reliability with the second coder on 20% of the free recall data (the rest of the free recall data were coded by the second coder). The primary coder conducted intercoder reliability with the third coder on 20% of the cued recall data and the primary coder and the third coder coded the balance of the cued recall data. Coders were blind to the hypotheses. The author checked for drift in coding by reviewing and discussing the free and cued recall coding on at least a bi-weekly basis with the coders. Percent agreement (i.e., number of agreements / (number of agreements + number of disagreements) x 100%) was used to assess reliability in free recall. For free recall, percent agreement is a more appropriate measure than Kappa because the number of responses are not bounded and can vary across children's reports (e.g., number of options reported). For cued recall, data are bounded so Kappa was used to measure inter-rater reliability.

Due to technical error, audio/video recordings and/or transcriptions were not available for 11 interviews so free and cued recall responses were coded from the responses written on the package used during the interview. Interviewers were instructed to write down all details stated by the child; the interviewer's written record of the interview has been the sole record of responses in previous studies (e.g., Connolly et al., 2016). Intercoder agreement was 89.11% for free recall. Cohen's κ revealed very high agreement between two independent coders for cued recall questions about the target instance (κ = .934, p < .001, 95% CI % [.91, .96]), and cued recall questions about the deviation (κ = .939, p < .001, 95% CI [.91, .97]). All disagreements were resolved through discussion and the agreed upon code was retained.

Results

Preliminary Analyses

Interviewer's prompts to the target instance. Interviewers were directed to ask children to recall everything he/she could remember about the target instance from beginning to end, as well as two follow-up prompts during free recall (see Appendix A).

In other words, interviewers were instructed to provide three specific prompts during free recall. To ensure the interviewers followed the protocol, we coded the number of prompts the interviewers actually provided to each interviewee during free recall. It was not possible to check if the interviewer provided prompts for the 11 interviews that were coded from the package; therefore, there were 337 interviews suitable for these analyses. Of the 337 interviews, 26 interviewers did not provide any of the three specific prompts to the target show as specified in the interview. Of the 311 interviewers who provided at least one of the three specific prompts, most provided three prompts (M = 2.14, SD = .82; mode = 3; range = 1-4 because two interviewers repeated one of the prompts in the protocol). Of the 26 interviewers who did not provide any of the three specific prompts noted in the protocol, 16 prompted the child specifically to the target show at least one time using an adlibbed prompt (M = 1.31, SD = 1.46; range = 1 to 5 specific adlib prompts to the target show). For example, an interviewer who said “I want you to tell me about the first show when you learned the Disappearing Ball Trick” provided a specific prompt to the show, but it was an adlib because that prompt was not stated in the protocol. Therefore, only 10 children out of the 337 verifiable interviews were not provided with a specific prompt to the target show; they were either directed to recall the trick during free recall or the interviewer simply proceeded to cued recall.

Of the 327 participants whose interviewer provided at least one specific prompt to the target show, we examined if the total number of prompts affected children’s responses in free recall. Not surprisingly, the total number of specific prompts the interviewer provided whether they were adlibbed or as written in the protocol (n = 327) was positively correlated with the total number of don't know responses children reported in free recall, $r = .182$, $p < .001$. The total number of specific prompts the interviewer provided was not related to the total number of correct responses, internal intrusions, external intrusions, general responses, or off-topic responses and so number of prompts, when at least one was provided, is not considered further.

Main analyses

The data for free recall does not contain data from the 10 participants whose audio/video recording of the interview demonstrated the interviewer did not ask at least one specific prompt to the target show (as specified in the interview protocol or adlibbed). Therefore, 338 participants were included in the free recall analyses. The cued recall data contains all participants from the full sample (N = 348). Table 2 shows the ns in each of the 12 conditions for free and cued recall.

Response types about the target instance and deviation were analyzed using 2(Age: kindergarten/Grade 1, Grade 3/Grade 4) x 2(MCR: present, absent) x 3(Instance: first, last, deviation) between-subjects ANOVAs. All tests were non-directional and alpha was set at .05 unless otherwise specified. LSDs were used for all post hoc tests because this method has been identified as sufficient for Type 1 error control when an omnibus ANOVA is significant (Keselman, Games, & Rogan, 1979).

There were several response types that were too infrequent to analyze: 1) denials (cued recall of the target instance and deviation), 2) off topic responses (free and cued recall of the target instance and cued recall of the deviation), 3) within-instance intrusions (free and cued recall of the target instance), 4) general details (cued recall of the target instance and deviation), and 5) internal intrusions during cued recall of the deviation.

Denials were only applicable during cued recall of the target instance and deviation. In cued recall of the target instance, 10 participants made a denial (range for all participants = 0-2). During cued recall of the deviation, 27 participants denied one of the deviation details occurred (range for all participants = 0-4).

When children were asked to recall the target instance, three participants made an off-topic response in free recall (range for all participants = 0-3) and three participants made an off-topic response in cued recall (range for all participants = 0-1). In response to cued recall questions about the deviation, seven participants made an off-topic response (range for all participants = 0-1).

In free recall, only one participant made a within-instance intrusion. Thirty-three participants made a within-instance intrusion in cued recall (all participants: $M = .11$, $SD = .38$; range = 0-3; mode = 0). When within-instance intrusions are combined with correct responses, the pattern of results for correct responses does not differ from that described below. Therefore, within-instance intrusions are only reported in analyses pertaining to deviation details.

Only nine participants provided a general response in cued recall of the target instance (range for all participants = 0-2; mode = 0). Therefore, analyses were only run for this response type in free recall of the target instance. During cued recall of the deviation, general responses are not considered because only five participants in the entire sample provided a general detail about the deviation.

During cued recall of the deviation, internal intrusions were coded (internal intrusions represent recall of a detail that occurred in one of the magic shows) but were only reported by 28 participants so this response type was not analyzed.

Results are organized according to the response category and each category contains data for free and cued recall responses unless otherwise noted above. Means and standard deviations are shown in tables: Tables 3 through 11 for free and cued recall of the target instance; Tables 12 through 14 for responses during cued recall of the deviation; Tables 15 and 16 for a broad definition of accuracy to include all experienced details reported during free and cued recall of the target instance. All other descriptive statistics are reported in text. In free and cued recall, the maximum number of critical details a child could report that occurred in the target instance was 12, and the maximum number of critical details a child could report about the deviation was seven.

Responses to the Target Instance.

Correct Responses. Descriptive information across conditions for the number of correct details children provided in free and cued recall is shown in Tables 3 and 4 respectively. In free recall, 104 of 338 participants provided one or more correct details about the target instance (range for all participants = 0-7 correct details). Of those who provided one or more correct details in free recall, 30 were younger and 74 were older participants. In free recall, there was a main effect of age, $F(1, 326) = 29.85$, $p < .001$, $\eta_p^2 = .084$ that was qualified by an Age x Instance interaction, $F(2, 326) = 4.12$, $p = .017$, $\eta_p^2 = .025$ (Figure 1 displays the interaction). Simple effects tests ($\alpha = .025$) showed that older children recalled the first instance more accurately than younger children, $F(1, 326) = 28.05$, $p < .001$, $\eta_p^2 = .079$, 97.5% CI [.653, 1.619] and the last instance more accurately than younger children, $F(1, 326) = 7.53$, $p = .006$, $\eta_p^2 = .023$, 97.5% CI [.109, 1.105]. Older and younger children did not differ in the number of correct details reported about the time that was different, $F(1, 326) = 1.90$, $p = .169$, $\eta_p^2 = .006$, 97.5% CI [-.181, .752]. There was a main effect of instance, $F(2, 326) = 14.33$, $p < .001$, $\eta_p^2 = .081$; children recalled the first instance more accurately than the last, $p = .001$, and the time that was different, $p < .001$, but recall of the last instance and the time that was different did not differ, $p = .073$. No other effects were significant.

In cued recall, 331 children provided at least one correct detail about the target instance. Of the 176 older children, 42 reported half (six or more) of the critical details to the target instance correctly (range for all participants = 0-11; mode = 4) whereas 25 of the 172 younger children reported half of the critical details about the target instance correctly (range for all participants = 0-9; mode = 3). I observed the following main effects: 1) age, $F(1, 336) = 13.98$, $p < .001$, $\eta_p^2 = .040$, 95% CI [.362, 1.167] with older children recalling more correct details than younger children; and, 2) instance, $F(2, 336) = 47.59$, $p < .001$, $\eta_p^2 = .221$, with post hoc tests indicating the first instance was recalled most accurately, *p*s < .001, and the last instance was recalled more accurately than the time that was different, $p < .001$.The main effect of MCR was not significant, $F(1, 336) = 0.06$, $p = .800$, $\eta_p^2 = .000$, 95% CI [-.351, .454]. However, as shown in Figure 2, there was a trend toward an interaction between instance and MCR, $F(2, 336) = 2.63$, $p = .073$, $\eta_p^2 = .015$. As the effect of MCR on children's recall of instances was a primary question of interest in the present study, I interpreted the interaction. Follow-up tests (α = .025) revealed a trend for children who recalled the first instance to be more accurate when MCR was absent than present, $F(1, 336) = 3.62$, $p = .058$, $\eta_p^2 = .011$, 97.5% CI [-.124, 1.484]; there were no other differences. No other interactions approached significance, all *p*s > .22.

Internal Intrusions. Descriptive information across conditions for the number of internal intrusions children provided in free and cued recall is shown in Tables 5 and 6 respectively. Ninety-six participants made one or more internal intrusions in free recall (range for all participants = 0-5; mode = 1). In free recall, there was a main effect of age: older children reported more internal intrusions than younger children, $F(1, 326) = 21.78$, $p < .001$, $\eta_p^2 = .063$, 95% CI [.264, .649]. There was a main effect of MCR, $F(1, 326) = 5.78$, $p = .017$, $\eta_p^2 = .017$, 95% CI [.043, .428] and a main effect of instance, $F(2, 326) =$

4.17, p = .016, η_p^2 = .025 that was qualified by a significant three-way interaction among age, instance, and MCR, $F(2, 336) = 3.64$, p = .027, η_p^2 = .022. Two 3(Instance) x 2(MCR) follow-up ANOVAs were conducted to examine the interaction—one for each age group (α = .025). The mean number of internal intrusions across conditions in free recall are shown in Figures 3 and 4 for younger and older children, respectively. Among younger children, the main effect of instance approached significance, $F(2, 162) = 3.53$, p = .032. LSD post hoc tests showed that younger children who recalled the last instance reported more internal intrusions than children who recalled the first instance, p = .015 and marginally more internal intrusions than children who recalled the time that was different, p = .031; the number of internal intrusions younger children reported did not differ between the first and time that was different conditions, p = .747. The main effect of MCR was significant, $F(1, 162) = 10.20$, p = .002, 97.5% CI [.097, .570]; younger children who received MCR provided a greater number of internal intrusions than younger children who did not receive MCR. The interaction between MCR and instance recalled was not significant, $F(2, 162) = 2.85$, p = .061. Among older children, no effects were significant: instance, $F(2, 164) = 1.709$, p = .184; MCR, $F(1, 164)$ = .691, p = .407; MCR x Instance interaction, $F(2, 164) = 1.578$, p = .209.

Three hundred and thirty-eight participants made one or more internal intrusions in cued recall (range for all participants = 0-11; mode = 6). Younger and older children were equally likely to make internal intrusions, $F(1, 336) = 0.50$, p = .480, η_p^2 = .001, 95% CI [-.287, .610]. There was a main effect of instance, $F(2, 336) = 61.28$, $p < .001$, η_p^2 = .267; LSD post hoc tests showed that children who recalled the time that was different reported the greatest number of internal intrusions in comparison to those who recalled the first, $p < .001$, and last instance, $p < .001$, and those who recalled the last instance reported more internal intrusions than those who recalled the first instance, p <

.001. The main effect of MCR approached significance, $F(1, 336) = 3.42$, $p = .065$, $\eta_p^2 =$ .010, 95% CI [-.871, .027] and, as shown in Figure 5, was qualified by an interaction between instance and MCR, $F(2, 336) = 6.55$, $p = .002$, $\eta_p^2 = .038$. Simple effects tests ($\alpha = .025$) showed that children who recalled the first instance provided more internal intrusions when MCR was present than when MCR was absent, $F(1, 336) = 15.36$, $p <$ .001, $\eta_p^2 = .044$, 97.5% CI [.663, 2.456] whereas participants provided a similar number of internal intrusions when MCR was present and absent in the other conditions, *p*s > .30. No other effects were significant.

External Intrusion Errors. Descriptive information across conditions for the number of external intrusions children provided in free and cued recall is shown in Tables 7 and 8 respectively. Sixteen participants made one or two external intrusion errors in free recall (range for all participants = 0-2 external intrusion errors; mode = 0) whereas 127 participants (36% reported one or more external intrusions errors in cued recall (range = 0-4; mode = 0). External intrusions were rare in free recall and so were not analyzed.

In cued recall, there were no significant main effects. However, there was a significant Age x MCR interaction, $F(1, 336) = 4.75$, $p = .030$, $\eta_p^2 = .014$. Simple effects tests ($\alpha = .025$) revealed that when MCR was absent, there was a trend for younger children to provide more external intrusions than older children, $F(1, 336) = 3.158$, $p =$ .076, $\eta_p^2 = .009$, 97.5% CI [-.055, .463]. When MCR was present, younger and older children provided a similar number of external intrusion errors, $F(1, 336) = 1.699$, $p =$ .193, $\eta_p^2 = .005$, 97.5% CI [-.407, .108]. Although this suggests that MCR increased older children’s external intrusion errors relative to younger children, caution is warranted in interpreting this effect.

General Details. General details were the most common response type in free recall. One hundred ninety-eight children provided one or more general details about what usually occurred across instances of the magic shows (range for all participants = 0-8; mode = 0) rather than details about what occurred during the target instance. There was a main effect of age, $F(1, 326) = 36.58$, $p < .001$, $\eta_p^2 = .101$, 95% CI [.917, 1.801]; older children were more likely to provide general details than younger children. There was a main effect of instance, $F(2, 326) = 3.68$, $p = .026$, $\eta_p^2 = .022$. LSD post hoc tests indicated that participants who recalled the first instance provided a greater number of general details than those who recalled the last, $p = .015$, and the time that was different, $p = .037$, whereas those who recalled the last time and the time that was different did not differ, $p = .664$. No other effects were significant. Means and standard deviations pertaining to general responses in free recall across conditions is shown in Table 9.

Don't Know Responses. Tables 10 (free recall) and 11 (cued recall) display the means and standard deviations for don't know responses across conditions. One hundred eighty-four participants provided a don't know response one or more times during free recall (range for all participants = 0-6; mode = 0). As shown in Figure 6, there was a significant Age x Instance interaction, $F(2, 326) = 3.70$, $p = .026$, $\eta_p^2 = .022$. Follow-up tests ($\alpha = .025$) showed that younger children provided more don't know responses to the first instance than older children, $F(1, 326) = 8.71$, $p = .003$, $\eta_p^2 = .026$, 97.5% CI [.146, 1.088]. There were no other reliable differences between younger and older children who recalled the time that was different, $p = .501$, 97.5% CI [-.591, .319], or the last instance, $p = .959$, 97.5% CI [-.474, .496]. No other effects were significant, *p*s from .058 to .863.

Two hundred and seventy-two participants provided a don't know response one or more times during cued recall (range for all participants = 0-12; mode = 1). There was a main effect of age, $F(1, 336) = 4.79$, $p = .029$, $\eta_p^2 = .014$, 95% CI [.051, .953] because younger children provided more don't know responses than older children. There was a trend toward a main effect of instance, $F(2, 336) = 2.33$, $p = .099$, $\eta_p^2 = .014$; LSD post hoc tests revealed a trend for children who recalled the first instance to provide more don't know responses than those who recalled the time that was different, $p = .060$, and the last instance, $p = .057$; the last instance and the time that was different did not differ, $p = .956$. As illustrated in Figure 7, there was a significant Instance x MCR interaction, $F(2, 336) = 3.04$, $p = .049$, $\eta_p^2 = .018$. Simple effects tests ($\alpha = .025$) showed that children who recalled the first time provided more don't know responses when MCR was absent than present, $F(1, 336) = 9.17$, $p = .003$, $\eta_p^2 = .027$, 97.5%CI [.311, 2.114]; however, there was no difference when MCR was absent versus present for children who recalled the time that was different, $F(1, 336) = .41$, $p = .522$, $\eta_p^2 = .001$, 97.5% CI [-.626, 1.124] or the last time, $F(1, 336) = 0.13$, $p = .719$, $\eta_p^2 = .000$, 97.5% CI [-1.051, .761].

Responses to the Deviation.

Children who were asked to report the first or last instance rarely recalled deviation details during free recall. In fact, out of 112 participants who recalled the first instance and were included in free recall analyses, one participant mentioned two specific (correct) details about the deviation and one participant mentioned two general details about the deviation. Out of 106 participants who recalled the last instance and were included in free recall analyses, zero participants mentioned a specific correct detail about the deviation and two participants mentioned one general detail about the deviation. Surprisingly, few of the 120 participants who recalled the time that was different and were included in free recall analyses mentioned a specific detail about the deviation in free recall, but when they did, virtually all responses were correct (13 participants recalled one or more specific details correctly, 0 made a within-instance intrusion, and 1 made an external intrusion error); 11 participants in the time that was different condition reported one or more general details about the deviation. Due to a lack of responses, deviation details in free recall are not discussed further.

The analyses below focus on the most common response types to the seven cued recall questions about the deviation.

Correct Responses. Three hundred twenty-five participants (93%) provided one or more correct details about the deviation in response to cued recall questions (range for all participants = 0-7; mode = 5). There was a main effect of age, $F(1, 336) = 30.10$, $p < .001$, $\eta_p^2 = .082$, 95% CI [.683, 1.446]; older children provided more correct responses about the deviation than younger children. There was a main effect of instance, $F(2, 336) = 4.06$, $p = .018$, $\eta_p^2 = .024$; LSD post hoc tests indicated those who recalled the first instance provided more correct details about the deviation than those who recalled the time that was different , $p = .004$, and no differences with those who recalled the last instance and the other two conditions, *p*s > .13. There were no other significant effects. Means and standard deviations are shown in Table 12 for correct responses pertaining to the deviation across conditions.

Within-Instance Intrusions. Within-instance intrusions occurred when children attributed an option of a variable detail that occurred in the deviation (“time that was different”) instance to the deviation. Forty-three participants made a within-instance intrusion (all participants: $M = .13$, $SD = .34$; range = 0-2; mode = 0). Of these 43 participants, 19 were from the time that was different condition ($M = .16$, $SD = .37$; range

= 0-1; mode = 0). The only significant effect was a main effect of age: younger children (M = .17, SD = .39) provided more within-instance intrusions than older children (M = .09, SD = .28), $F(1, 336) = 5.27$, $p = .022$, $\eta_p^2 = .015$.

External Intrusion Errors. Two hundred thirteen participants reported an external intrusion error in response to a deviation question (range for all participants = 0-6; mode = 0). Children provided a similar number of external intrusion errors in response to deviation questions across conditions; as shown in Table 13, there were no significant effects.

Don't Know Responses. Two hundred ninety-three participants provided at least one don't know response during cued recall of the deviation (range for all participants = 0-7; mode = 1). There was a main effect of age, $F(1, 336) = 30.51$, $p < .001$, $\eta_p^2 = .083$, 95% CI [.585, 1.231] because younger children provided more don't know responses than older children. There was also a main effect of instance, $F(2, 336) = 3.23$, $p = .041$, $\eta_p^2 = .019$. LSD post hoc tests indicated that those who recalled the time that was different provided significantly more don't know responses than those who recalled the first time, $p = .026$, and the last time, $p = .024$, and the latter two conditions did not differ from each other, $p = .961$. There were no other significant effects. Table 14 displays the means and standard deviations per condition for don't know responses during recall of the deviation.

Accuracy Redefined to Include All Experienced Variable Details

As particularization requirements differ depending on whether discrete offenses or continuous abuse is charged, accuracy was redefined to include all experienced details in responses to free and cued recall questions about the instance. Deviation details were not included because the number and type of deviation details recalled would not vary as a function of the definition of accuracy.

A composite measure was created by combining all experienced details reported in free recall and cued recall separately (i.e., correct responses + within-instance intrusions + internal intrusions). In free recall, the total number of possible responses was 60 and responses ranged from 0 to 9 (mode = 0); see Table 15 for means and standard deviations per condition in free recall. In cued recall, the maximum number of responses that could be reported was 12 and responses ranged from 0 to 12 (mode = 10); Table 16 displays the means and standard deviations per condition in cued recall.

In free recall, there was a main effect of age because older children reported more responses that were options of a variable detail than younger children, $F(1, 326) = 41.50$, $p < .001$, $\eta_p^2 = .113$, 95% CI [.791, 1.486]. There was also a main effect of instance, $F(2, 326) = 8.03$, $p < .001$, $\eta_p^2 = .047$ that was qualified by an Age x Instance interaction (depicted in Figure 8) that approached significance, $F(2, 326) = 2.82$, $p = .061$, $\eta_p^2 = .017$. Follow-up tests ($\alpha = .025$) showed that younger children reported a similar number of experienced details across instances, $F(2, 326) = .927$, $p = .397$, $\eta_p^2 = .006$ whereas older children differed in the number of experienced details they reported depending on the instance they were asked to recall, $F(2, 326) = 9.93$, $p < .001$, $\eta_p^2 = .057$. Older children reported more experienced details if they were asked to recall the first instance in comparison to the time that was different, $p < .001$, 97.5% CI [.655, 2.011], and the last instance in comparison to the time that was different, $p = .011$, 97.5% CI [.088, 1.462); the number of experienced details reported by older children did not differ in the first and last time conditions, $p = .073$, 97.5% [-.140, 1.257].

In cued recall, I observed a main effect of age, $F(1, 336) = 6.25$, $p = .013$, $\eta_p^2 = .018$, 95% CI [.123, 1.029] with older children recalling more experienced details than younger children. There was a main effect of instance, $F(2, 336) = 3.56$, $p = .030$, $\eta_p^2 = .021$. LSD post hoc tests showed that compared to children who were asked to recall the first instance, children who were asked to recall the time that was different, $p = .010$, and the last instance, $p = .042$ reported a greater number of experienced details; those who were asked to recall the time that was different and the last instance reported a similar number of experienced details, $p = .617$. The main effect of MCR approached significance, $F(1, 336) = 3.38$, $p = .067$, $\eta_p^2 = .010$, and was qualified by an Age x MCR interaction, $F(1, 336) = 4.36$, $p = .038$, $\eta_p^2 = .013$. Figure 9 displays the interaction. Follow-up tests ($\alpha = .025$) revealed the presence of MCR led to an increase in the number of experienced details younger children reported about the instance in comparison to when MCR was absent, $F(1, 336) = 7.62$, $p = .006$, $\eta_p^2 = .022$, 97.5% CI [.167, 1.643]; but, there were no differences among older children when MCR was present and absent, $F(1, 336) = 0.31$, $p = .859$ $\eta_p^2 = .000$, 97.5% CI [-.787, .672]. No other analyses approached significance, all ps > .23.

Discussion

Children in kindergarten and Grade 1 (younger) and Grades 3 and 4 (older) participated in five magic shows and all saw a deviation in the middle instance. Children answered free and cued recall questions about the first, deviation (i.e., time that was different or surprising), or last instance and cued recall questions about the deviation itself after a one-week delay; half of the children also received MCR instructions. The interview was adapted from the NICHD protocol (Lamb et al., 2007). Accuracy was defined narrowly as the number of correct details reported that occurred in the target instance and broadly as the number of experienced details that occurred across instances of the repeated event (Price et al., 2016; Woiwod et al., revised and resubmitted). A narrow definition was used to be consistent with the broader literature on memory for instances of a repeated event and because evidentiary requirements for charging repeated CSA as discrete acts require children to particularize individual acts (e.g., Guadagno et al., 2006). A broad definition was used to investigate the possibility that MCR enhances memory for details experienced across instances rather than details from a target instance and because jurisdictions that charge repeated CSA as a continuous offense require little particularization of discrete acts (Woiwod & Connolly, 2017).

When accuracy was defined narrowly, children recalled more correct details about the first instance than the last and deviation instance (a primacy effect). Additionally, MCR appeared to have a negative effect on recall of a target instance, particularly when the target instance was the first. When accuracy was defined broadly to include all experienced details, the primacy effect was lost in cued recall and MCR increased the number of experienced details younger children reported across instances. I will discuss each of these findings and their implications to theory on memory for repeated events, the generalizability of the present research to memory for repeated child sexual abuse (CSA), and interviewing and charging in repeated CSA cases. The major findings of the present research when a narrow and broad definition of accuracy are applied are also summarized in Table 17.

Children's memory for the first, last, and deviation instance

First and Last Instances. When accuracy was defined narrowly, correct responses showed clear evidence of a primacy effect in free and cued recall and a recency effect in cued recall. Superior memory for the first instance was further evidenced by the number of internal intrusions. Children who were asked to recall the deviation instance made more internal intrusions in cued recall than those who recalled the first and last instance, and children who recalled the last instance reported more internal intrusions than children who recalled the first instance.

The finding in the present study that children recalled more correct details about the first and last instances than the middle instance is consistent with the limited previous research that has examined primacy and recency effects in within-subjects designs (Connolly et al., 2016, Experiment 3; Powell et al., 2003). In Connolly et al., children participated in four magic shows and a deviation was presented in the last instance. In a cued recall interview 1- or 2- days after the last instance, older children recalled variable options that occurred in the first and last instances better than the two middle instances. In Powell et al. (2003, Experiment 2) children sequenced variable options that were presented in the first, middle, and last instance following a 3-day or 3-week delay. Older children (6- to 8-year-olds) showed a primacy and recency effect at the 3-day delay and a primacy effect at the 3-week delay whereas younger children (4- to 5-year-olds) showed a primacy and recency effect at the 3-week delay only.

In prior research, the middle instances did not contain deviation details and so they were not expected to be especially memorable. In the current study, the deviation was placed in the middle of five instances rather than the last instance and children received specific context cues to reinstate the target instance. Importantly, a valid test of primacy and recency effects must not confound delay-to-test. Therefore, in the present study, a between-subjects design was used and all children recalled the target instance after a one week delay.

Taken together with the findings of previous research, the results of the present study demonstrate that recency and primacy effects in the context of a repeated event are robust. A recency and primacy effect were observed when delay to test was held constant and when the middle instance was designed to be memorable by including a deviation. In traditional studies with word lists and other research on repeated events, items or instances that appear at the end have a shorter delay to test than items or instances that appear at the beginning. In the present study, the delay to test was equal across instances and this could partially explain why I only observed a recency effect on correct responses in cued recall and why the recency effect was weaker than the primacy effect overall. Despite these considerations, the pattern of a stronger primacy than recency effect in the present study is consistent with previous research.

To understand the primacy and recency effect in the current research, it is important to revisit two theoretical explanations on how memory for repeated events is organized in memory. Although both script theory and FTT can explain primacy and recency effects, I will discuss why script theory provides a more parsimonious and complete explanation for the recency and primacy effects observed in the present study than FTT.

Script theorists suggest that a script begins to form upon the first experience with an event; with repeated experience, memory for the script becomes stronger than memory for individual instances, and memory for instances becomes subsumed by the script over time (e.g., Fivush, 1984; Hudson & Mayhew, 2009). When the repeated event contains variable details, variable options become unlinked to instances and integrated into the script. That is, in the script, each variable detail has a list of options. Because options of variable details become organized into lists in the script, a primacy and recency effect are expected.

According to schema confirmation-deployment hypothesis, a primacy effect occurs because details in the first instance of a repeated event receive more attention than other typical instances. Greater attention is allotted to the first instance because it is novel and there is no script to guide comprehension (Farrar & Goodman, 1990, 1992). Therefore, details that are experienced in the first instance of a repeated event are remembered well even after the script is confirmed and deployed. Although schema-confirmation deployment doesn't offer an explanation for superior memory for details experienced last, it is possible that greater attention may account for superior memory of details that occurred in the last instance relative to the middle instances in the present study because children were aware the fifth magic show was the last.

Given that script theory asserts that options of each variable detail become organized like a list, a compelling explanation for the primacy and recency effect observed in the present study is one that is often given to explain primacy and recency effects observed in word lists (e.g., Wixted, 2004). With the first instance, there is no prior learning so there is no proactive interference. With the last instance, there is no later information so there is no retroactive interference. Proactive interference has been described as accounting for greater amounts of forgetting than retroactive interference (Underwood, 1957) which can explain the stronger primacy than recency effect.

According to FTT, details are stored in the verbatim trace whereas memory for the general event is stored in the gist trace (e.g., Brainerd & Reyna, 2002). Each time an instance of a repeated event is experienced, a verbatim trace will be laid and the gist trace for the repeated event will be strengthened. I offer two ways to explain superior memory for variable options presented in the first and last instances with FTT: distinctiveness and activation of multiple traces.

A verbatim trace is more likely to be retained if it is distinct in some way. Relative to others, the verbatim trace for the first instance should be strongest because it is novel, and therefore, distinct. This can explain the primacy effect observed in the present study. However, FTT does not clearly explain superior memory for the last instance relative to a middle deviation instance. Perhaps the last instance is recalled well because there is no interference from future instances and this makes it distinct from previous instances. However, this assertion seems weak when the middle instance is arguably the most distinct instance of all, as in the present research.

Based on FTT, it is also possible that retrieval cues activate more than one verbatim trace. A high rate of internal intrusions is only explained by FTT if retrieval cues activate more than one verbatim trace. It may be that fewer verbatim traces are activated when the target instance is the first or the last, leading to more correct responses and fewer internal intrusions than a middle instance. C. Brainerd (personal communication, March 18, 2017) asserted options experienced in each instance may be recalled, but not linked to the relevant variable details (i.e., decontextualized details). If a verbatim trace contains details that are decontextualized and the verbatim trace is accessed at retrieval, one may expect within-instance intrusions. However, within-instance intrusions rarely occurred during recall of a target instance. Despite the possibility that multiple verbatim traces were activated during recall, this explanation can only explain the recency and primacy effect if options in each instance were contextualized and it is easier to discriminate verbatim traces for the first and last instance than others.

Another possibility based on FTT is that both verbatim and gist traces may be activated at retrieval. This could explain why children who recalled the first instance reported more accurate details and general information during free recall than children who recalled the last time and the deviation instance. However, FTT emphasizes verbatim and gist traces are independent of each other and retrieval of either the verbatim or gist trace during recall rather than simultaneous recall.

FTT's exact assertions are unclear whereas script theory concisely explains the recency and primacy effects found in the present study. In a repeated event, options of variable details become unlinked to instances and linked to the variable detail in the script.[3] The script contains the variable details (e.g., the magic item) and a list of experienced options. As purported by script theory, details are organized in a list-like manner. When the variable detail is activated, activation spreads to the options. Options of details that were well-attended (e.g., the first) or have less interference (e.g., the first and last) will be remembered well.

Did the Deviation Help Children to Recall the Instance? Based on FTT and the source-monitoring framework, I examined the possibility that a deviation in the middle instance of a repeated event would enhance memory for the deviation instance, particularly when contextual cues were provided. This possibility is, of course, dependent on whether the deviation is linked to memory for the instance as posited by FTT or linked to the script as posited by script theorists. The present data suggest that memory for a deviation is linked to the script for the following reasons: the deviation itself was remembered more accurately than the instance details, internal intrusions during recall of the deviation instance were common, within-instance intrusions were rare, and children who were asked to freely recall "the time that was different or surprising" rarely spontaneously reported the deviation. Each of these is discussed next.

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[3] The period of time by which memory for options of variable details become linked to the script rather than the instance is unclear as no research has examined this. However, Farrar and Goodman's (1990) research suggests that details between instances (termed "script" and "episodic" in their research) become confused when just two instances are experienced.

Children recalled deviation details with a high degree of accuracy, which demonstrates the deviation itself was remembered well. I calculated mean proportions to determine the percentage of deviation details children recalled accurately in comparison to variable options that occurred in the target instance. On average, participants across conditions correctly recalled 50% of the seven deviation details during cued recall of the deviation (*M*prop = .50, *SD* = .27) in comparison to 31% of the 12 target instance details in cued recall (*M*prop = .31, *SD* = .18). In the time that was different condition, children recalled 45% of the deviation details correctly and only 21% of the variable options that occurred in the instance correctly (*M*prop = .45, *SD* = .27; *M*prop = .21, *SD* = .11 respectively). There is no evidence that the deviation helped children to recall the deviation instance. Interestingly, children who were asked to recall the first instance remembered more deviation details than children in the other conditions. This was unexpected. It is possible this effect was observed because children who recalled the first instance had the shortest delay to recall of the deviation. This explanation is purely speculative and requires further investigation.

If memory for the deviation was linked to the instance in which it occurred, superior memory for the variable options that occurred in the deviation instance would have been evidenced when children were asked about it. Even though children were provided with distinct cues to retrieve the deviation instance in the present study and were able to retrieve deviation details, they were unable to retrieve instance details to a level comparable to the first and last instance. This is consistent with the “script-pointer-plus-tag” (SP + T) hypothesis (Schank & Abelson, 1977); deviation details are not tagged to the particular instance; therefore, a deviation does not facilitate accurate recall of the instance that contained the deviation.

Cued recall responses to questions about the target instance showed that children who were asked to recall the deviation instance were not only less accurate, they were more confused about the variable options that occurred in the deviation instance than children who recalled the first and last instances as evidenced by internal intrusions (*M* = 6.71, *SD* = 1.85; *M* = 3.66, *SD* = 2.25; *M* = 5.54, *SD* =2.39 for the time that was different, first, and last instances respectively). Despite children showing superior memory for deviation details than variable details, the deviation did not facilitate children's recall of the deviation instance. In fact, children were more confused about what happened during the deviation instance than the first or last instances. This is consistent with the view that the deviation is tagged to the script and not the instance.

Children rarely reported variable options from the deviation instance when answering cued recall questions about the deviation; fewer than 16% of children in the time that was different condition made this kind of within-instance intrusion (18% of younger and 13% older participants). That children did not confuse variable options and deviation details suggests the deviation was not linked to the instance. Across conditions, these types of errors were more common for younger than older children (16% of younger and 9% of older participants). The age difference is similar to Farrar and Goodman's (1990) findings that 4-year-olds were more likely to confuse the script instances (three instances with fixed details) with a deviation instance (variable details from the script instances) than 7-year-olds. Farrar and Goodman applied their schema confirmation-deployment hypothesis to explain their data: older children were able to both confirm the schema and deploy it by forming episodic memories for each visit type whereas younger children remained in the schema confirmation phase. This may explain the current findings related to within-instance intrusions. However, on closer examination, the pattern is also consistent with the deviation being linked to the script rather than memory for the instance that contained the deviation.

Perhaps the most compelling support that the deviation is not linked to the instance in which the deviation occurred comes from the free recall data. Of the 120 children who provided free recall of the deviation instance, only 15 recalled anything about the deviation. If the deviation was linked to the instance in which it occurred, one would expect children to spontaneously recall the deviation when asked to freely recall the time that something different or surprising occurred.

The overall pattern of data for the present study is best explained by the SP + T hypothesis which purports that deviation details are remembered well because they are distinctly tagged in memory and attached to memory for the script. Superior recall of a deviation relative to other details is evident at a short delay, such as the present study, when the tag is easily accessible in memory and has not faded relative to memory for the script.

The deviation in the present study was an interruption that caused changes to how the instance details were experienced (e.g., Connolly et al., 2016; Hudson, 1988; & Trabasso & van den Broek, 1988). Script theorists suggest that memory for the entire instance may remain intact if the entire instance is novel, as was the case in Fivush et al.'s (1984) study on children's memory for a class trip to an archaeological museum. In the present research, I could have created an entirely novel instance by providing all new details in the deviation instance rather than options of variable details that changed predictably across all instances. For example, children could have watched an entirely different type of show, such as a box illusion show where the magician performs on a stage and various things come out of a large box at the magician's command. The instance would have fit within the schema of a “magic show” but would have been entirely novel. In this circumstance, script theorists posit the specific instance should be accessible, particularly in the presence of distinct retrieval cues (i.e., cuing directly to the time children saw the box illusion show). However, memory for a novel instance was not what I studied in the present research. I was interested in memory for the predictable, routine details that occurred across instances. Acts of child sexual abuse often occur in a similar way across instances. For example, as noted in the appellate court’s decision in *People v. Bailey* (2015), victim A. B. testified “it happened the same way every time but in different settings.” If the deviation instance in the current study was entirely novel, the application of the research may be to an offense that occurred one time in the context of a benign routine event, such as bed time. The present methodology was used to reflect the underlying memory processes that occur when children experience a repeated event that occurs in a typical manner that is predictable, such as child sexual abuse, and how deviations from the routine may affect memory for instances.

Summary of primacy, recency, and deviation effects. The focus of this section was to explain the theoretical implications of the data when accuracy was defined narrowly as the number of correct details reported about the first, last, and deviation instance. When accuracy was defined narrowly, children recalled the first instance most accurately in free and cued recall. In cued recall, children recalled more correct details about the last time than the deviation instance. Children remembered the deviation details well, but there was overwhelming evidence the deviation did not help children to recall the instance that contained the deviation. Both the primacy and recency effects and deviation memory are clearly explained by script theory: 1) options of variable details are linked to each other in the script and the first and last options have less interference from other experienced options, and 2) deviations are linked to the script rather than the instance that contains the deviation.

As discussed in more detail below, when accuracy was defined broadly to include all experienced details, further evidence that options of variable details are organized in the script emerged. Children who were asked to recall the last and deviation instance reported a greater number of experienced details in cued recall than children who recalled the first instance. In other words, children who are asked to think about the last instance or a time that was different may provide more experienced details than children who are asked to recall the first instance.

Differences between younger and older children in recall of instances and the deviation

Instance details. When accuracy was defined narrowly, older children provided more correct responses (first and last time in free recall and across all instances in cued recall), more internal intrusions (free recall), more general details (free recall), and fewer don't know responses (to the first instance in free recall and across instances in cued recall) than younger children. When accuracy was defined broadly, older children reported more experienced details (free and cued recall). In summary, whether a narrow or broad definition was used, older children recalled more event details than younger children. This is not to say that older children were exceptionally accurate during recall of a target instance—older children were simply more accurate than younger children.

FTT and script theory predict older children will outperform younger children during recall of an instance of a repeated event when accuracy is defined narrowly. However, the present study's findings that older children provided more correct details when accuracy was defined narrowly and more experienced details when accuracy was defined broadly is best explained by script theory.

FTT makes the following assertions: 1) younger children have poorer verbatim memory than older children, and 2) verbatim traces decay more quickly for younger than older children (e.g., Brainerd & Reyna, 1998; Brainerd et al., 2002). In a short delay-to-test as in the present study, older children should be better able to access the verbatim trace (i.e., the instance) than younger children and provide more correct details. This is a reasonable explanation for the pattern of data when accuracy is defined narrowly; however, it is more difficult to explain the data when accuracy is defined broadly using FTT. FTT may be an explanation for the present study's findings if children retrieve multiple verbatim traces simultaneously and older children are more likely to retrieve multiple verbatim traces than younger children. However, to my knowledge, FTT has not made this prediction; rather FTT explains the circumstances under which retrieval of the verbatim trace is more likely than the gist trace and FTT does not explain retrieval of multiple traces simultaneously. Furthermore, according to FTT, older children should have stronger verbatim traces and be better at discriminating between multiple verbatim traces than younger children; this would lead to fewer experienced details (i.e., correct plus within-instance and internal intrusions) reported among older than younger children when accuracy is defined broadly.

Farrar and Goodman (1990) purported in their schema confirmation-deployment hypothesis a similar pattern to what FTT asserts; younger children take longer to develop and confirm schemas than older children and so they are more likely to confuse details and make internal intrusions than older children. However, given that older children script faster and are better able to identify categorical relationships, their superior category knowledge and memory for options suggests there will be more confusion of options from the same category. Thus, if categorically-related variable options are linked across instances of a repeated event as hypothesized by script theory and older children remember more details overall, they should make more internal intrusions than younger children (for a similar argument, see Connolly & Price, 2006; for similar findings to the present study, see Powell & Thomson, 1996). Because a broad definition of accuracy includes all experienced details (i.e., correct details, within-instance intrusions, and internal intrusions), this explains why older children provided more correct details when accuracy was defined narrowly and more experienced details when accuracy was defined broadly.

Deviation details. In the current study, compared to younger children, older children provided more correct details and fewer don't know answers in response to cued recall questions. During cued recall of the deviation, internal intrusions were not possible, external intrusion errors occurred at a similar rate across conditions, and within-instance intrusions occurred for a minority of participants.

As previously discussed, within-instance intrusions (i.e., confusion between instance and deviation details) were more likely for younger than older children during recall of the deviation. Although a schema explanation is more consistent with the overall pattern of results, the finding on within-instance intrusions is also consistent with FTT. If the deviation was linked to the instance, FTT would predict within-instance intrusions during recall of the deviation details. However, FTT would likely predict the opposite of what was found with respect to age differences: that older children would make more within-instance intrusions in comparison to younger children because older children have superior verbatim memory and remember more details.

I return to a discussion of schema-confirmation deployment hypothesis because this model best explains age differences related to within-instance intrusions. As discussed in detail in the Introduction, the schema confirmation-deployment hypothesis (Farrar & Goodman, 1990, 1992) explains why older children will remember deviation details that occurred in an instance of a repeated event more accurately than younger children. When an event is encountered, children will attend to all information in order to search for a relevant schema. If one is not found, children will continue to attend to all information as they develop a new schema. If a potentially relevant schema is found children attend to all information to confirm the relevance of the schema and deploy it. This process of schema confirmation occurs more quickly for older than younger children. Therefore, older children enter the deployment phase more quickly than younger children. In the deployment phase, children allot more attention to schema-atypical information, such as deviations, relative to schema-typical information. Because older children enter the deployment phase faster than younger children, older children will recall more deviation details correctly and better distinguish between deviation details and routine details than younger children.

In the present study, the deviation occurred in the third of five instances and all instances prior to the deviation were similar to one another; this design would enable children to confirm the schema and enter the deployment phase quickly. As evidenced in children's recall of instances, it appears that both younger and older children had developed a schema for the magic show by the middle instance. However, older children likely entered the deployment phase more quickly than younger children. This explains why older children recalled more deviation details than younger children. Furthermore, even if younger and older children were to enter the deployment phase at similar rates, older children have superior memories than younger children and an advantage of older children's recall of the deviation would be expected.

Consistent with previous research (Connolly et al., 2016), the present data suggest deviation details stand out in memory and are recalled better than variable options. Therefore, an MCR instruction with unique cues to the deviation should facilitate recall of the deviation in both younger and older children in comparison to a standard interview where children are simply asked about the deviation. But MCR had no effect on either younger or older children's recall of the deviation. It is possible that because the deviation was tagged in memory, the deviation context was already well remembered and reinstating the context was of no additional benefit.

The effects of MCR on children's recall of instances of a repeated event

In the present research, I was interested in the effects of MCR on children's recall of instances of a repeated event when accuracy was narrowly and broadly defined. The narrow definition of accuracy includes correct responses only whereas the broad definition includes correct, within-instance and internal intrusions. Utilizing both definitions may explain findings from field studies that have found a beneficial effect of MCR on recall of a target instance of a repeated event and inform a discussion of the utility of using MCR when discrete acts rather than continuous abuse is charged. First, I will discuss the present study's findings pertaining to the effects of MCR when accuracy was narrowly defined and broadly defined. Then, I will discuss the implications of these findings to the broader literature.

When accuracy was defined narrowly, MCR did not increase the number of correct details reported about the target instance and it increased the number of internal intrusions reported (i.e., confusion across instances). There was no effect of MCR on correct responses in free recall and a trend toward a disadvantage of MCR in cued recall such that children who recalled the first instance provided fewer correct details when MCR was present than when MCR was absent. Analyses on internal intrusions further indicated that MCR hindered recall by increasing internal intrusions. In free recall, younger children who received MCR reported more internal intrusions than younger children who did not receive MCR. In cued recall, both younger and older children who were asked to recall the first instance and received MCR reported a greater number of internal intrusions and fewer don't know responses in comparison to those who were asked to recall the first instance and did not receive MCR. Results pertaining to correct responses and internal intrusions suggest that MCR has a detrimental effect on children's recall when children, particularly younger children, are asked to recall the first instance—the instance children remembered best when compared to the last and deviation instance.

The apparent disadvantage of MCR when accuracy was defined narrowly shifted to an advantage for younger children during cued recall when accuracy was defined broadly; in cued recall, younger children reported more experienced details that occurred across instances when MCR was present than when MCR was absent.

FTT and script theory hypothesize different effects of MCR when accuracy is narrowly and broadly defined. If instance memory is available as purported by FTT, MCR should have had a targeted effect on increasing accuracy rates when accuracy was narrowly defined, a decrease on internal intrusion rates, as well as no effect when accuracy was broadly defined. If, as predicted by script theory, memory for the instance is not available, asking children to try to reinstate it during MCR may result in at least two effects: (1) activation of memory for the script rather than memory for the specific instance, particularly for younger children who are more reliant on script memory than older children; (2) consumption of cognitive resources that could be used to attribute details to the correct instance—a difficult task under ideal circumstances. If MCR activates memory for the script, it would retrieve memory for all available experienced details, not just those experienced during the target instance. With more variable options retrieved, attributing each to its source is more complicated; therefore, leading to a decrease in accuracy defined narrowly. Script theory explains the disadvantage of MCR when accuracy was narrowly defined and the advantage of MCR when accuracy was broadly defined.

The present study's findings can explain the limited findings from research to date pertaining to the effects of MCR on children's and adult's recall of instances of a repeated event. Most of the research conducted on the Cognitive Interview and MCR in particular has utilized single events. The overall finding across age groups is that the presence of CI prompts has a large effect on increasing correct responses with a small increase in incorrect responses (Memon et al., 2010). Drohan-Jennings et al. (2010) conducted the only published laboratory study on the effects of MCR on children's recall of an instance of a repeated event. Unfortunately, they only reported suggestibility data. MCR decreased suggestibility of 6- to 7-year-olds if the suggestion was consistent with the theme of the event. These findings were evident at the one-week and not the four-week delay. Based on the present data, I speculate this is because children remembered the details that happened across instances at a one-week delay, and MCR served to activate memory for all experienced details allowing children to dismiss consistent suggestions as not in the list so not experienced. Although this explanation would also reduce suggestibility to inconsistent suggestions, it did not have this effect. Children are generally more suggestible to suggestions that are consistent than inconsistent with the theme of the event (Connolly & Price, 2006; Drohan-Jennings et al., 2010; Roberts & Powell, 2006) but there was not a floor effect on suggestibility for false-inconsistent suggestions in Drohan-Jennings et al. It is unclear why the effect was not found on both consistent and inconsistent suggestions.

Recent field studies testing the effects of MCR on adults' recall of instances of a repeated event have reported an advantage of MCR. The researchers concluded that because MCR increases the overall amount of information recalled when adults are asked about an instance of a repeated event, and the instance time and location or some other details were *generally* corroborated from records or other people who were present, the information recalled is likely to be accurate (Leins et al., 2014; Rivard et al., 2014). Based on the current findings, it is possible that the increase in the amount of information provided by interviewees with MCR is accurate—when accuracy is broadly defined.

In summary, a narrow and broad definition of accuracy shows a different pattern of the effects on MCR on children's recall of instances of a repeated event. A narrow definition shows that MCR had a negative effect on younger and older children's recall of the first instance by increasing internal intrusions. A broad definition showed a positive effect of MCR on younger children's responses to cued recall questions. These data suggest that MCR activates memory for the script—all experienced details that are available. As will be discussed next, in a forensic context, the effects of MCR are undesirable when accuracy is defined narrowly as the number of details experienced in a target instance, particularly when the target instance is the first. However, the effects of MCR are desirable when accuracy is defined broadly as the number of experienced details recalled.

Forensic implications: Interviewing and charging in cases of repeated CSA

Although replication and additional research are needed, the present study suggests MCR may increase the number of details reported when children are asked to recall an instance of repeated abuse. This finding is similar to field research examining child complainants of single and repeated CSA that found MCR increased the number of details children reported (Hershkowitz et al., 2002). MCR may thus increase the number of leads provided that could be further investigated, and potentially corroborated, so that the chances of successful prosecution increase. More information is arguably beneficial regardless of whether a jurisdiction charges repeated CSA as discrete acts of abuse or continuous abuse. However, in a jurisdiction that charges repeated CSA as discrete acts, the present study suggests that interviewers should use caution when administering MCR with a complainant who alleges repeated CSA. If the goal is to secure accurate information about individual acts, MCR may increase confusion across instances and interfere with children's ability to provide accurate details of a discrete instance. If memory for the instance is not available and children spend cognitive resources trying to mentally reinstate the instance, there are fewer cognitive resources available to attribute instance details to their source—a task that is difficult under ideal circumstances, outside the demands of a forensic interview.

If the goal of a forensic interview is to secure information across instances of the event as when continuous CSA is charged, MCR may be beneficial. Continuous CSA statutes do not require children to particularize individual acts to the same degree of specificity as when discrete acts are charged; it is sufficient for children to describe what usually occurred as well as differences across instances. Woiwod and Connolly (2017) discussed that continuous CSA statutes are reflective of how memory for instances of repeated events are organized and recalled. Because the present research suggests the script is available rather than the instance, an MCR instruction may reinstate the general context and help children report experienced details across instances of the event.

The present study demonstrates that the benefits of cuing children to the first, last, or time that was different differ depending on whether or not particularization of an instance is required. Due to particularization requirements for charging discrete offenses, the present research suggests that when the delay to recall is one week or less, cuing children to the first time followed by the last time repeated CSA occurred will provide investigators with the most accurate information about what occurred during that time. Admittedly, directing child complainants to recall the "first" time abuse occurred is a recommendation with limitations. In the present research, there is no ambiguity as to what constituted the first and last magic show. In CSA, there may be a grooming process such that the first time abuse occurred is unclear. Cuing children to a time that was different or surprising may yield valuable information about what was different (i.e., deviation details) but is unlikely to result in accurate reports of other instance-specific details that may be relevant to support charging one or more discrete acts of repeated CSA. When the requirements for particularization are expressly relaxed as in some jurisdictions with continuous CSA statutes, children who are asked to recall the last instance or a time that was different may provide more experienced details across instances of the event, and thus more leads for future investigation than children who are asked to recall the first instance.

Limitations and future research

The present study's findings are limited to the event used, the delay to recall, the temporal distance between instances, and the cues provided to the instance. As discussed in more detail, future research may explore some of the possible explanations offered for the present study's overall finding that MCR does not facilitate accurate recall of instances of a repeated event.

The findings in the present study are only generalizable to repeated events where instances are relatively similar. Although the deviation in the present study was designed to make the middle instance distinct and create differences in context such that children who recalled this instance may benefit from MCR, this effect was not observed. However, the deviation was also designed to be associated with the event rather than a particularly unusual deviation (Hudson, 1988) or an entirely novel instance (Fivush et al., 1984). An important distinction between the present research and recent research on adults' memory for naturally occurring events is the nature of the repeated event. Perhaps when instances deviate in several ways (e.g., the family events in Leins et al., 2014), MCR increases accurate particularization of a target instance. For example, the repeated event could be a "show" in which all instances contained a different type of show (e.g., a magic show, a hula show, a comedy show, a broadway show). If the repeated event were defined at this general level, it is possible that MCR could have a beneficial effect because the context would differ in a substantial way across instances.

The delay to recall and temporal distance between the instances are factors that limit generalizability to repeated CSA cases. CSA may occur over a lengthy, distributed duration and may not be recalled until years after the last instance (e.g., Connolly & Read, 2006). MCR may increase the number of correct details about a target instance if the delay-to-test is short (i.e., less than one week). Additionally, more distributed spacing between instances may have facilitated memory for individual instances such that MCR may have had a targeted and beneficial effect. This may account for the apparent advantage of MCR in recent field research with adults. In Leins et al. (2014), family events occurred over the course of one year, but only a family event that occurred in the last six months was chosen as the target instance, whereas in Rivard et al. (2014) the training meetings occurred over the course of one month. Price et al. (2006) found some evidence for a spacing effect in a laboratory study with 7- to 8-year-olds. Children who experienced a massed presentation (4 instances in 1 day) made more internal intrusions than children who experienced a distributed presentation (4 instances in 10 days), suggesting that memory for individual instances was more likely to be available in the distributed than massed condition.

In the present study, multiple contextual cues to the target instance were provided prior to free recall, including an identifying label and the name of the magic trick. This is a methodological strength as previous research has shown that multiple retrieval cues (i.e., contextual and temporal) increase the number of correct details about a target instance relative to children who only receive a temporal cue (Pearse, Powell, & Thomson, 2003). However, the labels used in the present study were chosen by the researcher. Recent recommendations for forensic interviewers of complainants of repeated CSA note that interviewers should ask children to report a time they "remember best" before directing children to instances (e.g., the first, last, time that was different) and try to use labels to instances that were generated by the child rather than the interviewer (Brubacher, Powell, & Thomson, 2014). A label that matches the child's subjective experience of a self-nominated instance is generally preferable and may lead to a different effect of MCR, particularly if the MCR instruction incorporates details the child previously reported. Future research should examine this possibility.

There is no prior research that has examined the effects of MCR in a practice phase or the number of times a child who has experienced a repeated event should receive MCR prior to recall of an instance. In the present study, participants who received MCR were given MCR three times during the interview: once in the practice (presubstantive) phase and two times during the substantive phase. The purpose of including MCR in the practice phase was to allow children to practice MCR before the substantive portion of the interview. There was no evidence that the MCR instruction during the practice phase hindered recall of the target magic show or that children were still thinking about the [first, last, time that was different or surprising] time in gym class during the substantive portion of the interview. However, this is a question that should be investigated.

The interview used in the present study was based off of empirically supported techniques: ground rules, rapport building, a practice phase that includes recall of an instance of a repeated event, MCR (for half of the children), and the report everything prompt (e.g., Brubacher et al., 2014; Episodic Memory Training, Lamb et al., 2007). Recent research suggests that older children benefit from recalling two instances of a repeated event prior to the interview (Danby, Brubacher, Sharman, & Powell, 2017; see Brubacher et al., 2014 for discussion) and Connolly and Gordon (2014) suggested that recall of what usually occurred in an event may be beneficial prior to recalling one instance of a repeated event. Future research may choose to incorporate these recommendations. Future research would benefit from audio or video recording the interviews to enable coding of additional variables (e.g., facilitators by the interviewer) that were not examined in the present study.

Although there were many methodological strengths in the present study, children participated in their classrooms and classrooms were assigned to recall an instance. This was done to control for delay-to-test such that all participants were interviewed one week after the target instance and participants who participated in an early interview would not tell their classmates who participated in a later interview what happened. Ideally, children would participate individually in all instances of the repeated event, be randomly assigned to both the instance recalled and MCR, and all be interviewed in the same room. This type of procedure was not feasible given limited resources and the time of participants. In most repeated-event studies, children participate in small groups or in their classrooms and are randomly assigned to interview conditions (Woiwod et al., revised and resubmitted). Laboratory repeated event research is exceptionally labor intensive and, as with most research, there are methodological constraints. The underlying memory processes are not expected to differ, but future researchers may wish to have the most controlled environment possible.

The present study demonstrates that conclusions on children's accuracy during recall of an instance of a repeated event may differ depending on whether a narrow or broad definition of accuracy is used. As such, theoretical explanations of memory for repeated events and recommendations for policy on interviewing complainants of repeated CSA would benefit from future research employing both definitions.

Conclusions

Forensic interviewing protocols recommend that interviewers direct children to particular instances (e.g., the first, the last, a time that was different or surprising) to secure episodic information that is required to fulfill particularization requirements for discrete charges (e.g., Guadagno et al., 2006; Lamb et al., 2007). The present data suggest that forensic interviewers will obtain the most accurate information about a target instance from children who recall the first time and the last time abuse occurred at a short delay. Although all children remembered the deviation well, the deviation did not facilitate recall of the options that occurred in the instance. Therefore, directing children to recall a time that was different or surprising will likely not yield correct information relevant to that discrete act of abuse. As hypothesized by script theory, the present data suggest that memory for deviations are not linked to memory for instances. MCR is commonly administered in forensic interviews and a substantial amount of research has documented that MCR facilitates children's recall of a single event. It appears this research does not generalize to children's recall of instances of a repeated event. Rather, the effect of MCR on children's recall of instances was to increase internal intrusions when children recalled the first instance. When accuracy was broadly defined to include all experienced details, MCR increased the total number of experienced details younger children reported. Field research with children (Hershkowitz et al., 2002) and adults (Leins et al., 2014; Rivard et al., 2014) has found a beneficial effect of MCR on recall of target instances, but this effect may reflect an increase in the number of details experienced across instances rather than the target instance. Additional research in which the methodological characteristics of the event are varied is needed to fully resolve the discrepancy between the findings of this laboratory study and field research.

Table 1

Variable Details and Options Used in the Present Study

Variable details	Options					
	A **Disappearing Ball**	**B** **Mystery Box**	**C** **Egg Pouch**	**D** **Appearing Flower**	**E** **Color Blendo**	**F** **Change Bag**
1. Admissions ticket	Pebble	Sponge	Sand paper	Fur	Seashell	Pom pom
2. RA removes X	Sunglasses	Ring	Scarf	Sweater	Gloves	Backpack
3. Warm up exercise	Stretching (touch toes)	Jumping Jacks	Running in place	Air punch	Hopping on one leg	Arm circles
4. Hat magician wore	Straw Hat	Cowboy Hat	Police Hat	Baseball Hat	Fireman Hat	Chef Hat
5. Magic item	Handkerchief	Bracelet	Diamond	Wand	Fan	Coin
6. Magic juice	Cherry	Lemon	Blueberry	Mango	Apple	Grapefruit
7. Stuffed assistant	Elephant	Bear	Tiger	Horse	Gorilla	Cow
8. Music to play to start show	Drums	Trumpet	Violin	Guitar	Piano	Flute
9. Magic words	Presto Chango	Shazam	Abra Cadabra	Hocus Pocus	Bippity Boppity Boo	Open Sesame
10. Sticker on body part	Leg	Cheek	Hand	Shoulder	Forehead	Foot
11. Disclosure	Did bad on a test	Lost keys	Slept in & missed class	Broke a cup yesterday	Ripped favorite jeans	Forgot to do my homework
12. Special goodbye	Wave	Curtsey	Bow	Thumbs Up	Clap	Spirit fingers

Note: The magic trick was not used as a critical detail, but rather to ensure that children were recalling the correct instance. As shown, there were 12 variable details with associated options that changed in each show. Although there were six tricks used in this study, each child received one of the two presentation orders that contained a total of five shows.

Table 2

Sample Size per Condition in Free and Cued Recall

Age	No MCR	MCR	Total
Free Recall			
	First time		
Younger	29	27	56
Older	27	29	56
Overall	56	56	112
	Time that was different		
Younger	29	31	60
Older	30	30	60
Overall	59	61	120
	Last time		
Younger	26	26	52
Older	24	30	54
Overall	50	56	106
Cued Recall			
	First time		
Younger	29	28	57
Older	28	29	57
Overall	57	57	114
	Time that was different		
Younger	30	31	61
Older	30	30	60
Overall	60	61	121
	Last time		
Younger	27	27	54
Older	29	30	59
Overall	56	57	113

Table 3

Mean Number (SDs in parentheses) of Correct Responses about the Target Instance in Free Recall as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	.69 (1.51)	.30 (.54)	.50 (1.16)
Older	1.74 (2.09)	1.52 (1.77)	1.63 (1.91)
Overall mean	1.20 (1.87)	.93 (1.45)	1.06 (1.67)
	Time that was different		
Younger	.07 (.26)	.19 (.54)	.13 (.43)
Older	.40 (.67)	.43 (1.04)	.42 (.87)
Overall mean	.24 (.54)	.31 (.83)	.28 (.70)
	Last time		
Younger	.08 (.39)	.38 (.70)	.23 (.58)
Older	.71 (1.08)	.97 (1.30)	.85 (1.20)
Overall mean	.38 (.85)	.70 (1.09)	.55 (1.00)
	Overall		
Younger	.29 (.96)	.29 (.59)	.29 (.80)
Older	.94 (1.50)	.97 (1.45)	.95 (1.47)
Overall mean	.61 (1.30)	.64 (1.17)	.62 (1.23)

Table 4

Mean Number (SDs in parentheses) of Correct Responses about the Target Instance in Cued Recall as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	4.69 (2.29)	4.46 (1.67)	4.58 (1.99)
Older	5.89 (2.41)	4.76 (2.50)	5.32 (2.50)
Overall mean	5.28 (2.40)	4.61 (2.12)	4.95 (2.28)
	Time that was different		
Younger	2.30 (1.42)	2.42 (1.26)	2.36 (1.33)
Older	2.70 (1.34)	2.70 (1.44)	2.70 (1.38)
Overall mean	2.50 (1.38)	2.56 (1.35)	2.53 (1.36)
	Last time		
Younger	2.63 (1.80)	3.26 (1.87)	2.94 (1.85)
Older	4.00 (2.38)	4.30 (2.00)	4.15 (2.18)
Overall mean	3.34 (2.21)	3.81 (1.99)	3.58 (2.11)
	Overall		
Younger	3.21 (2.13)	3.35 (1.80)	3.28 (1.97)
Older	4.16 (2.44)	3.91 (2.19)	4.03 (2.32)
Overall mean	3.69 (2.34)	3.63 (2.02)	3.66 (2.18)

Table 5

Mean Number (SDs in parentheses) of Internal Intrusions about the Target Instance in Free Recall as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	.07 (.26)	.22 (.64)	.14 (.48)
Older	.44 (.75)	.93 (1.19)	.70 (1.03)
Overall mean	.25 (.60)	.59 (1.02)	.42 (.85)
	Time that was different		
Younger	.10 (.31)	.26 (.77)	.18 (.60)
Older	.47 (.94)	.63 (.96)	.55 (.95)
Overall mean	.29 (.72)	.44 (.89)	.37 (.81)
	Last time		
Younger	.12 (.43)	.81 (1.20)	.46 (.96)
Older	1.04 (1.49)	.80 (1.03)	.91 (1.25)
Overall mean	.56 (1.16)	.80 (1.10)	.69 (1.13)
	Overall		
Younger	.10 (.33)	.42 (.92)	.26 (.71)
Older	.63 (1.10)	.79 (1.06)	.71 (1.08)
Overall mean	.36 (.85)	.61 (1.01)	.49 (.94)

Table 6

Mean Number (SDs in parentheses) of Internal Intrusions about the Target Instance in Cued Recall as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	2.72 (1.85)	4.46 (2.52)	3.58 (2.35)
Older	3.04 (1.91)	4.41 (2.18)	3.74 (2.15)
Overall mean	2.88 (1.87)	4.44 (2.33)	3.66 (2.25)
	Time that was different		
Younger	6.33 (1.83)	7.03 (1.60)	6.69 (1.74)
Older	6.97 (1.79)	6.50 (2.13)	6.73 (1.96)
Overall mean	6.65 (1.82)	6.77 (1.88)	6.71 (1.85)
	Last time		
Younger	6.07 (2.38)	5.70 (2.55)	5.89 (2.45)
Older	5.45 (2.61)	5.00 (1.97)	5.22 (2.30)
Overall mean	5.75 (2.50)	5.33 (2.27)	5.54 (2.39)
	Overall		
Younger	5.03 (2.60)	5.78 (2.46)	5.41 (2.55)
Older	5.20 (2.66)	5.31 (2.25)	5.26 (2.46)
Overall mean	5.12 (2.63)	5.54 (2.36)	5.33 (2.50)

Table 7

Mean Number (SDs in parentheses) of External Intrusion Errors about the Target Instance in Free Recall as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	<u>First time</u>		
Younger	.03 (.19)	.04 (.19)	.04 (.19)
Older	.07 (.38)	.21 (.49)	.14 (.44)
Overall mean	.05 (.30)	.13 (.38)	.09 (.34)
	<u>Time that was different</u>		
Younger	.03 (.19)	.00 (.00)	.02 (.13)
Older	.07 (.25)	.07 (.25)	.07 (.25)
Overall mean	.05 (.22)	.03 (.18)	.04 (.20)
	<u>Last time</u>		
Younger	.00 (.00)	.08 (.27)	.04 (.19)
Older	.04 (.20)	.00 (.00)	.02 (.14)
Overall mean	.02 (.14)	.04 (.19)	.03 (.17)
	<u>Overall</u>		
Younger	.02 (.15)	.04 (.19)	.03 (.17)
Older	.06 (.29)	.09 (.32)	.08 (.31)
Overall mean	.04 (.23)	.06 (.27)	.05 (.25)

Table 8

Mean Number (SDs in parentheses) of External Intrusion Errors about the Target Instance in Cued Recall as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	.52 (.78)	.46 (.64)	.49 (.71)
Older	.43 (.74)	.76 (.83)	.60 (.80)
Overall mean	.47 (.76)	.61 (.75)	.54 (.75)
	Time that was different		
Younger	.57 (.90)	.26 (.51)	.41 (.74)
Older	.30 (.65)	.47 (.63)	.38 (.64)
Overall mean	.43 (.79)	.36 (.58)	.40 (.69)
	Last time		
Younger	.74 (1.13)	.56 (.75)	.65 (.95)
Older	.48 (.69)	.50 (.68)	.49 (.68)
Overall mean	.61 (.93)	.53 (.71)	.57 (.82)
	Overall		
Younger	.60 (.94)	.42 (.64)	.51 (.81)
Older	.40 (.69)	.57 (.72)	.49 (.71)
Overall mean	.50 (.83)	.50 (.69)	.50 (.76)

Table 9

Mean Number (SDs in parentheses) of General Responses about the Target Instance in Free Recall as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	1.34 (1.78)	1.37 (1.69)	1.36 (1.72)
Older	3.22 (3.04)	3.00 (2.20)	3.11 (2.62)
Overall mean	2.25 (2.62)	2.21 (2.12)	2.23 (2.37)
	Time that was different		
Younger	.66 (1.11)	1.32 (1.76)	1.00 (1.51)
Older	2.33 (2.26)	2.33 (2.15)	2.33 (2.19)
Overall mean	1.51 (1.97)	1.82 (2.01)	1.67 (1.99)
	Last time		
Younger	.65 (1.60)	1.42 (1.60)	1.04 (1.63)
Older	1.83 (2.20)	2.20 (2.58)	2.04 (2.40)
Overall mean	1.22 (1.98)	1.84 (2.20)	1.55 (2.11)
	Overall		
Younger	.89 (1.54)	1.37 (1.67)	1.13 (1.62)
Older	2.48 (2.56)	2.51 (2.32)	2.49 (2.43)
Overall mean	1.67 (2.24)	1.95 (2.10)	1.82 (2.18)

Table 10

Mean Number (SDs in parentheses) of Don't Know Responses about the Target Instance in Free Recall as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	1.31 (1.44)	1.26 (.98)	1.29 (1.23)
Older	.37 (.69)	.97 (1.09)	.68 (.96)
Overall mean	.86 (1.23)	1.11 (1.04)	.98 (1.14)
	Time that was different		
Younger	.90 (.98)	1.06 (1.06)	.98 (1.02)
Older	1.20 (1.37)	1.03 (1.10)	1.12 (2.24)
Overall mean	1.05 (1.20)	1.05 (1.07)	1.05 (1.13)
	Last time		
Younger	.85 (1.12)	.88 (.99)	.87 (1.05)
Older	1.21 (1.38)	.50 (.82)	.81 (1.15)
Overall mean	1.02 (1.25)	.68 (.92)	.84 (1.10)
	Overall		
Younger	1.02 (1.20)	1.07 (1.02)	1.05 (1.11)
Older	.93 (1.24)	.83 (1.03)	.88 (1.13)
Overall mean	.98 (1.22)	.95 (1.02)	.96 (1.12)

Table 11

Mean Number (SDs in parentheses) of Don't Know Responses about the Target Instance in Cued Recall as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	3.93 (2.52)	2.32 (2.20)	3.14 (2.48)
Older	2.64 (1.66)	1.83 (1.67)	2.23 (1.70)
Overall mean	3.30 (2.22)	2.07 (1.94)	2.68 (2.17)
	Time that was different		
Younger	2.70 (2.26)	1.94 (1.53)	2.31 (1.95)
Older	1.87 (2.10)	2.13 (2.60)	2.00 (2.34)
Overall mean	2.28 (2.20)	2.03 (2.11)	2.16 (2.15)
	Last time		
Younger	2.19 (1.94)	2.41 (2.41)	2.30 (2.17)
Older	1.97 (2.60)	2.03 (1.81)	2.00 (2.21)
Overall mean	2.07 (2.29)	2.21 (2.10)	2.14 (2.19)
	Overall		
Younger	2.95 (2.35)	2.21 (2.04)	2.58 (2.23)
Older	2.15 (2.16)	2.00 (2.05)	2.07 (2.10)
Overall mean	2.55 (2.29)	2.10 (2.04)	2.32 (2.18)

Table 12

Mean Number (SDs in parentheses) of Correct Responses about the Deviation as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	3.41 (1.90)	3.04 (1.69)	3.23 (1.79)
Older	4.57 (1.75)	4.28 (1.98)	4.42 (1.86)
Overall mean	3.98 (1.90)	3.67 (1.93)	3.82 (1.92)
	Time that was different		
Younger	2.47 (1.85)	2.81 (1.78)	2.64 (1.81)
Older	3.67 (1.69)	3.67 (1.90)	3.67 (1.78)
Overall mean	3.07 (1.86)	3.23 (1.87)	3.15 (1.86)
	Last time		
Younger	2.59 (1.72)	3.41 (2.08)	3.00 (1.93)
Older	3.90 (1.70)	4.03 (1.63)	3.97 (1.65)
Overall mean	3.27 (1.81)	3.74 (1.87)	3.50 (1.85)
	Overall		
Younger	2.83 (1.85)	3.07 (1.85)	2.95 (1.85)
Older	4.03 (1.74)	3.99 (1.84)	4.01 (1.78)
Overall mean	3.43 (1.89)	3.54 (1.89)	3.49 (1.89)

Table 13

Mean Number (SDs in parentheses) of External Intrusion Errors about the Deviation as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	.69 (1.17)	1.18 (1.09)	.93 (1.15)
Older	.79 (1.07)	1.17 (1.17)	.98 (1.13)
Overall mean	.74 (1.11)	1.18 (1.12)	.96 (1.13)
	Time that was different		
Younger	1.17 (1.58)	1.06 (1.12)	1.11 (1.36)
Older	1.03 (1.07)	1.33 (1.35)	1.18 (1.21)
Overall mean	1.10 (1.34)	1.20 (1.24)	1.15 (1.28)
	Last time		
Younger	1.30 (1.14)	1.00 (1.18)	1.15 (1.16)
Older	1.21 (.98)	1.50 (1.17)	1.36 (1.08)
Overall mean	1.25 (1.05)	1.26 (1.19)	1.26 (1.12)
	Overall		
Younger	1.05 (1.33)	1.08 (1.12)	1.06 (1.22)
Older	1.01 (1.04)	1.34 (1.22)	1.18 (1.15)
Overall mean	1.03 (1.19)	1.21 (1.18)	1.12 (1.18)

Table 14

Mean Number (SDs in parentheses) of Don't Know Responses about the Deviation as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	2.45 (1.74)	2.25 (1.84)	2.35 (1.78)
Older	1.46 (1.26)	1.31 (1.07)	1.39 (1.16)
Overall mean	1.96 (1.59)	1.77 (1.56)	1.87 (1.57)
	Time that was different		
Younger	2.87 (1.89)	2.65 (1.70)	2.75 (1.79)
Older	2.07 (1.44)	1.67 (1.32)	1.87 (1.38)
Overall mean	2.47 (1.71)	2.16 (1.59)	2.31 (1.65)
	Last time		
Younger	2.33 (1.78)	2.30 (1.73)	2.31 (1.74)
Older	1.55 (1.33)	1.33 (.96)	1.44 (1.15)
Overall mean	1.93 (1.59)	1.79 (1.45)	1.86 (1.52)
	Overall		
Younger	2.56 (1.80)	2.41 (1.74)	2.48 (1.77)
Older	1.70 (1.36)	1.44 (1.13)	1.57 (1.25)
Overall mean	2.13 (1.64)	1.91 (1.54)	2.02 (1.59)

Table 15

Accuracy Redefined Broadly to Include All Experienced Instance Details: Mean Number (SDs in parentheses) in Free Recall as a Function of Age, Instance Recalled, and Recall Technique

Age	No MCR	MCR	Overall mean
	First time		
Younger	.76 (1.53)	.52 (.80)	.64 (1.23)
Older	2.19 (2.25)	2.45 (2.31)	2.32 (2.27)
Overall mean	1.45 (2.03)	1.52 (1.99)	1.48 (2.00)
	Time that was different		
Younger	.17 (.47)	.45 (1.15)	.32 (.89)
Older	.90 (1.45)	1.07 (1.87)	.98 (1.66)
Overall mean	.54 (1.13)	.75 (1.57)	.65 (1.37)
	Last time		
Younger	.19 (.57)	1.19 (1.70)	.69 (1.35)
Older	1.75 (2.11)	1.77 (1.87)	1.76 (1.96)
Overall mean	.94 (1.70)	1.50 (1.80)	1.24 (1.77)
	Overall		
Younger	.38 (1.02)	.70 (1.29)	.54 (1.17)
Older	1.58 (2.00)	1.75 (2.08)	1.67 (2.04)
Overall mean	.97 (1.68)	1.24 (1.81)	1.11 (1.75)

Table 16

*Accuracy Redefined Broadly to Include All Experienced Instance Details: Mean Number (*SDs *in parentheses) in Cued Recall as a Function of Age, Instance Recalled, and Recall Technique*

Age	No MCR	MCR	Overall mean
	First time		
Younger	7.45 (2.37)	9.11 (2.27)	8.26 (2.45)
Older	8.93 (1.88)	9.21 (2.01)	9.07 (1.94)
Overall mean	8.18 (2.25)	9.16 (2.12)	8.67 (2.23)
	Time that was different		
Younger	8.70 (2.45)	9.65 (1.58)	9.18 (2.09)
Older	9.80 (2.02)	9.40 (2.40)	9.60 (2.21)
Overall mean	9.25 (2.30)	9.52 (2.01)	9.39 (2.15)
	Last time		
Younger	8.93 (1.75)	9.04 (2.33)	8.98 (2.04)
Older	9.52 (2.68)	9.47 (1.74)	9.49 (2.23)
Overall mean	9.23 (2.28)	9.26 (2.03)	9.25 (2.15)
	Overall		
Younger	8.35 (2.29)	9.28 (2.06)	8.81 (2.22)
Older	9.43 (2.23)	9.36 (2.05)	9.39 (2.13)
Overall mean	8.89 (2.32)	9.32 (2.05)	9.11 (2.19)

Table 17

Major Findings: Accuracy Narrowly and Broadly Defined

Variables of Interest	Narrow Definition	Broad Definition
Instance Details: Free Recall	Age	Age
Accuracy: Instance	Older children > younger children first and last instance, no diffs for dev. instance	N/A
Accuracy: MCR	MCR present = MCR absent	N/A
Internal Intrusions: Instance	Younger children only: last instance > first instance followed by dev. instance	N/A
Internal Intrusions: MCR	Younger children only: MCR present > MCR absent	N/A
Accuracy + Int. I.: Instance	N/A	Older children only: first > dev. instance, last > dev. instance, first = last; Older > younger children
Accuracy + Int. I.: MCR	N/A	MCR present = MCR absent

Don't Knows: Instance	Younger children > older children first instance only, no diffs for last and dev. instance	N/A
Don't Knows: MCR	MCR present = MCR absent	N/A
Instance Details: Cued Recall		
Accuracy: Instance	First instance > dev. instance and last, last > dev. instance; Older > younger children	N/A
Accuracy: MCR	MCR absent > MCR present first instance only	N/A
Internal Intrusions: Instance	Dev. instance > last > first, last > first	N/A
Internal Intrusions: MCR	MCR present > MCR absent for first instance only, MCR present = MCR absent for last and dev. instance	N/A
Accuracy + Int. I.: Instance	N/A	Dev. instance and last > first, dev. instance = last; Older > younger children
Accuracy + Int. I.: MCR	N/A	Younger children only: MCR present > MCR absent
Don't Knows: Instance	Younger > older children	N/A

Don't Knows: MCR	MCR absent > MCR present first instance only	N/A
Deviation Details: Cued Recall		
Accuracy: Instance	First instance > dev. instance; Older > younger children	N/A
Accuracy: MCR	MCR present = MCR absent	N/A
Within-Instance Int.: Instance	First = dev. instance = last; Younger > older children	N/A
Within-Instance Int.: MCR	MCR present = MCR absent	N/A
Don't Knows: Instance	Dev. instance > first and last, last = first; Younger > older children	N/A
Don't Knows: MCR	MCR present = MCR absent	N/A

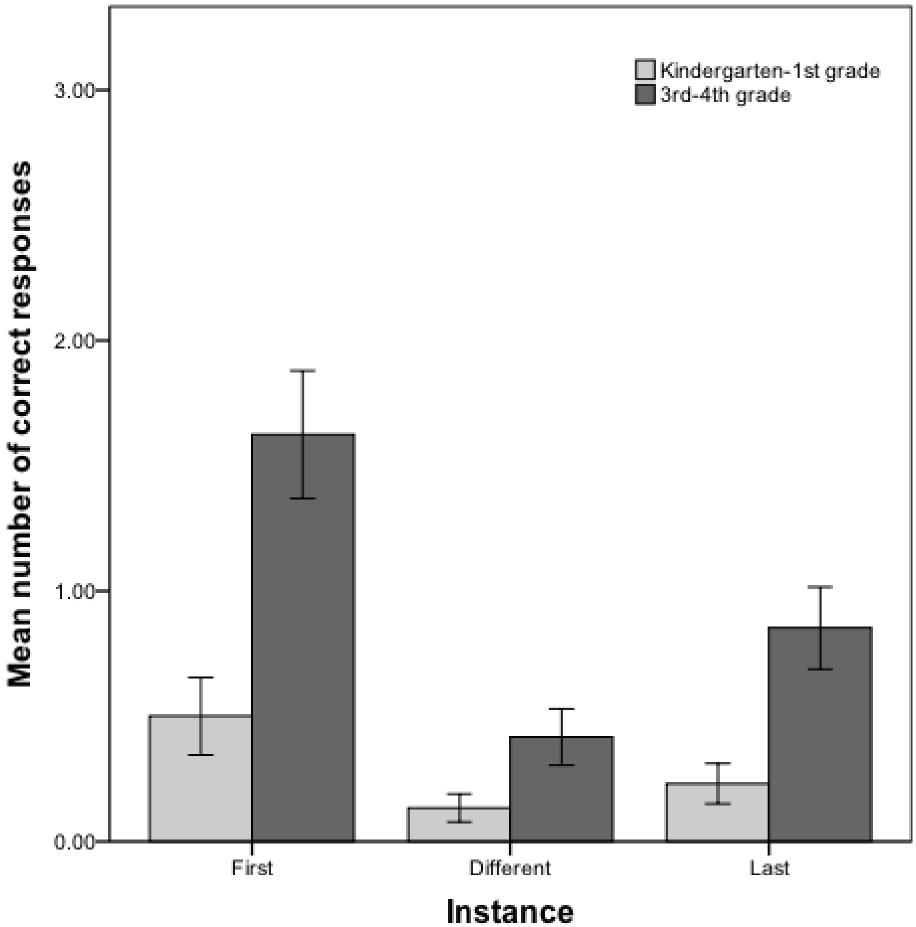

Figure 1. Mean number of correct responses in free recall for younger and older children across instances. Error bars are +/- 1 *SEs.*

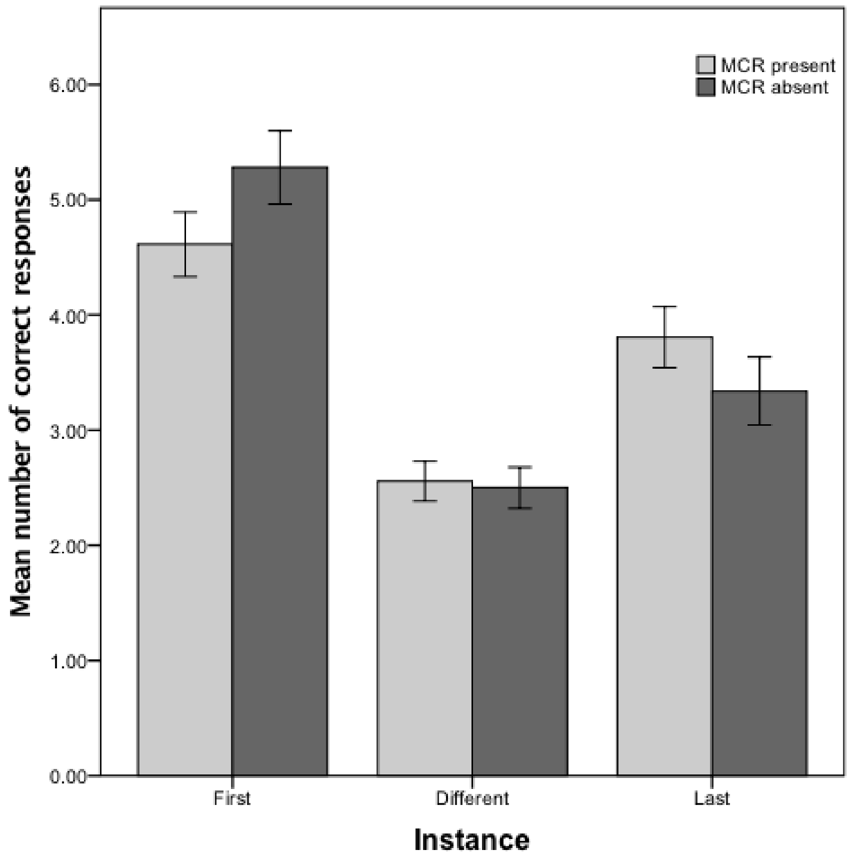

Figure 2. Mean number of correct responses in cued recall across instances when MCR was present and absent. Error bars are +/- 1 *SEs.*

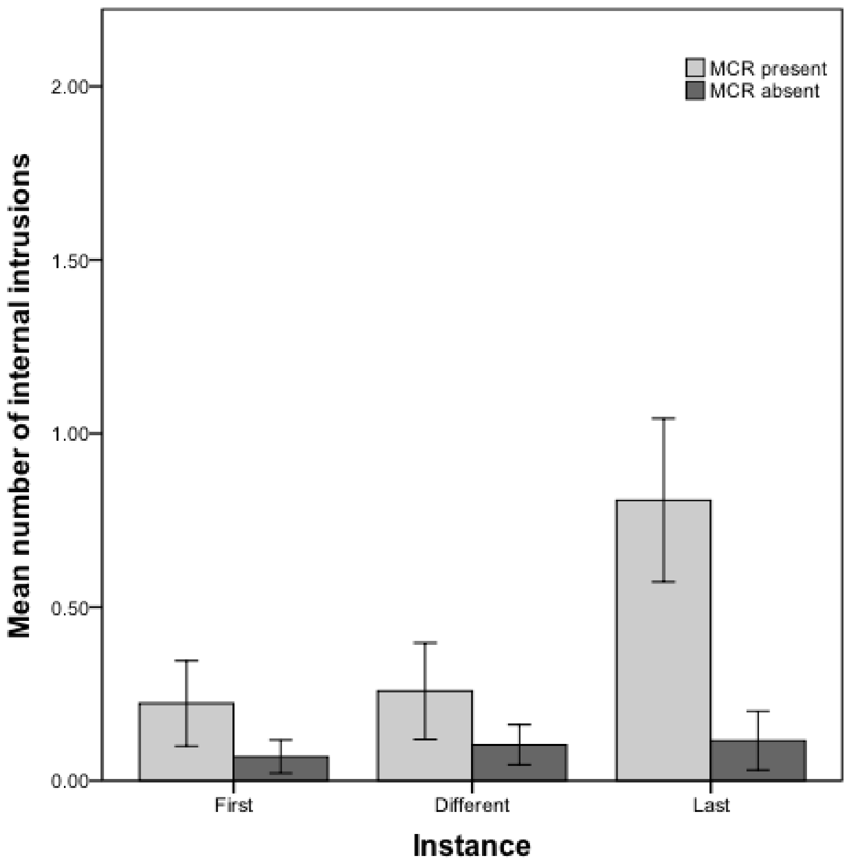

Figure 3. Mean number of internal intrusions in free recall across instances when MCR was present and absent for younger children. Error bars are +/- 1 *SEs*.

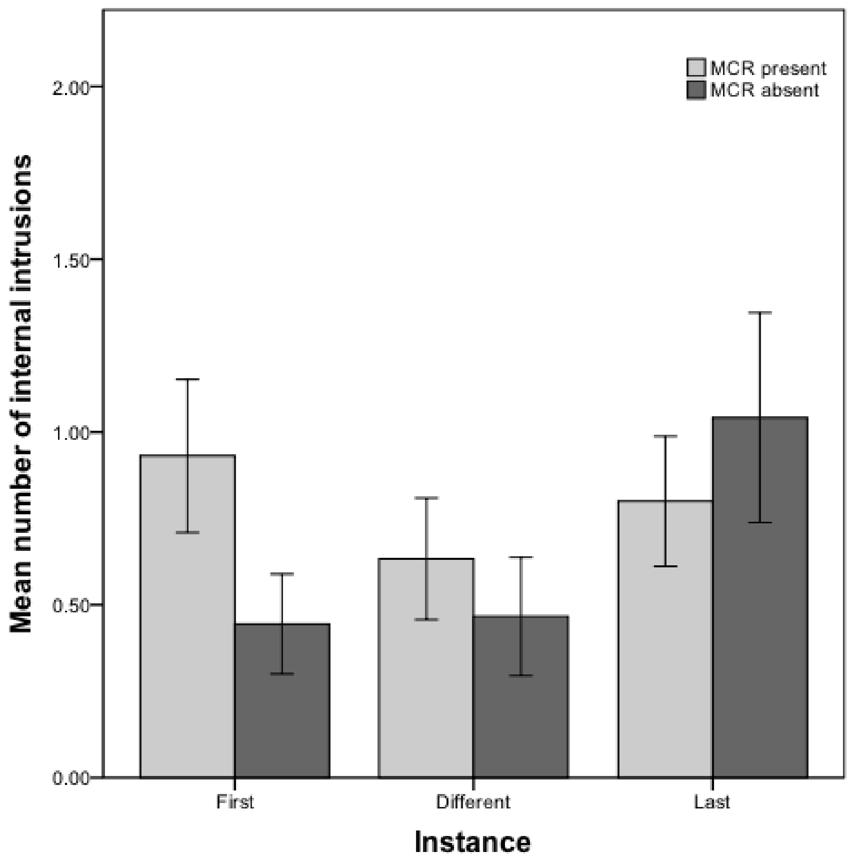

Figure 4. Mean number of internal intrusions in free recall across instances when MCR was present and absent for older children. Error bars are +/- 1 SEs.

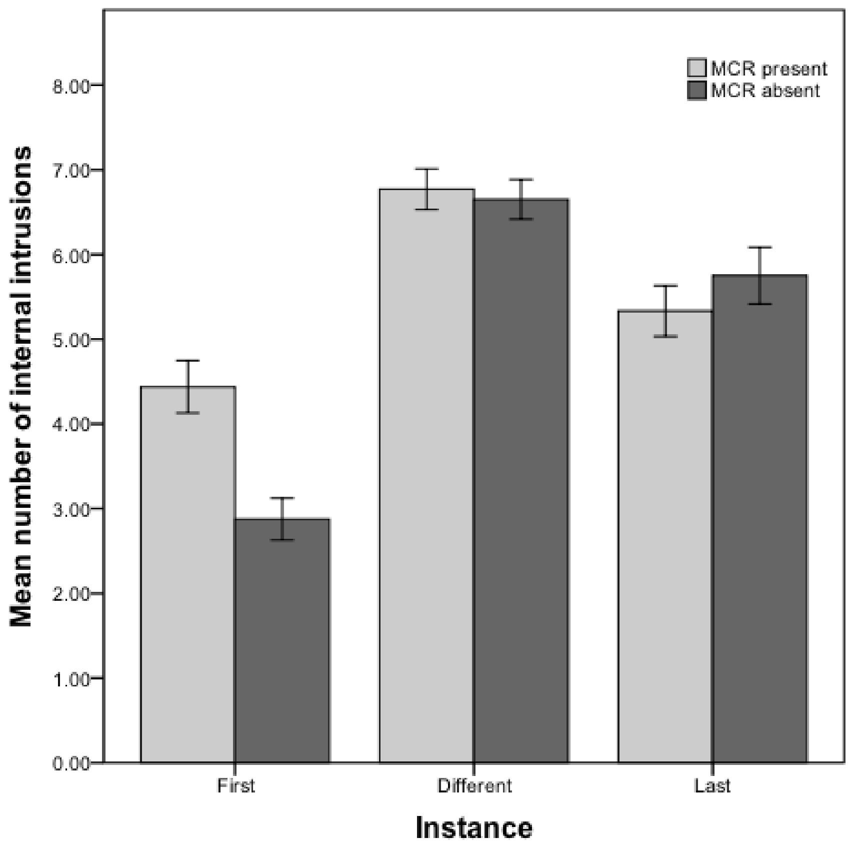

Figure 5. Mean number of internal intrusions in cued recall across instances when MCR was present and absent. Error bars are +/- 1 *SEs.*

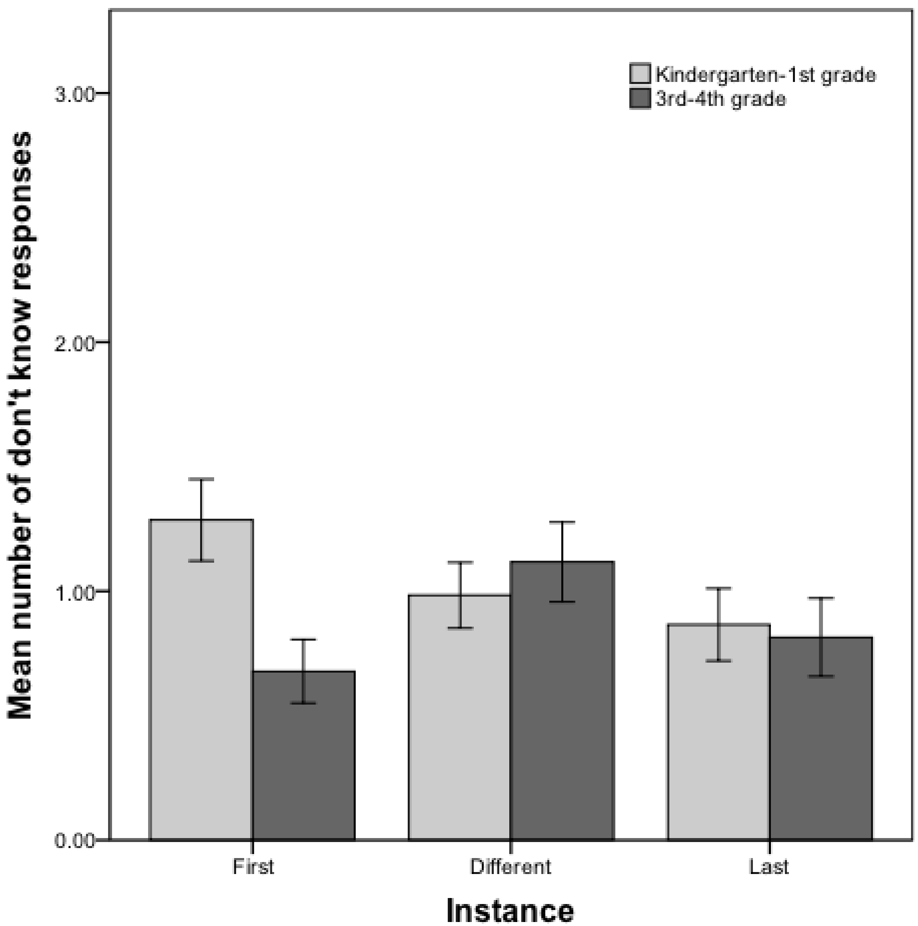

Figure 6. Mean number of don’t know responses in free recall across instances for younger and older children. Error bars are +/- 1 *SEs.*

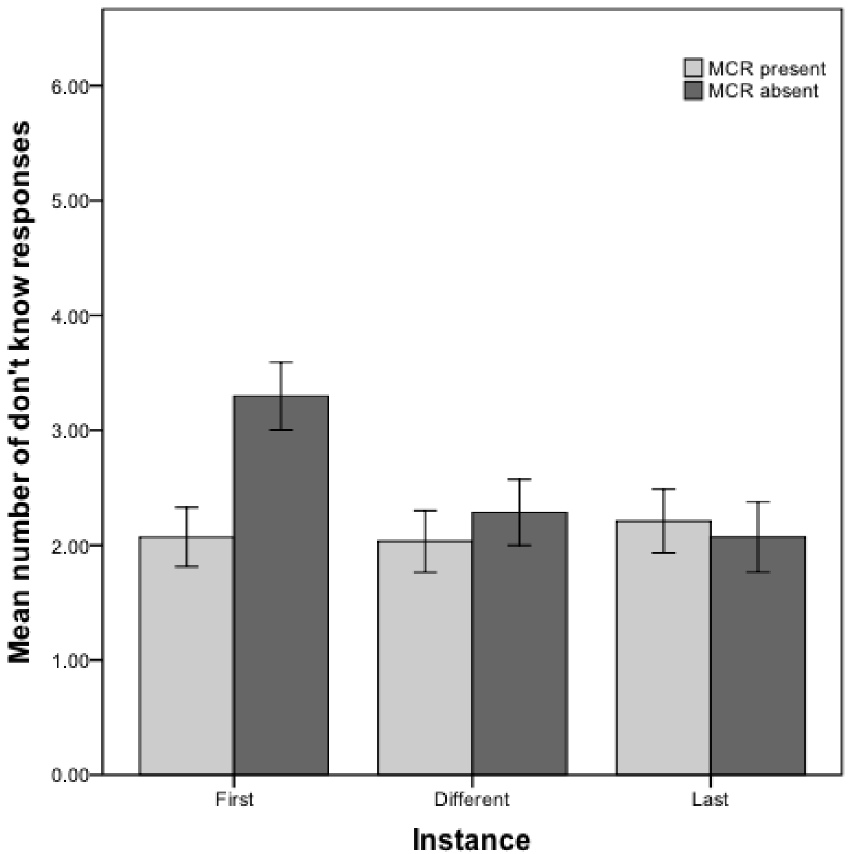

Figure 7. Mean number of don’t know responses in cued recall across instances when MCR was present and absent. Error bars are +/- 1 SEs.

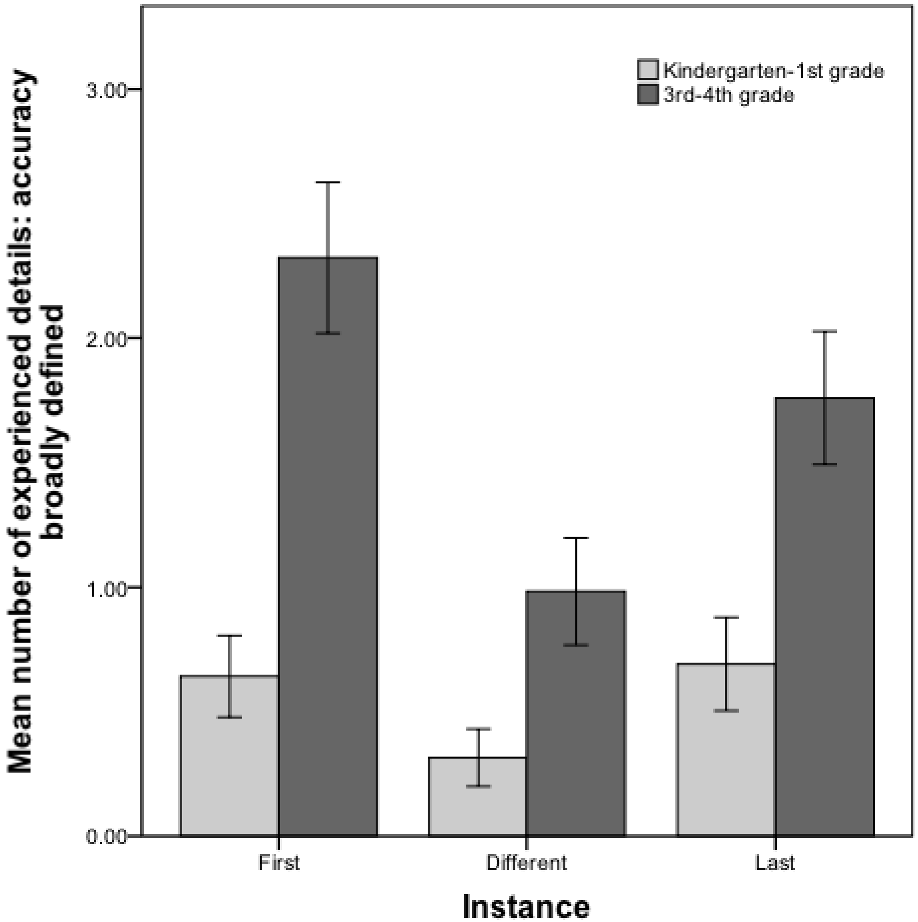

Figure 8. Mean number of experienced details reported by younger and older children across instances in free recall when accuracy was broadly defined. Error bars are +/- 1 *SEs.*

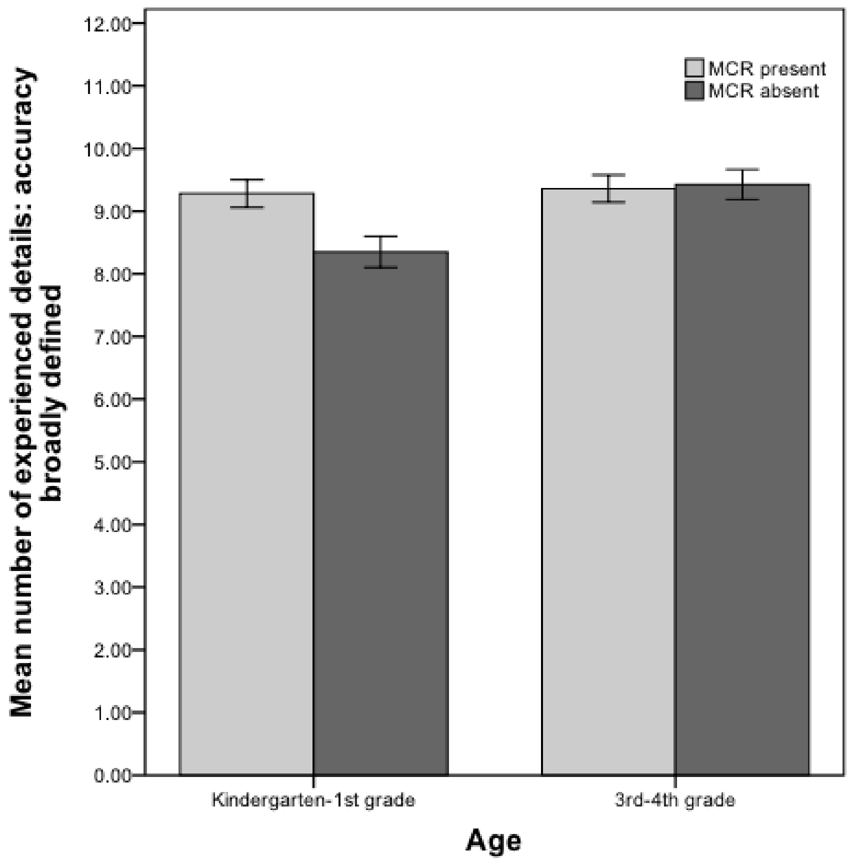

Figure 9. Mean number of experienced details reported by younger and children in the presence and absence of MCR in cued recall when accuracy was broadly defined. Error bars are +/- 1 *SEs.*

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Appendix A.

Interview Protocol

Before the interview, the interviewer will say the participant number into the recording device (*audio or video*).

Instructions/ Ground rules

Hello, my name is ____ and I would like to ask you about one of the magic shows you participated in with Dazzling Dylan. I wasn't there when you saw the magic shows and I was wondering if it would be ok for me to ask you questions about what happened during one of the magic shows; is it ok? [Allow child to respond; if the child assents, continue]. Great! As you can see, we have a *video-camera/audio-recorder* here. It will record our conversation so I can remember everything you tell me. Sometimes I forget things and the recorder allows me to listen to you without having to write everything down. Is that ok? [Allow child to respond]. I also have a certificate with your name on it; after you answer some of my questions, I will let you pick out a sticker to put on your certificate. How does that sound? [Wait for child's response]. Great!

Turn on the recording device (audio or video) and say the participant number into the recording device.

Today is _____ and it is now ____ o'clock and we are interviewing at _____ school.

Part of my job is to learn what happened during one of the magic shows. I have to ask you all of the questions that I brought with me, but I would like to tell you how to answer my questions first. Before we begin, I want to make sure you understand how important it is to tell the truth. It is very important that you only tell me the truth about things that really happened during the magic show I'm going to ask you about.

If I ask a question that you don't understand, just say, "I don't understand." Okay? [pause to let the child respond]

If I don't understand what you say, I'll ask you to explain. [pause]

If I ask a question, and you don't know the answer, just tell me "I don't know."

So, if I ask you, 'When is my birthday?' what would you say? [wait for an answer].

If the child says, 'I don't know', say: "Right. You don't know, do you?"

If the child offers a GUESS, say: "No, you don't know because you don't me. When you don't know the answer, don't guess—say that you don't know." [pause]

But, if you know the answer, be sure to tell me.

If I say things that are wrong, you should tell me. Okay? [wait for an answer]

OK.

Rapport building

"Now, I would like to get to know you better."

1. "Tell me about a favorite place you like to go with your family and tell me about everything that happens when you go there."

[Wait for child to respond]

[If the child gives a fairly detailed response, skip to practice phase]

[If the child does not answer, gives a short answer, or gets stuck, say:]

2. "I really want to know you better. Tell me more about what happens when you go to your favorite place with your family." [Wait for an answer]

Notes (write the child's favorite place, was (s)he detailed, shy, other observations):

Practice Phase

Note that children in the MCR present condition will receive MCR instructions 1c.

“I want to know more about you and the things you do.”

1. I would like to ask you about one time you went to gym class. [Pause]. I would like you to tell me about [depends on condition]:

- the first time you went to gym class this year

-the last time you went to gym class this year

-the time that something different or surprising happened in gym class this year

[If in the MCR condition, proceed to MCR instructions. If not, proceed to 1b].

1a. MCR instruction: Close your eyes and think about the [first time, last time, time that something different or surprising happened] in gym class this year as if you were there again. (Pause). Think about where you were (Pause), think about what was happening around you (Pause), think about all of the things you felt (Pause), think about what special smells you could smell (Pause), and think of what sounds or voices you could hear (Pause). Think about all of the things you did and all of the people who were there. (Pause). Open your eyes.

1b. Think hard about what happened the [first time, last time, time that something different or surprising happened] in gym class this year and tell me about everything that happened in gym class from beginning to end, as best as you can remember. [Wait for an answer].

[Provide one follow-up utterance]:

“I don’t want you to leave anything out. Tell me what else you can remember.”

Thank you for answering my questions and helping me get to know you better! I think you’ve earned a sticker. Which sticker would you like to put on your certificate? [Allow the child time to pick out a sticker. After the child has chosen a sticker, turn over the certificate and put away the stickers so the child is not distracted.]

Substantive portion

Free recall

Now that I know you a little better, I would like to talk with you about one of the magic shows you learned with Dazzling Dylan. Remember that I was not there when you learned the magic shows. It is important that you concentrate on what you can remember and tell me everything you can in as much detail as possible, even things you don't think are important. Remember that it is ok to say "I don't know" or "I don't remember" when I ask you a question. Remember not to guess and only tell me things that really happened during the magic show.

1. The magic show I am going to ask you about is:

-the first time you saw the magic show

-the last time you saw the magic show

-the time that something different or surprising happened in the magic show

Do you remember that time? Do you remember the trick you learned during that show? [Allow the child to describe the trick to ensure they are thinking about the correct show. Only if the child nominates the wrong time, say the name of the trick and direct the child to the proper instance]

If in the MCR condition, proceed to 1a. If not, proceed to 1b].

1a. MCR condition: Close your eyes and think about the time that something different or surprising happened in the magic show, as if you were there right now. (Pause). Think about where you were (Pause), think about what was happening around you (Pause), think about all of the things you felt (Pause), think about what special smells you could smell (Pause), and think of what sounds or voices you could hear (Pause). Think about all of the things Dazzling Dylan did, you did, and all of the people who were there. (Pause). Open your eyes.

1b. Think hard about the [first time, last time, time that something different or surprising happened in one of the magic shows], and tell me about everything that happened during that show from beginning to end, as best as you can remember.

[Provide one follow-up utterance]:

"I don't want you to leave anything out. Tell me what else you can remember."

1c. You've told me a lot, and that's really helpful. To be sure I understand, please start at the beginning and tell me exactly what happened from beginning to end.

1d. You're doing great answering all my questions! I think you've earned a sticker to put on your certificate [allow child to pick sticker and then turn over the certificate and stickers]

2. Now, I have some specific questions about the [first time, the last time, time that something different or surprising happened in one of the magic shows]. You may have already told me the answers to some of these questions, but I still have to ask all of the questions that are on my sheet. Some of these questions might be hard and it is OK to say "I don't know" if I ask you a question and you don't remember.

Cued recall

Ask 1 prompt per question [try to concentrate] if the child initially says, "I don't know."

1) What was on the magic show ticket the first/last time you saw the magic show/the time that something different or surprising happened in the magic show?

   ____

2) What did Dazzling Dylan remove to show she was ready to begin the first/last magic show/ the time that something different or surprising happened in the magic show?

   ____

3) What warm-up exercise did you do the first/last time you saw the magic show/ the time that something different or surprising happened in the magic show?

   ____

4) What kind of juice did Dazzling Dylan drink the first/last time you saw the magic show/ the time that something different or surprising happened in the magic show?

____

5) What kind of hat did Dazzling Dylan wear the first/last time you saw the magic show/ the time that something different or surprising happened in the magic show?

____

6) What magic item did you get to use the first/last time you saw the magic show/ time that something different or surprising happened in the magic show?

____

7) What stuffed animal did Dazzling Dylan bring to be her assistant the first/last time you saw the magic show/ the time that something different or surprising happened in the magic show?

____

8) What musical instrument did you listen to the first/last time you saw the magic show/ the time that something different or surprising happened in the magic show?

____

9) What magic words did you say the first/last time you saw the magic show/ the time that something different or surprising happened in the magic show?

____

10) Where did Dazzling Dylan put the sticker on your body the first/last time you saw the magic show/ the time that something different or surprising happened in the magic show?

____

11) What was the secret Dazzling Dylan told you the first/last time you saw the magic show/ the time that something different or surprising happened in the magic show?

____

12) What action did Dazzling Dylan do to end the show and say goodbye the first/last time you saw the magic show/ the time that something different or surprising happened in the magic show?

____

Deviation Questions

Now, I want to ask you about the things that happened when a different magician came into the room and needed Dazzling Dylan's help. Do you remember that happened? [If the child says no, say "during one of the magic shows another magician came into the room because she needed Dazzling Dylan's help (Pause), I have to ask you some questions about what happened when the different magician interrupted the show].

If in the MCR condition, give the following instruction: Close your eyes and think about what happened when a different magician interrupted the show, as if you were there right now (Pause). Think about where you were (Pause), think about what was happening around you (Pause), think about all of the things you felt (Pause), think about what special smells you could smell (Pause), and think of what sounds or voices you could hear (Pause). Think about all of the things Dazzling Dylan did, you did, and all of the people who were there. (Pause). Open your eyes.

1) What was the name of the different magician who interrupted the show?

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2) What was the name of the spell the different magician accidentally put on herself that she needed Dazzling Dylan to break?

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3) What was the different magician carrying in her hand that Dazzling Dylan said she'd never seen her carry before?

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4) What did Dazzling Dylan put on the different magician to help break the spell?

---

5) What color was the thing that Dazzling Dylan put on the different magician?

---

6) How many times did Dazzling Dylan spin the different magician around in order for the antidote to break the spell?

---

7) What kind of party did the different magician invite Dazzling Dylan to go to before she left?

Great work answering all of my questions! Thank you for trying so hard! How about you select a sticker to put on your SFU certificate? (Wait until children selects sticker to ask the two exploratory questions).

Exploratory Questions

Just out of curiosity, of all of the magic shows, what magic show do you remember best?

____

(Ask if child did not specify the exact trick: Ok, what trick did you learn during that time?)

____

I have no more questions for you. We are going to return to your classroom now. Before we do, you can pick out a special pencil/prize.