

Preface

My interest in eyewitness testimony began when I read Elizabeth Loftus' (1979) book titled *Eyewitness Testimony*. This reading was the culminating assignment for a course I took on learning and memory in fall 1981, taught by Professor Deborah Burke at Pomona College. I was fascinated. Seeing the application of all that I had learned that semester in Loftus' book highlighted the importance of basic research and how findings are translated to real-world contexts.

Then I was robbed. Over the winter break in early January 1982, I worked as a bank teller. A man approached my window, and he asked for all of the money in my drawer. As a seasoned bank teller, I enacted the protocol for such a situation. When he left the building, I went to a quiet place and wrote down everything I could remember. Over the next few hours, numerous law enforcement officers interviewed me. As I was answering questions, I (internally) analyzed their questioning practices: Were they (unintentionally) misleading me? Was my memory of the event being affected by telling and retelling what happened? The one question I still remember today is, "What color was the man's hat?" Hum . . . did he even have a hat? I could not remember the color, and I still question whether or not he was wearing a hat.

Fast forward to today. As a developmental scientist, I find the topic of children's eyewitness testimony, and more generally the questions pertaining to children's event memory, fascinating for the same reasons I loved Loftus' book. This topic has important real-world implications. Moreover, the topic is complex, and thus motivates study of a host of developmental areas and processes. Now my students at Colby College join me as I dive into these areas, and we conduct research on children's event memory that may have implications for eyewitness testimony. As we have learned and as you will see as you read this Element, complex questions do not have simple answers, but I hope you enjoy the journey.

1 Introduction

At what age can children be reliable eyewitnesses? This question has important practical implications because, unfortunately, children are witnesses to crimes, either directly or indirectly. Moreover, for some crimes, such as child physical or sexual abuse, the survivor may be the only witness. Figure 1 shows the different types of crimes involving children aged two to seventeen years living in the contiguous United States. Although these data were published in 2005 by Finkelhor et al., it is likely that the relative trends, if not the absolute numbers, apply to the present day. Even though much of the work on eyewitness testimony focuses on the situation of child sexual abuse, other crimes directly

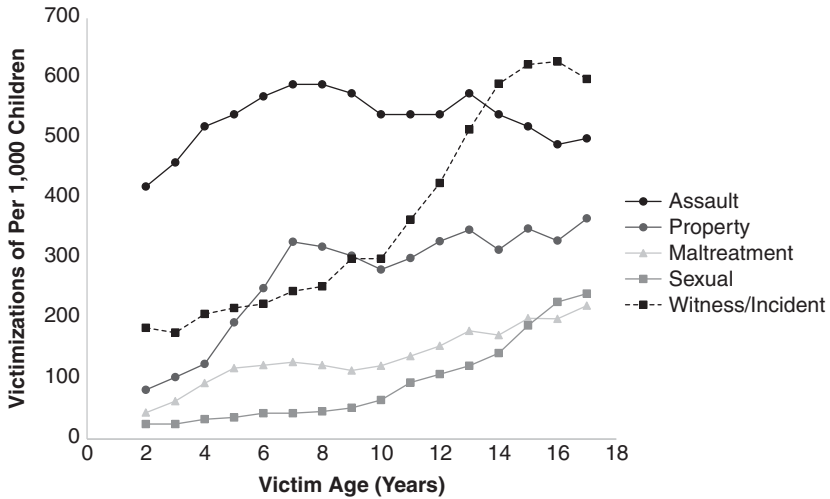


Figure 1 Crime involvement as victims or bystanders as a function of type of crime and age for children in the United States.

Note: Figure reproduced by M. E. Arterberry from Finkelhor et al. (2005) with permission.

involve children, including physical assault (the most common type of crime) and property violations. Moreover, about one in three children witness violent crimes or experience indirect victimization. Outside of criminal contexts, children report on events all the time. When parents or teachers encounter two or more children fighting, crying, or something broken, the first thing they ask is, “What happened?” Moreover, parents may ask what happened at school, peers may ask what someone ate for breakfast, grandparents may ask what they did first on a field trip, or siblings or peers may compare notes on a recent dental visit or a birthday party. All of these contexts involve memory for events.

The answer to the question about at what age children can be reliable eyewitnesses is elusive. For one reason, adults are not very reliable eyewitnesses (Loftus, 2019). Thus, how can children be expected to be reliable? Perhaps a more useful question is: What factors influence children’s accuracy in reporting on events? Through exploring these factors, age trends may be identified, but it is unlikely that there is one age after which children are considered to be reliable. The question focusing on factors also moves the discussion to many aspects of episodic or event memory, not just those that pertain to criminal proceedings. Yes, eyewitness testimony and its accuracy are important, but recalling and reporting on events is a part of all children’s everyday interactions.

What does it mean for a witness or for memory to be reliable? From a researcher’s standpoint, reliability is a central concept. Researchers want

their findings to be reliable in that they reflect truth, such as truth about principles (e.g., gravity) or truth in accurately characterizing behaviors (e.g., ways to attract someone's attention). Consequently, there are a number of procedures researchers follow, along with controls, to ensure that their results mean what they hope they mean. One test of a reliable study is doing it again and see if the same findings emerge. Replication of the same procedure by the same researchers is one way to do this. Alternatively, others may try to replicate the procedure. And still others may extrapolate from the original finding, reasoning that if it is true, then something else should be true. When talking about reliable memory of events, truth is also at stake. Memory should reflect what happened. Moreover, if someone is asked multiple times about the same event or if multiple people are asked about the same event, the details should be the same. When these conditions are met, memory is reliable.

1.1 Information-Processing Framework

Trying to determine the factors that influence children's accuracy in reporting on events has led to many discoveries about children's cognition, and this Element focuses on these discoveries, particularly on the development of event memory. Much of the research conducted on this topic comes from an information-processing framework (Atkinson & Shiffrin, 1968; Howe, 2015; Miller, 2002). The information-processing framework emerged in the 1960s and uses a computer metaphor for cognitive processes, particularly memory. The basic idea is that information is taken in, it is processed, it may be stored, it may be retrieved at a later date, and all of this is in service of behavior or an output. The framework has three key components – sensory register, short-term/working memory, and long-term memory – and three key processes – attention, encoding, and retrieval (see Figure 2). To illustrate this model, consider a vignette used by Smetana and Ball (2018, p. 2263) in

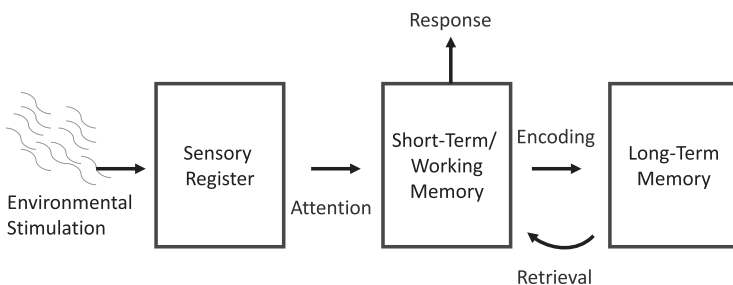


Figure 2 Schematic representation of the information-processing framework, after Atkinson & Shiffrin (1968) (created by M. E. Arterberry).

a study on moral transgressions: “One day, Madison and Sarah both decided to go play on the swings. Sarah was about to take a turn, but Madison shoved her so that she fell over, and Madison got on the swing.”

All information processing begins with input, and in this model, input is defined as environmental stimulation. This stimulation – whether wavelengths of light, sound frequencies, pressure, temperature, or chemical properties – enters the system via the sensory register. A bystander witnessing the swing event described previously would be awash in energy impinging on the senses (such as the color of the children’s clothing, their faces, their movements, the sound of the swing, the change in air as the swing moves, the feel of wood chips under the feet, the children’s voices or screams, and the sunshine). Some of this information is central to the event (the actor’s faces and movements), and some is peripheral (the wood chips). This information is collected for a brief time in the sensory register. The sensory register has a large capacity but a very short duration. Thus, much of this information disappears quickly. The information that does not disappear has been moved to short-term memory/working memory via attentional processes. Attention is selective in that there are limits to how much information can be attended to at one time. Often the most salient features capture attention (e.g., bright colors, flashing lights, and movement).

Information that is in conscious awareness, or attended to, is in short-term/working memory. Short-term/working memory has a small capacity and a short duration. Adults hold about five to nine (or seven plus or minus two) items in short-term memory (Miller, 1956), and as long as the information is being used, it remains active or accessible. For example, a bystander may be surprised by the pushing event in the swing vignette and continue to watch Madison on the swing, allowing for more opportunities to remember what she looked like, the clothes she was wearing, and the like. Information that is saved for later is encoded and stored in long-term memory. Long-term memory has an infinite capacity and long duration. The bystander may evaluate the shoving as a moral transgression and decide to tell a teacher after recess is over or a parent once home from the playground. With this goal in mind, details about the event may be stored in long-term memory. Later, information from long-term memory can be retrieved and moved back to short-term/working memory. Successful retrieval relies on effective encoding. Encoding processes vary, but those that allow for deeper encoding, such as extracting the meaning of the information and storing it with information already known, increase the chance of successful retrieval. For example, the bystander may encode the present event by tying it to their memories of other transgressions, perhaps previous acts committed by Madison or other instances where children shoved one another. Retrieval cues

help with retrieval, such as remembering the event that took place on the playground or someone asking why Sarah was upset.

Retrieving information from memory involves one of two processes – recall and recognition. The term recall often refers to the general process of pulling something from memory. However, recall in the information-processing framework is specific to retrieval without outside support. For example, the statement “tell me what happened” cues open-ended recall. The respondent does just that – tells what they can remember – without any guidance by the interviewer. Cued recall provides a little more support in that questions provide context. An example question might be, “Tell me how Sarah fell down?” Another type of retrieval is recognition. With recognition, the interviewer is asking for the selection of a response, such as “Did Madison shove Sarah?” (yes/no) or “What color was her shirt? Blue or green?” Recognition is easier than recall because with recognition the respondent is provided with more context than with recall and may only need to confirm or deny the information.

Whereas the information-processing framework is useful for organizing knowledge about and understanding the processes involved in event memory, reliable event memory is not just about attention, encoding, storage, and retrieval. There are other factors, including factors pertaining to the context, both internal (e.g., stress) and external (e.g., salience of the event) and factors pertaining to individuals (e.g., language skills) that intersect with memory for events and children’s ability to report on them. To explore the topic of event memory and its implications for eyewitness testimony, research from other theoretical perspectives, including attachment theory and sociocultural theory, is included.

1.2 Overview

This Element begins by identifying a number of topics that enlighten understanding of children’s event memory. Next, the Element considers one study in detail to understand the role of knowledge on short- and long-term memory of event details and to illustrate typical methodology used to study event memory. Following this study, the following topics are considered: memory for stressful events, children’s ability to remember the temporal order of events and the spatial location of where events occurred, and the ways poorly worded questions and/or intervening events (such as conversations about the event) may interfere with accurate reporting. Following an understanding of children’s memory performance under ideal and nonideal conditions, the Element considers the ways that children differ in the areas of language development, understanding right from wrong and emotions, and cognitive processes and

how these differences predict better (or worse) event memory. Finally, the Element turns to how potential jurors perceive children as eyewitnesses and how the findings of the research on children's event memory inform the best practices for interviewing children in criminal contexts. Because a number of researchers are interested in the lower age limits for when children can accurately report verbally on events, much of the research herein focuses on children between three and eight years of age.

2 Many Factors and One Comprehensive Study

2.1 Concept Map

When considering the factors that influence children's accuracy in reporting on events, clearly memory development is important. But, so is understanding other aspects of cognitive development, individual differences, and context. Figure 3 is one way to diagram the various topics that place eyewitness testimony in a larger context. This concept map is in no way complete, but it illustrates the complexity of this topic and the way that subareas intersect with the central question regarding the factors that influence children's memory reliability.

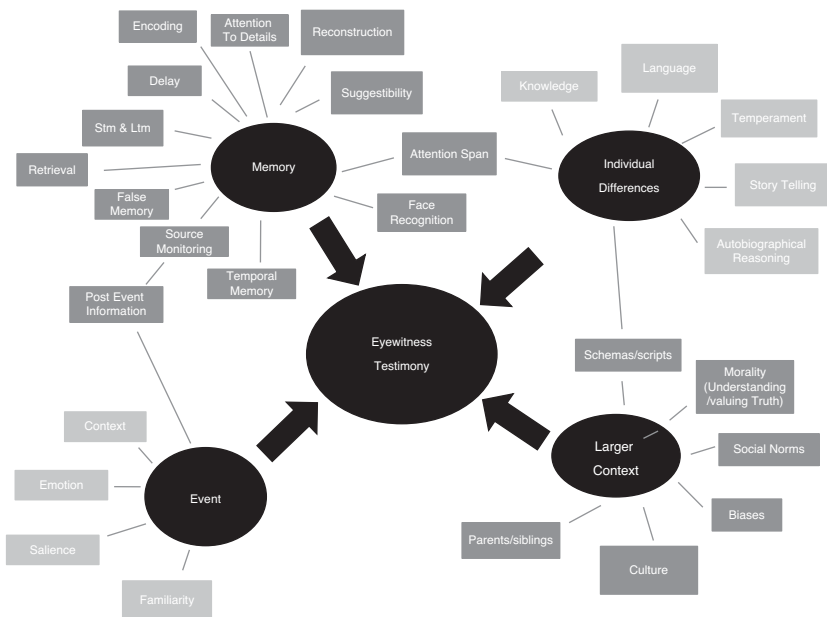


Figure 3 Schematic representation of topic areas that pertain to understanding of children's eyewitness testimony (created by M. E. Arterberry).

As is the case with much of the research in psychology, there is a trade-off between naturalistic studies (or ecologically valid studies) and those with a high level of control (often laboratory studies). In the research reviewed here, there is a balance between realistic contexts and experimental control. This trade-off may appear more acute here than in other areas of psychological research because of the field's interest in application. If a case relied on the testimony of a child witness, all parties involved would want to know whether or not the child witness is developmentally ready for such a task. Is this assessment best done under controlled laboratory conditions or in the messy real-world? Both approaches, controlled laboratory and real-world, provide a rich understanding of children's event memory. The next subsection begins by describing one study that addresses several of the topics included in the concept map, and the study illustrates how researchers can use a real event and a realistic questioning context without losing experimental control.

2.2 Short- and Long-Term Memory of an Event

Ornstein et al. (2006) were not the first researchers to explore children's event memory; however, over the years, they made significant contributions to the field's understanding of this topic. Their study conducted in 2006 is particularly ambitious and informative and so merits description in considerable detail for several reasons. First, it serves as an illustration of how this type of research is done with children, including the many considerations when designing a study that yields interpretable findings. To this end, some of the methodological decisions the researchers made as they designed and executed the study are highlighted. Second, the study serves as a model for many experiments that were done afterward to address children's event memory. Thus, later descriptions of studies can be brief, given this foundation. Finally, the findings serve as a comparison to those of other studies presented later in this Element.

For the context, Ornstein et al. (2006) took advantage of a naturally occurring event that all children in the United States (hopefully) experience – an annual well-child medical visit. This visit includes a (ideally) standard set of medical assessments regardless of medical provider. Moreover, the visit is intimate. A stranger (nurse or doctor) touches the children, such as when they place a stethoscope on their chest to listen to their heart and lungs, and the children may be partially undressed. For most children, this visit is not stressful, outside of the typical wariness children might have for medical settings (it is at these visits that children may receive inoculations). This context is especially useful for understanding children's event memory with the goal of drawing implications for eyewitness testimony because this medical context is like the contexts

in which children find themselves victims of crime, most notably those involving abuse. Often abuse events are repeated, involve some type of physical contact, and are perpetrated by a trusted adult.

In this work, Ornstein et al. (2006) addressed four questions. First, they asked how memory for the event changed between four and seven years of age. Second, they asked how long children retained information about a specific well-child visit, and third, they asked whether repeated questioning sustained or reactivated memory of the event. Finally, they asked how children's previous knowledge of an event contributed to their memory of the event. In other words, do children who know more about what typically happens in well-child pediatric visits remember more about the events that occurred during a specific visit than children who know less?

To answer these questions, they recruited families with children aged four, five, six, and seven years as they approached their children's well-child pediatric visit. Before the visit, a researcher interviewed half of the children in their home and asked them what typically happens at these visits. Within a month of the knowledge interview, all of the children experienced the well-child visit, and a parent used a checklist to indicate which of nineteen procedures the child experienced. Next, immediately after the visit, all children were interviewed by a researcher about the visit. Three months later, researchers interviewed half of the children again, and then six months later, researchers interviewed all of the children about the visit. See Figure 4.

The interview about the event was hierarchical in that first open-ended questions probed for what children remembered ("Tell me what happened at your checkup"). Then yes/no questions probed for details about specific events

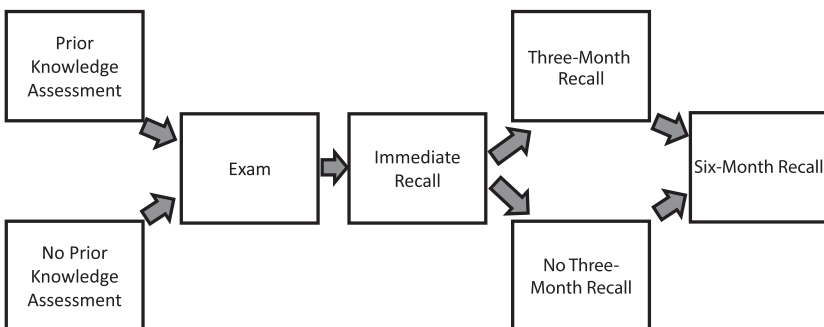


Figure 4 Procedural timeline for the interviews and the well-child exam experienced by children in Ornstein et al. (2006).

Note: Figure created by M. E. Arterberry using information in Table 1 in Ornstein et al. (2006).

not mentioned during the open-ended phase (“Did the nurse find out if you can hear ok?”). In addition, when necessary, children were prompted to elaborate (“Tell me how she did that”). Next, the researchers asked two leading questions for each medical feature, one leading to the correct answer and one leading to the incorrect answer. Finally, the researchers asked eight yes/no extra-event questions that probed for activities that might occur during a medical visit but not at a well-child visit, such as wrapping one’s leg in a bandage.

2.2.1 A Methodological Aside

Those unfamiliar with research in psychology or research with children may not fully appreciate the number of decisions Ornstein et al. (2006) made when designing and implementing this research project. There are a number of decisions that make this a strong investigation. First, they asked only half of the children about their knowledge of the visit. From this baseline assessment, the investigators were able to determine generally what children know about well-child visits at the four ages (i.e., four to seven years). But the investigators also were able to determine whether children who were asked in the month preceding a visit about such visits showed greater memory for the specific experience compared with children who were not asked. It is possible that children remembered more about the actual visit because they were asked in advance about it. In other words, the knowledge interview asked children to retrieve information about such visits, and that may have made them pay more attention during the actual visit, or it may have allowed them to store new information about the visit along with past information more readily than children who did not have the opportunity to retrieve their knowledge about well-child visits. Ornstein et al. (2006) also asked only half of the children questions at three months. This decision allowed them to test whether questioning at three months enhanced memory at six months after the event. The children who were not asked questions at three months served as an important control. Another control assessed children’s language abilities. Because the children were required to describe what they experienced and also answer specific questions about the medical encounter, the researchers wanted to be sure they were measuring memory for the event rather than children’s ability to talk about it.

Other important decisions were made when considering how to implement the procedure. The children were recruited from two pediatric groups, and six pediatricians and five nurses provided care across the sample. In practice, providers sometimes skip one or more of the standard assessments in their implementation of the well-child visit. To account for this variability across

visits, parents completed a checklist during the exam so that the researchers knew which of the possible nineteen components of the exam were provided (the average was fourteen to fifteen components across all four age groups), and thus the researchers were able to tailor their questioning and scoring to items that were experienced or not.

The hierarchical questioning during the interviews is also an important methodological decision because it allowed the researchers to compare recall and recognition. The researchers first asked children to tell them what happened, using open-ended prompts to facilitate recall. The first prompt was “Tell me what happened during your checkup” (Ornstein et al., 2006, p. 335). Then children were asked more specific open-ended questions like “Tell me what the nurse/doctor does/did to check you.” This type of prompting allowed children to report what they could remember without any assistance or cuing from the interviewer. This type of memory is called recall. After children indicated they did not remember anything more, they were asked direct questions that were increasingly specific to assess recognition. For example, if children did not mention the hearing test, they were asked, “Did the nurse find out if you can hear okay?” If children answered yes, the researchers followed with a request for more information, such as “How did the nurse do that?” Some of the direct questions were not misleading (“Did you put on earphones and listen to sounds?”), whereas others were about events that did occur (hearing test) but provided incorrect information (“Did the nurse whisper into your ear?”).

2.2.2 Now for Some Results

At the immediate interview, the amount of details recalled increased with child age, ranging from 68 percent for four-year-olds to 88 percent for seven-year-olds. This increase was most apparent for the open-ended questions (Figure 5). Not surprisingly, rates of recall went down after three months, with children recalling 55 percent to 74 percent of the details four and seven years of age, respectively (Figure 5). Performance on the open-ended questions did not significantly drop between three and six months (Figure 5). Despite age differences for information recalled at each time point, the rates of forgetting were equal across ages, with children forgetting approximately 18 percent of the details by three months after the event. Children were also remarkably consistent in resisting the questions about events that did not happen, with denials ranging between 75 and 96 percent across the three assessments.

Ornstein et al. (2006) also found differences across the four ages in terms of children's knowledge of what typically happens at a well-child visit. Moreover,